ASHLEY LAKE TIMBER SALE

ENVIRONMENTAL ASSESSMENT

PREPARED BY

MONTANA DEPARTMENT OF NATURAL
RESOURCES AND CONSERVATION
NORTHWESTERN LAND OFFICE
KALISPELL UNIT
JANUARY 2012

ASHLEY LAKE TIMBER SALE
ENVIRONMENTAL ASSESSMENT

COVER SHEET

Proposed Action: The Montana Department of Natural Resources and Conservation (DNRC) is proposing forest management activities on forested State Trust lands. Proposed activities would include the sale and harvest of up to approximately 1.5 million board feet (MMBF) of timber from 640 acres of State land located approximately 13 miles west of Kalispell, Montana. Timber harvest would focus on improving the current and future productivity of forest stands in the project area. If selected, the proposed action would begin implementation as early as the summer of 2012.

Type of Document: Environmental Assessment

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FINDING

Ashley Lake Timber Sale

An interdisciplinary team (ID Team) has completed the Environmental Analysis (EA) for the proposed Department of Natural Resources and Conservation (DNRC) Ashley Lake Timber Sale. After a thorough review of the EA, project file, public correspondence, DNRC policies, standards and guidelines, and the State Forest Land Management Plan (SFLMP), the following decisions have been made:

I. Alternative Selected

Two alternatives are presented and were fully analyzed in the EA:

No Action Alternative A

Timber harvesting as proposed would not occur. Small scale removal of forest products within the project area would continue, road maintenance would occur only as needed, and weed control would be done as priorities and funding permitted. No planting of western larch would occur to move the Kalispell Unit toward a more desired future condition in terms of species composition and age class distribution.

Action Alternative B

Action Alternative B proposes the sale and harvest of an estimated 1.3 million board feet (MMBF) of timber from approximately 598 acres. Regeneration harvests would be used to treat all 598 acres, and 350 of those acres will be replanted with larch seedlings. Approximately 7.5 miles of existing road will be used to access the two harvest units.

For the following reasons, I have selected the Action Alternative B as presented:

a. The Action Alternative meets the Project Objectives listed on page 3 of the EA.

b. The analysis of identified issues did not reveal information compelling the DNRC not to implement the timber sale.

c. The Action Alternative identifies mitigation measures to address issues raised in the scoping process which include effects on soil productivity, vegetation, wildlife habitat, spread of noxious weeds, and air quality.

II. Significance of Impacts

a. Soils

The soil types found within the sale area are susceptible to impacts when not dry (less than 20% soil moisture) or frozen. Care will be taken to operate within those dry or frozen conditions as well as utilizing existing skid trails where properly located, additional skid trails will be used only where existing trails are unacceptable, and coarse woody debris and fine litter will be retained on-site for nutrient recycling. With these mitigation measures in place long-term soil impacts and adverse cumulative effects would be minimized.

b. Vegetation

The concern with grass establishment delaying natural regeneration will be addressed by planting 350 acres to western larch. This will also contribute to the desired species composition, age class, and successional stage to the extent that no impacts to the desired future condition of the vegetation are anticipated.

c. Wildlife

Impacts to wildlife essentially revolve around snags and course woody debris, threatened and endangered species, and big game (deer and elk).

The potential negative effects due to loss of snags and course woody debris will be minor and addressed by managing for snags, snag recruits and course woody debris, and closing roads and trails to the extent possible after the sale to reduce loss of snags to firewood cutting. Minor adverse effects are anticipated for Canada lynx, grizzly bears, bald eagles and wolves due to its location and existing cover types and length of open road. Minor adverse effects are also anticipated to big game because of the lack of closed canopy and connectivity that exists currently.

d. Air Quality

Potential impacts to air quality are recognized as coming from log hauling on the native surface county road (Ashley Lake and North Ashley lake Rds), and from burning logging slash. The sale contract as proposed will require the purchaser to dust abate the roads if stipulated by the County when hauling during dusty periods. The burning of logging slash will be done in accordance with County and State air quality guidelines during authorized periods of “open burning” only. With these mitigations in place the impacts are expected to be minor and of short duration.

Taken individually and cumulatively, the identified impacts of the proposed timber sale are within threshold limits. These proposed timber sale activities are common practices and none of the project activities are being conducted on important fragile or unique sites. The proposed timber sale conforms to the management philosophy adopted by DNRC in the SFLMP and is in compliance with existing laws, policies, guidelines, and standards applicable to this type of proposed action.

Upon review of the above primary issues considered as part of this EA 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 various resources will not be adversely affected to a significant degree. I find no precedent for future actions that would cause significant impacts, nor do I find conflict with local, State, or Federal laws, requirements, or formal plans. In summary, I find that the identified adverse impacts will be avoided, controlled, or mitigated by the design of the project to an extent that they are not significant.

III. Should DNRC prepare an Environmental EIS?

Based on the following, I find that an EIS does not need to be prepared:

a. The EA adequately addressed the issues identified during project development and displayed the information needed to make the decisions.

b. Evaluation of the potential impacts of the proposed timber sale indicate that no significant impacts would occur.

c. The ID Team provided sufficient opportunities for public review and comment during project development and analysis. Public concerns were incorporated into project design and analysis of impacts.

Greg Poncin

Kalispell Unit Manager

MT DNRC

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ACRONYMS

ARM	Administrative Rules of Montana
BMP	Best Management Practices
DBH	Diameter at Breast Height
DFWP	Department of Fish, Wildlife, & Parks
DNRC	Department of Natural Resources and Conservation
EA	Environmental Assessment
ECA	Equivalent Clearcut Acres
FI	Forest Improvement
HCP	Habitat Conservation Plan
HUC	Hydrologic Unit Code
ID Team	Interdisciplinary Team
MBF	Thousand Board Feet
MCA	Montana Codes Annotated
MEPA	Montana Environmental Policy Act
MMBF	Million Board Feet
SFLMP	State Forest Land Management Plan
SLI	Stand Level Inventory
SMZ	Streamside Management Zone
USFS	United States Forest Service
USFWS	United States Fish & Wildlife Service

CHAPTER 1: PURPOSE AND NEED

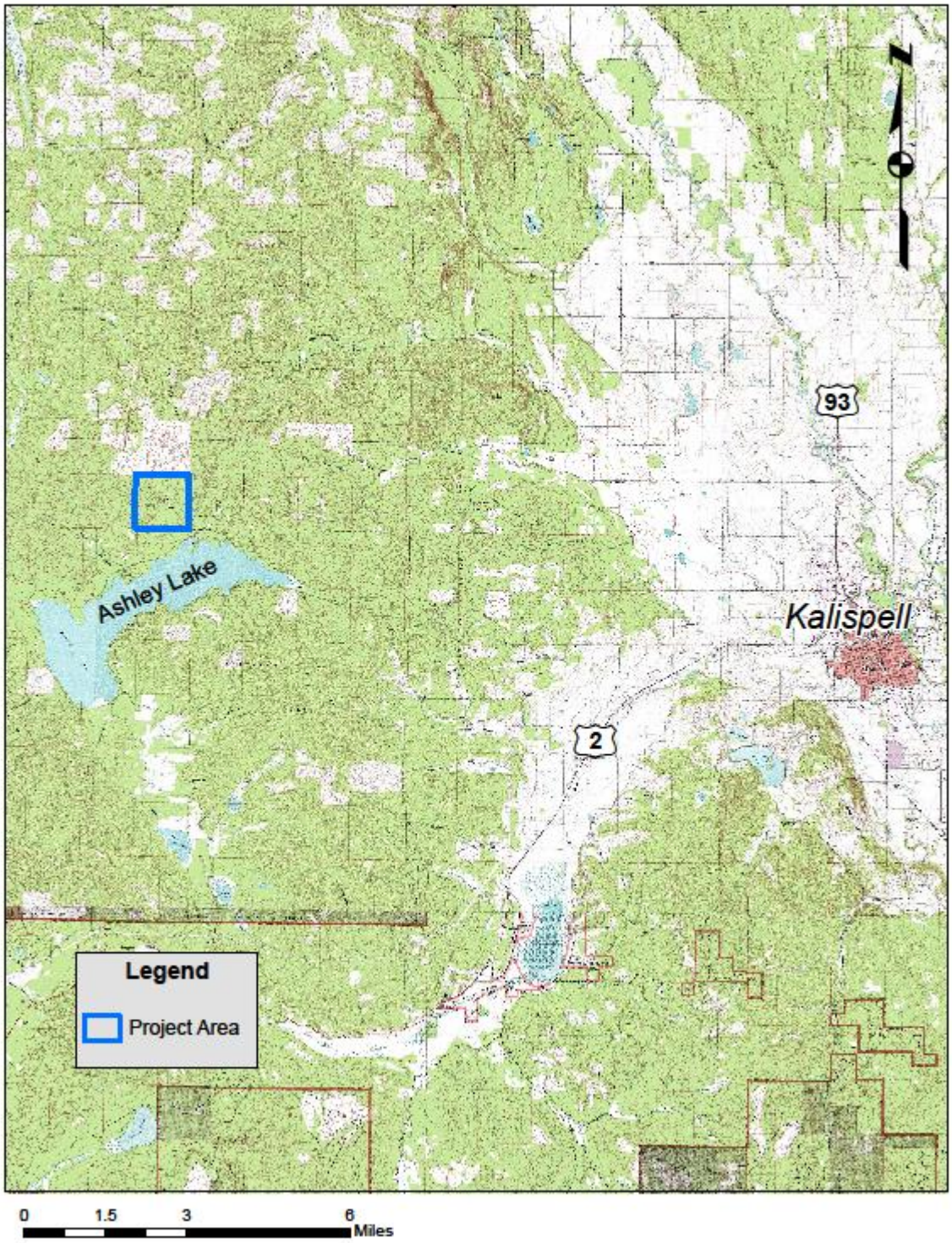
DESCRIPTION OF PROPOSED ACTION

The Montana Department of Natural Resources and Conservation (DNRC), Kalispell Unit, is proposing the Ashley Lake Timber Sale Project on state school trust lands west of Kalispell, Montana. Proposed activities include:

- Timber harvesting
- Reforestation activities

The project area is comprised of 640 acres on the Common School Grant (C.S.) and is located 13 air miles west of Kalispell, Montana in section 36, T29N, R23W (Figure 1-1). State trust land shares a common boundary with the United States Forest Service, private industrial forest land and private landowners. If the Action Alternative is selected, an estimated 1.3 Million Board Feet (MMBF) of timber would be sold and harvested from 598 acres. Seed tree removal prescription would be used to treat the harvested acres. To access the harvest units, existing roads would be used and would require minor maintenance prior to use to comply with Best Management Practices (BMP's).

FIGURE 1-1: Ashley Lake Vicinity Map



NEED FOR ACTION

The land involved in the proposed project is held by the State of Montana for the support of specific beneficiary institutions, including public schools, State colleges and universities, and other specific State institutions, such as the school for the deaf and blind (Enabling act of February 1889: 1972 Montana Constitution Article X, Section 11). The Board of Land Commissioners (Land Board) and 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 Montana Code Annotated [MCA]).

The project was developed in compliance with the State Forest Land Management Plan (SFLMP), the Administrative Rules for Forest Management (Forest Management Rules; ARM 36.11.401 through 471), and conservation commitments contained in the Selected Alternative in the Final EIS of the Montana Forested State Trust Lands Habitat Conservation Plan (HCP) and associated Record of Decision (ROD), as well as other applicable state and federal laws.

OBJECTIVES OF THE ASHLEY LAKE PROJECT

- Harvest approximately 1.3 MMBF of wood products to generate revenue for the Common School Trust (C.S.) and provide a sufficient amount of sawlog volume to contribute to the annual sustainable yield for DNRC, as mandated by 77-5-222 MCA.
- Increase the productivity by removing the existing seed trees and planting the project area with western larch seedlings.

COOPERATING AGENCIES AND ENTITIES WITH JURISDICTION AND REQUIRED PERMITS

Montana Fish, Wildlife and Parks (FWP) has jurisdiction over the management of fisheries and wildlife in the project area.

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.

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.

Adjacent, private landowners have a road easement up to and through the state section. Road work and timber sale activities would have to be coordinated.

USFWS- 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 take 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.

RELEVANT AGREEMENTS, LAWS, AND PLANS

STATE FOREST LAND MANAGEMENT PLAN (SFLMP)

DNRC developed the SFLMP to "provide field personnel with consistent policy, direction, and guidance for the management of State forested lands" (***DNRC 1996: Executive Summary***). The SFLMP provides the philosophical basis, technical rationale, and direction for DNRC's forest management program. The SFLMP is premised on the philosophy that the best way to produce long-term income for the trust is to manage intensively for healthy and biologically diverse forests. In the foreseeable future, timber management will continue to be the primary source of revenue and primary tool for achieving biodiversity objectives on DNRC forested trust lands.

DNRC FOREST MANAGEMENT RULES

DNRC Forest Management Rules (*ARM 36.11.401 through 456*) are the specific legal resource management standards and measures under which DNRC implements the SFLMP and subsequently its forest management program. The Forest Management Rules were adopted in March 2003 and provide the legal framework for DNRC project-level decisions and provide field personnel with consistent policy and direction for managing State forested lands. Project design considerations and mitigations developed for this project must comply with the Forest Management Rules.

MONTANA DNRC FORESTED STATE TRUST LANDS HCP

In December 2011, the Land Board approved the ROD for the Montana DNRC Forested State Trust Lands HCP. Approval of the ROD was followed by the issuance of an Incidental Take Permit by the USFWS. The HCP is a required component of an application for an incidental take permit which may be issued by the USFWS to state agencies or private citizens in situations where otherwise lawful activities might result in the incidental take of federally-listed species. The HCP is the plan under which DNRC conducts forest management activities on select forested state trust lands while implementing specific mitigation requirements for managing the habitats of grizzly bear, Canada lynx, and three fish species: bull trout, westslope cutthroat trout, and Columbia redband trout.

SUSTAINABLE YIELD CALCULATION (SYC)

In addition to the SFLMP and Forest Management Rules, DNRC is required to re-calculate the annual sustainable yield for forested trust lands at least every 10 years (*MCA 77-5-221 through 223*).

The SYC determines the amount of timber that can be harvested annually on a sustainable basis from State trust lands, given all applicable laws and environmental commitments described in the SFLMP and Forest Management Rules. Important ecological commitments related to biodiversity, forest health,

threatened and endangered species, riparian buffers, old growth, and desired species mix and covertypes were incorporated into the SYC. After incorporating these commitments into the model, the state-wide annual sustainable yield was determined to be 53.2 MMbf of timber.

MONTANA ENVIRONMENTAL POLICY ACT (MEPA) AND DNRC ADMINISTRATIVE RULES FOR MEPA

MEPA (*MCA 75-1-101 through 324*) provides a public process that assures Montana's citizens that a deliberate effort is made to identify impacts before the state government decides to permit or implement an activity that could have significant impacts on the environment.

DNRC's management activities on State school trust lands are subject to the planning and environmental assessment requirements of MEPA. The statute requires DNRC and other state agencies to inform the public and other interested parties about proposed projects, the potential environmental impacts associated with proposed projects, and alternative actions that could achieve the proposed project objectives.

DNRC Administrative Rules for MEPA (*ARM 36.2.521 through 543*) are specific legal requirements under which DNRC interprets and implements MEPA. DNRC is required to conform to these rules prior to reaching a final decision on a proposed action.

OTHER RELEVANT ENVIRONMENTAL REVIEWS IN THE AREA

- Ashley Lake Timber Sale EA. DNRC. 2004

DECISIONS TO BE MADE

Following the completion of the Final Environmental Assessment (EA) and 30-day public review period, the Decision Maker (Kalispell Unit Manager) will review any public comments, the EA, and information contained in the project file. The Decision Maker will consider and determine the following:

- Which of the alternatives presented in the EA meets the objectives?
- Does the EA properly address issues and concerns?
- Are the proposed mitigations adequate and feasible?
- Which alternative or combination/modification of alternatives should be implemented and why?
- Is there a need for further analysis or preparation of an environmental impact statement?

These decisions will be published and made available to the public. The decisions in the published documentation will become DNRC's recommendation to the Land Board. The Land Board will make the final decisions regarding implementation of actions.

SCOPE OF THE ENVIRONMENTAL ANALYSIS

This section defines and explains the scope (boundaries/limits) of the Ashley Lake Timber Sale Project. It briefly describes the history and planning process, identifies the resource issues studied in detail, and identifies the issues eliminated from detailed study.

History of the Ashley Lake Planning Process

This EA was prepared in accordance with the Montana Environmental Policy Act (MEPA), which requires State government to include the consideration of environmental impacts in its decision-making process. Agencies are also required to inform the public and other interested parties about proposed projects, environmental impacts that may result, and alternative actions that could achieve the project objectives. Public scoping of the Ashley Lake Project was initiated in October 2011 with a letter to known interested parties. Additional public participation was solicited by placing a notice in the Kalispell Daily Interlake newspaper. The mailing list for this project is in the project file. The public comment period was for 30 days and generated two emails and one letter. The Interdisciplinary Team (ID Team) made up of DNRC's wildlife biologist and hydrologist, began compiling the issues and gathering information related to current conditions in the fall of 2011. Final issues were defined in January 2012. The issues and concerns identified through public scoping were summarized and used to further refine the project.

Issues Studied in Detail

The ID team carefully considered comments received from DNRC resource specialists, the public, and other agencies.

The ID team determined that the following issues were relevant to the decisions that must be made concerning the Ashley Lake Timber Sale project. Further, these issues directly influenced the technical design of the project including the development of the alternatives (Chapter 2, Alternatives).

Issues were grouped by general resource area (Hydrology, Wildlife, etc).

Vegetation

- Grass establishment in the harvest units may delay natural regeneration of the site and contribute to a loss of timber productivity.
- Timber harvesting and associated activities may affect stand characteristics with regards to species composition, stand age, and succession.

Noxious Weeds

- Timber harvesting and associated activities may increase noxious weeds and promote invasion and establishment of new populations.

Water Resources

- Timber harvesting and associated activities may increase sediment delivery into streams/lakes and affect water quality.

- Timber harvesting and associated activities have the potential to increase water yield, which, in turn, may affect erosive power, sediment production and stream channel stability.

Soils

- Timber harvesting may result in displaced and compacted soils which can adversely affect the hydrologic function, soil structure and long-term productivity of the impacted area.

Wildlife

- Timber harvesting and associated activities could decrease mature forested cover, which could reduce habitat connectivity and habitat suitability for wildlife species associated with mature forest.

- Timber harvesting and associated activities could reduce the availability of snags and coarse woody debris, which could adversely affect the quality of wildlife habitat.

- Timber harvesting and associated activities could reduce landscape connectivity and the availability of suitable Canada lynx habitat types (i.e. denning, young foraging, mature foraging, forested travel/"other"), reducing the ability of the area to support Canada lynx.

- The proposed activities could alter the availability of grizzly bear visual screening and could increase human access, which could displace bears and increase the risk of human-caused bear mortality.

- The proposed activities could remove large trees and snags and could increase disturbance to bald eagles, which could reduce the quality of bald eagle nesting habitats.

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

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

Air Quality

- Burning of slash residue from logging may reduce air quality.

- Road dust from hauling logs on native or gravel surface roads may affect air quality.

Issues Eliminated From Detailed Study

The ID team eliminated the following issues from detailed study because they were beyond the scope of this project or because this project would not be likely to impact them.

Cultural or Paleontological Sites

The DNRC conducted a search of its Trust Land Management System database to determine if previous cultural resource had been identified, or previous cultural resource inventories had been conducted within the proposed project area. None were identified.

Old Growth

No old growth, as defined by Green et al (1992), exists in the project area.

Sensitive Plants

A review of the records for the Montana Natural Heritage Program indicated no plant species of special concern within the project area. Field reconnaissance also indicated no unique or sensitive plants within the project area.

CHAPTER 2: ALTERNATIVES

INTRODUCTION

Chapter 2 describes the alternatives developed and considered for the Ashley Lake Timber Sale project. This chapter will introduce the No Action Alternative and the Action Alternative as well as provide summaries and comparisons of the alternatives and predicted effects of each alternative, based on the detailed environmental analysis in Chapters 3 & 4.

DEVELOPMENT OF ALTERNATIVES

The role of an ID team is to summarize issues and concerns, develop management options within the project area, and analyze the potential impacts of a proposal on the human and natural environments.

The project leader provided the ID team with a harvest proposal to accomplish the desired future forest conditions on the Kalispell Unit and the objectives described in Chapter 1. The ID team further developed the proposal within the framework of the SFLMP and the ARMs. The ID team discussed how to address both public and internal issues, mitigations required by the ARMs, and additional mitigations that may be implemented to reduce or minimize effects related to the project.

Issues related to vegetation, recreation, wildlife, aesthetics, and soils resulted in the development of one action alternative.

DESCRIPTION OF ALTERNATIVES

This section describes the elements and mitigation measures of the Action Alternative, and also includes a description of the No Action Alternative. Actions designed to protect resources during harvesting and road construction or site preparation activities would be incorporated into a timber sale contract as contract specifications. These contract specifications would be applied to the Action Alternative and are a form of mitigation. Mitigation measures designed to reduce impacts on a particular resource are discussed in this chapter.

NO ACTION ALTERNATIVE

No timber harvesting would occur. Small quantities of wood products would continue to be sold from small areas.

Road maintenance on existing roads would be limited to periods when the roads are being used for removal of forest products. Weed control efforts would continue as priorities and funding allow.

Recreational uses of the area would continue.

Forest and plant succession would continue to be mainly influenced by the occurrence of natural events, such as insect and disease outbreaks, windthrow, or wildfire.

ACTION ALTERNATIVE

The Action Alternative is designed to improve timber stand productivity and maintain healthy forests within the Ashley Lake analysis area, as a necessary means for providing revenue generating opportunities in the future, while limiting present logging and road development costs. Timber harvesting would occur to maintain or promote the Desired Future Condition (DFC) of western larch/Douglas-fir on the moister grand fir and on the drier Douglas-fir habitat types. Silvicultural treatments designed for meeting the above objective include seed tree removal and planting of western larch seedlings.

The Action Alternative would apply silvicultural treatments to 598 acres, harvesting approximately 1.3 MMBF of timber. Regeneration harvests would be used to treat all 598 acres. Figure 2-1 displays harvest unit location.

To access the harvest units, approximately 7.5 miles of existing road would be used. Minor road maintenance would be required. No new road construction would be needed.

Recreational uses of the area would continue.

MITIGATION MEASURES FOR THE ACTION ALTERNATIVE

The following mitigation measures were developed to reduce the potential impacts to the identified resource concerns. The resource concerns were identified through the scoping process and by DNRC resource specialists. These mitigation measures would be applied if the Action Alternative were chosen.

Vegetation

- Remove overstory and plant western larch to improve long-term productivity.

Noxious Weeds

- All equipment used in road construction and timber harvesting operations will be cleaned of plant parts, dirt, and weed seeds prior to entry to prevent the possibility of seed dispersal by equipment.
- Grass seed areas disturbed during road maintenance activities.
- Monitor project area and contract herbicide spraying as needed to control spot outbreaks of noxious weeds.

Soils

- Limit timber harvest operations to periods when soils are frozen or less than 20% soil moisture.
- Existing skid trails and roads will be used, wherever possible, to reduce the amount of ground disturbance.
- Grass seed areas disturbed during road maintenance activities.

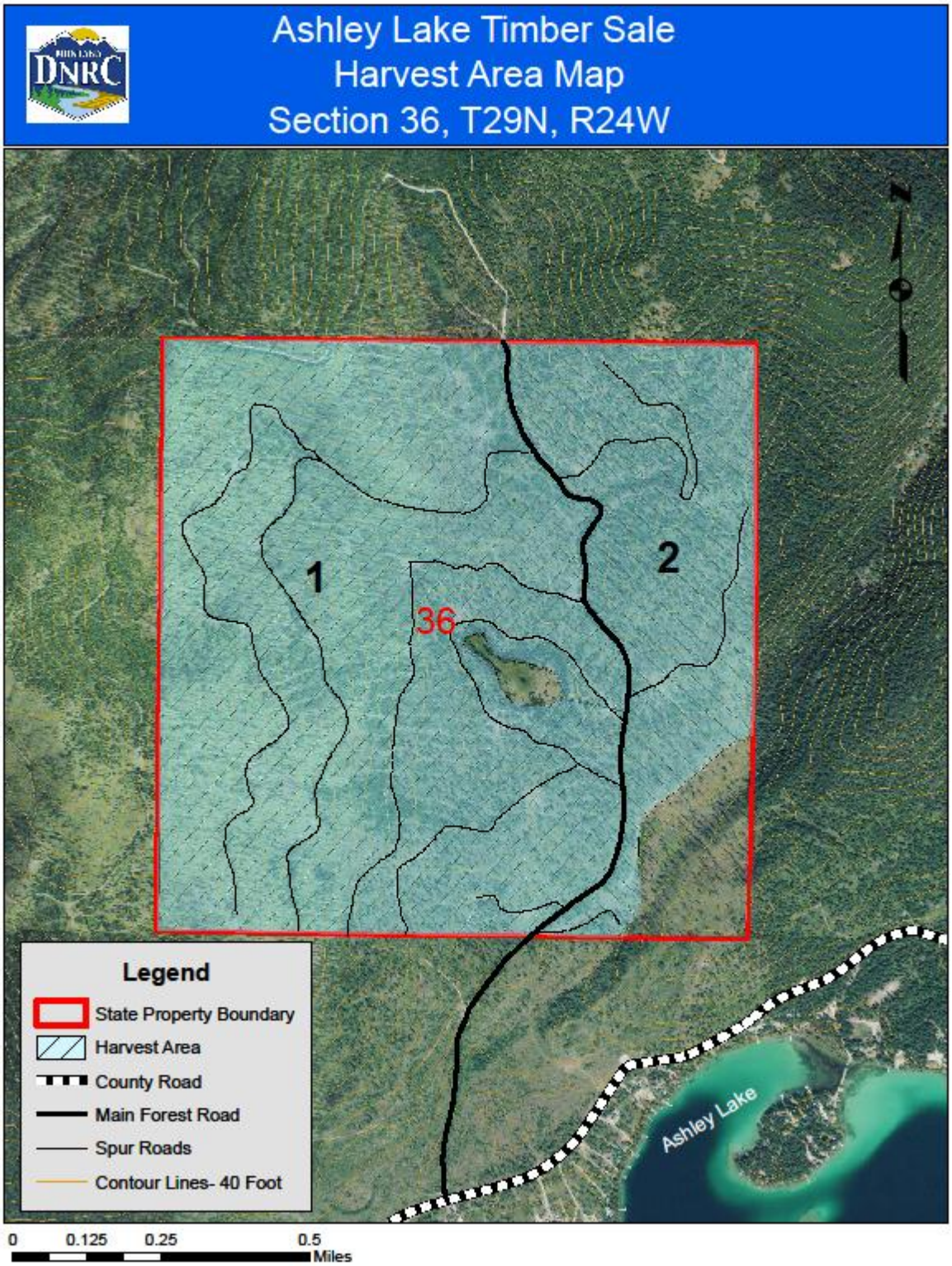
Wildlife

- A DNRC biologist would be consulted if a threatened or endangered species is encountered to determine if additional mitigations that are consistent with the administrative rules for managing threatened and endangered species (ARM 36.11.428 through 36.11.435) are needed.
- Close roads and trails to the extent possible after the proposed activities to reduce the potential for unauthorized motor vehicle use and/or loss of snags to firewood gathering.
- Manage for snags, snag recruits, and coarse woody debris, particularly favoring western larch and ponderosa pine (*ARM 36.11.439(1)(b)*).
- Prohibit contractors and purchasers conducting contract operations from carrying firearms while operating on restricted roads (*ARM 36.11.432(1)(m*)).

Air Quality

- Slash burning will be conducted only when weather and air quality conditions are favorable for smoke dispersion and as allowed under the cooperative Montana/Idaho Airshed Group rules and regulations.
- Require dust abatement on county roads if logs are hauled during dusty periods.

Figure 2-1: Ashley Lake Action Alternative Harvest Map



SUMMARY COMPARISON OF ALTERNATIVES

Each alternative is unique in terms of activities, achievement of project objectives, and effects that would occur. This section presents key characteristics of the alternatives, using tables to display differences and make comparisons. Table 2-1 provides a brief comparison of on-the-ground activities that would occur if the No Action Alternative or the Action Alternative were implemented. Table 2-2 provides a comparison of how each alternative would meet the project objectives identified in Chapter One.

Table 2-1: SUMMARY COMPARISON OF ACTIVITIES

Project Actions	Alternatives	
	No Action	Action
Total Project Acres	640	640
MMBF Harvested	0	1.3
Acres Treated	0	598
Miles of Existing Road Maintenance	0	7.5

Table 2-2: SUMMARY COMPARISON OF PROJECT OBJECTIVE ACHIEVEMENT

Project Objective	Indicators of Achievement	Alternatives	
		No Action	Action
Generate revenue	Stumpage Receipts (dollars)	0	$169,000
Manage for long-term productivity through silvicultural treatments that remove seed trees and planting western larch	Acres of seed tree removal	0	598
	Acres of tree planting	0	350

Table 2-3: Summary of environmental effects of both the No Action and Action Alternative

Table 2-3: SUMMARY OF ENVIRONMENTAL EFFECTS OF THE NO ACTION AND ACTION ALTERNATIVE		
Resource Issue	**No Action Alternative**	**Action Alternative**
Vegetation: Age Class & Cover Type	Direct/Indirect: Older age classes continue to dominate without disturbance. Forest cover type distribution would continue with appropriate amounts of western larch/Douglas-fir and mixed conifer. Cumulative: Decline in younger age classes without disturbance. Decline in acres of western larch/Douglas-fir cover types on the Kalispell Unit.	Direct/Indirect: 598 acres of seed tree removal. Conversion of 598 acres from the 150+ age class to the 0-39 age class. Forest cover type distribution would continue with appropriate amounts of western larch/Douglas-fir and mixed conifer. Cumulative: No change in cover type distribution on the Kalispell Unit. Conversion of 598 acres into younger age classes moves the Kalispell Unit towards historic conditions regarding age classes.
Vegetation: Timber Productivity	Direct/Indirect: Timber productivity would remain static to decline in overstory. Insect and disease would continue to occur at current levels. Cumulative: Continued decline in tree growth and increase in susceptibility to insect and disease.	Direct/Indirect: Timber productivity would increase with silvicultural treatments favoring younger age classes. Reduction in trees infected with mistletoe and stem decays. Cumulative: Increase in timber productivity on 598 acres.
Vegetation: Noxious Weeds	Direct/Indirect: Noxious weed seed would continue to be spread from uses within and adjacent to state land. Cumulative: Noxious weed populations could increase across the project and Kalispell landscape.	Direct/Indirect: Timber harvesting and road maintenance would increase the potential for further establishment. Cumulative: Potential for increase in acres infested. Could be offset with an increase in area treated.
Water Resources: Sediment Delivery	Direct/Indirect: No effect to sediment delivery. Intermittent streams would continue to be affected by natural and pre-existing conditions. Cumulative: No effect to sediment delivery. Intermittent streams would continue to be affected by natural and pre-existing conditions.	Direct/Indirect: Low risk of sediment from timber harvest and road maintenance activities with incorporation of BMP's. Cumulative: While there is a short term risk of increased sediment delivery for 2-3 years, long term reduction in risk of sediment delivery reduced from current levels.

Water Resources: Water Yield	Direct/Indirect: No effect to water yield. Intermittent streams in project area continue to be affected by natural and pre-existing conditions. Cumulative: No effect to water yield. Intermittent streams in project area continue to be affected by natural and pre-existing conditions.	Direct/Indirect: No measurable impacts to stream channel stability from water yield increases are anticipated with timber harvesting. Cumulative: No measurable impacts to stream channel stability from water yield increases are anticipated with timber harvesting.
Soils	Direct/Indirect: No change from existing condition. Cumulative: No change from existing condition.	Direct/Indirect: Impacts of 16% of the harvest area (96 acres) from timber harvesting. Cumulative: Impacts expected to be less than the 20% goal of impacts to project areas as stated in the SFLMP.
Wildlife: Mature Forested Habitats & Connectivity	Direct/Indirect: No change. Mature forest would develop slowly over time increasing the availability and connectivity of mature forests. Cumulative: No change. Mature forest would develop slowly over time increasing the availability and connectivity of mature forests.	Direct/Indirect: No mature forested habitat is currently available. No changes in availability of forested habitat or connectivity. Cumulative: No mature forested habitat is currently available. No changes in availability of forested habitat or connectivity.
Wildlife: Snags & Coarse Woody Debris	Direct/Indirect: No change in snags and coarse woody debris. Cumulative: No change in snags and coarse woody debris.	Direct/Indirect: Present and future snags would be reduced. No change in coarse woody debris. Minor adverse direct and indirect effects to snags and coarse woody debris availability and to the wildlife requiring these habitat attributes would occur. Cumulative: Present and future snags would be decreased. Minor adverse direct and indirect effects to snags and coarse woody debris availability and to the wildlife requiring these habitat attributes would occur.
Wildlife: Canada Lynx	Direct/Indirect: No effects to lynx habitat anticipated. 622 acres of temporary non-lynx habitat would persist and connectivity would remain low. Cumulative: No effects to lynx habitat anticipated. The 128 acres of mature habitat, 487 acres of forested travel/other habitat and 647 acres of temporary non-lynx habitat occurring on DNRC managed land would persist and connectivity would remain low.	Direct/Indirect: No changes to lynx habitat availability. 622 acres of non-lynx habitat would persist and connectivity would remain low. Cumulative: No changes to lynx habitat availability or connectivity would occur. 622 acres harvested would still be classified as non-lynx habitat.

Wildlife: Grizzly Bears	Direct/Indirect: No change in open road density or visual screening. No changes in grizzly bear habitat would occur. Cumulative: No change in open road density or visual screening. No changes in grizzly bear habitat would occur.	Direct/Indirect: Negligible adverse effects anticipated to grizzly bear habitat. Visual screening is currently limited and would be minimally affected. No new open roads constructed. Cumulative: Minimal change to visual screening would occur. No change in open road density. Negligible adverse cumulative effects anticipated to grizzly bear habitat.
Wildlife: Bald Eagles	Direct/Indirect: No effects anticipated. Cumulative: No effects anticipated.	Direct/Indirect: Timber harvesting in 207 acres of bald eagle habitat would occur. Minimal effects anticipated because use of DNRC managed lands minimal, 1 snag and 1 snag recruit would be retained and disturbance levels would last approximately 1 year. Cumulative: Timber harvesting on 207 acres of bald eagle habitat. Minor cumulative effects associated with removal of some snags, disturbance of logging and effects of projects on private ownerships would occur.
Wildlife: Gray Wolves	Direct/Indirect: No effects anticipated. Cumulative: No effects anticipated.	Direct/Indirect: Minor effects would occur with harvesting on 598 acres in the project area. Effects would be minor because no disturbance to wolf den or rendezvous sites and no change in availability of big game habitats would occur. Cumulative: Negligible effects would occur with timber harvest because no disturbance to wolf den or rendezvous sites and no change in availability of big game habitats would occur.
Wildlife: Big Game Winter Range	Direct/Indirect: No effects anticipated. Cumulative: No effects anticipated.	Direct/Indirect: Minor adverse effects would be anticipated with removal of overstory canopy and some of the limited visual screening and displacement due to harvest activities. Cumulative: Minor cumulative effects anticipated with removal of overstory canopy and some of the limited visual screening and displacement due to harvest activities.

Air Quality	Direct/Indirect: No change from existing condition. Cumulative: No change from existing condition.	Direct/Indirect: Temporary and localized reductions in air quality may occur but would not exceed air quality standards. Cumulative: Cumulative effects during peak burning periods may affect residents for short durations. Application of dust abatement would mitigate the effects of road dust from the project.
Economics	Direct/Indirect: Revenue from the project area would not be realized at this time. Trust funding would not benefit. Cumulative: Timber volume needed for the statewide sustained yield would need to come from sales elsewhere. Timber substituted may be from other areas and not benefit this region of the State.	Direct/Indirect: An estimated $169,000 in revenue would be generated and an estimated $32,669 into the FI account. This work would provide work for approximately 13 positions. Cumulative: Volume harvested would contribute to annual sustained yield of 53.2 MMBF. Revenue generated through this project would reduce tax burdens on Montana taxpayers.

CHAPTER 3:
EXISTING CONDITIONS & ENVIRONMENTAL EFFECTS

INTRODUCTION

This chapter identifies and describes those resources that may be affected by the proposed action and describes the environmental effects of each alternative on the resources. The chapter is organized by general resource categories and their associated issues introduced in Chapter 1. The descriptions of the existing conditions found in this chapter can be used as a baseline for comparison with the Action Alternative. Environmental Effects described in this chapter provide the basis for the Summary of Environmental Effects in Chapter 2.

Cumulative effects from current management and relevant future actions are discussed in this chapter. These include other active timber sales, those in the planning stage, ongoing maintenance, and other uses of the areas being analyzed. Direct, indirect, and cumulative effects on the resources being analyzed were considered.

VEGETATION

The vegetation section describes present conditions and components of the forest as well as the anticipated effects of both the No Action and Action Alternatives. Issues expressed during initial scoping by the public and internal were:

- Grass establishment in the harvest units may delay natural regeneration of the site and contribute to a loss of timber productivity.
- Timber harvesting and associated activities may affect stand characteristics with regards to species composition, stand age, and succession.

Analysis Areas

- ***Direct and Indirect Effect Analysis Area-*** The **Ashley Lake Project Area** was used to assess direct and indirect effects on forest cover type, species composition, the distribution of age classes, and noxious weeds. This area includes all trust lands within the project area specified in Chapter One, and more specifically, those stands proposed for harvesting under each alternative.
- ***Cumulative Effects Analysis Area-*** The **DNRC Kalispell Unit** was used to assess cumulative effects on forest cover type, species composition, the distribution of age classes, and noxious weeds. This area includes all scattered forested Trust land parcels, administered by the Kalispell Unit for DNRC. This geographic area is a subset of the Lower Flathead Valley Climatic Section and includes school trust lands in the vicinity of Whitefish, MT south to Arlee, MT and school trust lands in the vicinity of Bigfork, MT west to the Thompson Chain of Lakes.

Analysis Methods

Administrative Rules of Montana (ARM 36.11.404) direct DNRC to take a coarse filter approach to favor an appropriate mix of stand structures and compositions on State lands, referred to as a desired future condition. The following characteristics: forest composition, age class distribution, and cover type, are used to describe current forest and stand conditions in comparison to the estimated natural forest characteristics for Montana prior to extensive influences from fire suppression, logging, and development. This analysis will compare the desired stand conditions that DNRC believes to be appropriate for the site with current stand conditions.

Forest/Timber Analysis Methods

The method used to analyze current and desired future stand conditions, old growth timber stands, and stand development are as follows:

- *Current and Desired Future Conditions:* The DNRC site–specific model (ARM 36.11.405) was used to determine the characteristics of the desired future condition and to evaluate the potential direct, indirect, and cumulative effects. This model assigns a desired future condition in terms of cover type for each stand identified in the DNRC's Stand Level Inventory (SLI). At the administrative unit level, the aggregate acreage of each desired future cover type describes a broad picture of the desired future condition for that unit. This provides a basis for comparison of current and desired future conditions at both the project and landscape (administrative unit) levels. Current conditions are described by DNRC's 2011 SLI for the Kalispell Unit.

- Old Growth Timber Stands: The methods to identify old growth timber stands, as defined by ARM 36.11.403 (48), are based on the Kalispell Unit SLI data. The process uses the SLI to identify stands that may meet the minimum criteria (number of trees per acre that have a minimum dbh and minimum age) for a given habitat type group as described in Green et al (1992), Old Growth Forest Types of the Northern Region. Field surveys were used to verify that the definition is met in the identified stands and to determine if additional stands meet the definition.

- *Cover Types and Age Classes*: Climatic Section M333B- Lower Flathead Valley (Losensky 1997) was used in this analysis for comparing historic conditions related to the distribution of forest cover types and age classes, to current conditions within the project area. The Lower Flathead Valley geographic area includes Flathead Lake west to the Montana border, from the Canadian border south to Missoula, MT (Losensky 1997).

Noxious Weeds Analysis Methods

During field reconnaissance, DNRC personnel assessed road conditions and generally evaluated noxious weed occurrence, extent, and location.

EXISTING CONDITIONS

General Forest Vegetation Information

The existing vegetative types, more specifically forest habitat types and cover types within the Kalispell Landscape and the Ashley Lake project area reflect the varied influences of site factors, fire regimes or disturbance patterns, and past management activities.

Site conditions vary depending upon the physiographic and climatic factors associated with geographic locations. Soil types, slope aspect and position, length of growing season, and moisture availability influence the type, growth, and development of forest vegetation. These site factors are considered in the forest habitat classifications (Pfister et al. 1977) used to generally describe forest vegetation, forest stand development, and relative forest productivity associated with given site and climatic factors.

Stand History and Past Management

Ashley Lake Project Area: The first recorded timber harvest was in 1966 and included a relatively small amount of timber. The next entry occurred with a timber harvest in 1978. That entry was responsible for designing and building the present day transportation system. 3.5 MMBF of timber was removed in the 1978 harvest with a majority of the volume removed being western larch. A small bark beetle salvage sale was sold just prior to the last timber harvest and removed 0.1 MMBF of dead Douglas-fir. The last timber harvest entry occurred 7 years ago with a regeneration harvest prescribed over 628 acres. 6.3 MMBF of timber was removed in the 2004 harvest, with a majority of the volume removed being Douglas-fir and western larch overstory.

Christmas tree permits and firewood permits have been sold starting in 1954 up to the present.

Adjacent Lands to Ashley Lake: The lands adjacent to Ashley Lake are a mixture of private industrial and federal forest land to the north, west and east and private residential land to the south, along Ashley Lake. The residential land was once industrial forest land that has since been logged and converted to residential.

Forest Habitat Types

Approximately 75% of the project area is occupied by the Subalpine fir (Abies lasiocarpa) series ranging from cool and moist to cool and dry. The twinflower (Linnaea borealis) type is the most prevalent type under the subalpine fir series. The remaining 25% is generally found on the drier upper slopes where Douglas-fir (*Pseudosutga menziesii)* habitat types are found. The most common type in the Douglas-fir series is snowberry (Syphoricarpos albus). Timber productivity in these habitat types ranges from low to high with the Abies lasiocarpa/Linnaea borealis habitat type being most productive.

Forest Cover Type and Age Class Distribution

Table 3-1 compares the DNRC Kalispell Landscape (Current Cover Type) with the desired future condition for cover types on the Kalispell Unit.

Table 3-1: CURRENT COVER TYPES AND DESIRED FUTURE CONDITIONS FOR KALISPELL UNIT			
Cover Type	**Current Cover Type (acres)**	**Desired Future Condition (acres)**	**Current Type Minus (-) DFC (acres)****
Subalpine fir	2249.9	254.8	1995.1
Douglas-fir	1646.5	1029.4	617.1
Hardwoods	449.0	207.0	242.0
Lodgepole pine	2269.2	1376.8	892.4
Mixed Conifer	10265.8	2282.3	7983.3
Ponderosa pine	10636.9	11936.2	-1299.3
Other*	3635.4	3576.2	59.2
Western larch/Douglas-fir	25494.6	32974.5	-7479.9
Western white pine	567.6	3577.7	-3010.1
TOTAL	57214.9	57214.9	

*Other= non stocked lands, non-forest, or water.
**The Current Type minus DFC Type column above lists the excess and deficit (-) acres for each Cover Type.

The ponderosa pine, western larch/Douglas-fir, and western white pine cover types are not as well represented within the Kalispell Unit Landscape as estimated for the early 1900's. Most notable is the conversion of over 10,000 acres in the ponderosa pine, western larch/Douglas-fir, and western white pine cover types, over the last 100 years, to the present over abundance of the mixed conifer and subalpine fir cover types.

The longer intervals between disturbances and commodity extraction generally explain the decrease in the western larch/Douglas-fir and ponderosa pine cover types. Active fire suppression initiated in the early 1900's has interrupted wildfire frequencies and intensities in conjunction with 50 years or more of logging practices that favored the removal of commercially valuable western larch, ponderosa pine, western white pine and Douglas-fir for railroad ties, mining timbers, and construction lumber. Many open, mature stands dominated by western larch and other seral species with even-aged patches of immature seral trees in the understory have been replaced with more densely stocked stands in both the overstory and understory. These stands often include a higher percentage of more shade tolerant trees such as Douglas-fir, grand fir, or spruce, as a result of longer intervals between disturbances.

Table 3-2 Compares the Ashley Lake project area current cover types with desired future conditions.

Table 3-2: CURRENT COVER TYPES AND DESIRED FUTURE CONDITIONS FOR ASHLEY LAKE PROJECT AREA			
Cover Type	**Current Cover Type (acres)**	**Desired Future Condition (acres)**	**Current Type Minus (-) DFC (acres)**
Subalpine fir	0	0	0
Douglas-fir	0	0	0
Hardwoods	0	0	0
Lodgepole pine	0	0	0
Mixed Conifer	7	7	0
Ponderosa pine	0	0	0
Other*	0	0	0
Western larch/Douglas-fir	633	633	0
Western white pine	0	0	0
TOTAL	640	640	

*Other= non stocked lands, non-forest, or water.
**The Current Type minus DFC Type column above lists the excess and deficit (-) acres for each Cover Type.

The table shows that the current cover types match the desired future condition for all cover types. The match between current and desired future is the result of the latest harvest entry in 2005 that converted 21 acres of mixed conifer to WL/DF.

Table 3-3 displays age class distributions on the project and landscape scales. Stands in the seedling/sapling age class (0-39) are under-represented compared to the historical condition when compared to both the Kalispell landscape and the project area and the 150+ age classes over represented. This deviation from historical conditions can partly be explained by successful fire suppression increasing the interval between large, stand replacement fires and logging practices that did not necessarily create a similar disturbance to a wildfire.

Table 3-3: PERCENT OF ANALYSIS AREAS BY AGE CLASS GROUPS				
Analysis Area	**Age Class (Years)**			
	00-39	**40-99**	**100-149**	**150+**
M33B (Historic)	36%	13%	15%	36%
Kalispell (Current)	10%	21%	30%	39%
Ashley Lake Project Area	0%	0%	0%	100%

Distribution of 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 the 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)*. No stands in the project area met DNRC's old growth definition.

Timber Productivity

Tree Vigor: Radial growth rates in the overstory are static or declining for a majority of the project area. 100% of the project area is in the 150 years + age class.

Insect and Disease:

Defoliators: Western spruce budworm (*Choristoneura occidentalis*) defoliation has been on the increase in the past five years. Damage is occurring in the Douglas-fir, subalpine fir, grand fir and spruce overstory and understory. Heavy defoliation in some seedlings and saplings has led to branch dieback and top kill.

Stem decays: Minor amounts of white pocket rot (*Phellinus pini*) were found in the project area. It is affecting the western larch overstory.

Dwarf Mistletoe: Small pockets of Douglas-fir dwarf mistletoe were found in the project area.

Noxious Weeds

Noxious weed populations are currently found adjacent to logging roads, old landings and recreational trails. Weed species identified during reconnaissance include: Spotted knapweed (*Centaurea maculosa*), Orange hawkweed (*Hieracium aurantiacum*), Houndstongue (*Cynoglossum officinale*), and Oxeye daisy (*Chrysanthemum leucanthemum*). All weeds identified in the project area are classified as category 1 weeds in Flathead County. Category 1 weeds are classified as abundant in Montana and widespread across many counties in the State.

VEGETATION EFFECTS

Forest Age Class & Cover Type Distribution

No Action Alternative- Direct and Indirect Effects

Under the No Action Alternative, natural processes would continue to have an effect on these forest characteristics. In the absence of wildfires, older age-classes will continue to dominate the project area. Forest cover type distribution would continue with appropriate amounts of western larch/Douglas-fir and mixed conifer.

No Action Alternative- Cumulative Effects

Under the No Action Alternative, there would be no change in the amount of western larch/Douglas-fir cover types on the Kalispell Unit. Western larch/Douglas-fir and ponderosa pine cover types would continue to be under represented on the unit and mixed conifer and subalpine fir types would continue to be over-represented. Across the landscape, fire suppression, insect and disease occurrence, and increasing human use may influence cover type and age class distribution to an unknown degree. In the absence of stand replacement fires, variability of age class and cover type distribution would decline.

Action Alternative- Direct and Indirect Effects

Under the Action Alternative, timber harvesting would occur on 598 acres. Overstory removal would occur on all 598 acres. A majority of the remaining seed trees would be removed and up to 2 snags and 2 snag recruits would be left per acre. Age classes would be converted on 598 acres of the project area from the 150+ age class to the 0-39 age class with the planting of western larch seedlings.

Action Alternative- Cumulative Effects

There would be no change to cover types under the Action Alternative. The project would not change the current under representation of western larch/Douglas-fir cover types on the Kalispell Unit but would help maintain the western larch/Douglas-fir cover types already represented in the project area. The action alternative would increase the amount of the 0-39 year age class by 598 acres in the project area and would help to move the Kalispell Unit towards the historical amounts of younger age classes represented on the landscape.

Timber Productivity

No Action Alternative- Direct and Indirect Effects

Timber productivity would remain static to decline in the overstory. The vigor in the 150+ overstory would continue to decline and, without tree planting, natural regeneration would be slow in establishing a new stand where growth and vigor would increase.

Defoliators would continue to find tree species and stand conditions favorable for habitat development in the project area.

Dwarf mistletoe would continue to occur in small pockets and may increase in number of trees infected in the understory.

No Action Alternative- Cumulative Effects

Without silivicultural treatments to initiate new stands, the trend towards increasing acreage on the Kalispell Unit covered by older, slower growing stands that are more susceptible to insect and diseases and/or wildfires would continue.

Action Alternative- Direct and Indirect Effects

Silvicultural treatments to be applied under the action alternative would remove a majority of the overstory trees, some of which are affected by insect and disease. Reduction in the amount of dwarf mistletoe and stem decays in the overstory would help promote health and vigor in the understory. Planting of western larch seedlings over much of the project area would initiate younger age classes and increase timber productivity.

Action Alternative- Cumulative Effects

Timber productivity would increase with silvicultural treatments that favor retention of younger, healthy trees. The acres of forested stands susceptible to insect and diseases would decrease. Tree planting would increase the acres of the 0-39 year old age class in the project area by 598 acres and improve the percentage across the Kalispell landscape, which is currently under represented by that age class by 26% (36% historical vs 10% today).

Noxious Weeds

No Action Alternative- Direct and Indirect Effects

Noxious weed seed would continue to spread from existing populations and new populations may be introduced to the project area from uses adjacent to or within state land. Herbicide treatment along existing roads would continue as funding and unit priorities allow. Containment of weed infestations or a reduction in acres infested with weeds may be realized.

No Action Alternative- Cumulative Effects

Noxious weed populations could increase across the project area and Kalispell Unit as a result of the No Action Alternative. With the adoption of ARM 36.11.445 and the implementation of an integrated noxious weed agreement with Flathead County, a more aggressive approach to noxious weed identification and treatment has occurred than in the past. This ongoing treatment of noxious weeds

should limit large increases in noxious weed spread and may reduce the number of acres infested in the future.

Action Alternative- Direct and Indirect Effects

Timber harvesting and road maintenance would increase the potential for further establishment of noxious weeds with the exposure of bare mineral soil. Applying integrated weed management techniques within the sale design would reduce the occurrence and spread of noxious weeds. Grass seeding road construction and log landings and spot spraying new weed infestations would reduce or prevent establishment of additional populations. Washing logging equipment prior to use would limit the introduction of weed seeds into the forest. Trampling of slash in skid trails and closing roads to motorized use in the project area would limit the potential for soil disturbance and reduce the potential for weed establishment during and after logging. Treating existing weed populations with herbicide spray would reduce current populations or contain the area infested. This project would also likely be winter logged which would limit the exposure of mineral soil and deter new weed infestations.

Under the Action Alternative, timber harvesting would occur on 598 acres and include 7.5 miles of road maintenance. Acreage within harvest units and associated road maintenance would be at a higher risk for incurring weed establishment and spread due to soil disturbance that may occur from skidding, landing and heavy equipment use for road maintenance and site-preparation activities. This risk would be limited by mitigation measures described above. Maintaining existing road closures, trampling slash in skid trails, grass seeding areas disturbed during road work, and spot herbicide treatments, would reduce current coverage and limit potential risk of further establishment of weed populations.

Action Alternative- Cumulative Effects

In combination with other management on the Kalispell Unit, the Action Alternative would increase the risk of further encroachment of forested sites by noxious weeds. The potential risk would be limited with the use of prevention measures implemented under the county agreement and with the mitigation measures for the Ashley Lake Project. Actual weed treatments would likely be applied to a more extensive area under the Action Alternative, and have a greater potential for reducing current weed populations within the project area, thereby reducing the noxious weed affected area within the Kalispell Unit.

WATER RESOURCES

Introduction

Project Area and Project Activities

The gross project area includes 640 acres of Trust Lands near Kalispell, Montana. The potentially affected watershed is the Ashley Lake watershed. The proposed parcel is within the Ashley Creek watershed, but does not contribute surface flow to Ashley Lake or any other body of water. The project

area is adjacent to land managed by the Flathead National Forest, Plum Creek Timber Company, Stoltze Land and Lumber and non-industrial private ownership. The proposed action alternative would include ground based methods to harvest timber on approximately 598 acres within the project area.

Resource Description

Water yield and sediment delivery will be assessed in this analysis. 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 Management 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: Timber harvesting and related activities, such as road construction, can lead to water-quality impacts by increasing the production and delivery of fine sediment to streams. 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: Qualitative discussion of road surface drainage features and subsequent risk of delivery to a stream or draw. Sediment from harvesting activities and vegetative removal will be analyzed qualitatively through data collected during past statewide and DNRC internal BMP field reviews.

- Water Yield: Timber harvesting and associated activities can affect 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. Canopy removal also decreases interception of rain and snow and alters snowpack distribution and snowmelt, which lead to further water-yield increases. These 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 and move toward a closed canopy. 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: Potential impacts to annual water yield and peak flow magnitude, duration and timing will be addressed qualitatively.

Analysis Methods

Existing conditions for sediment delivery and water yield were analyzed using field site visits and visual inspection of the drainage features in the proposed project area. Potential effects of the proposed project on sediment delivery and water yield will be assessed qualitatively based on risk of increased sediment delivery from proposed activities, and risk of increased water yield affecting the stability of existing draws and stream channels.

Analysis Area

Sediment Delivery

The analysis area for sediment delivery is the proposed project area, and all forest roads that lead into the project area from other ownership. The primary focus of the sediment delivery analysis was on the discontinuous streams and draws located within the proposed project area.

Water Yield

The analysis area for water yield is the class 3 stream and ephemeral draws covered by the project area.

Existing Conditions

Regulatory Framework

Montana Surface Water Quality Standards: According to ARM 17.30.608 (1)(a), the Ashley Creek drainage above Smith Lake and its tributaries, including Ashley Lake, are all 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 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 are no designated beneficial surface water uses within the project area due to a lack of connectivity of stream channels or delivery to downstream waters

Water Quality Limited Waterbodies: Ashley Creek below Ashley Lake is listed in the 2010 *List of Waterbodies in Need of Total Maximum Daily Load (TMDL) Development* publication produced by the Montana Department of Environmental Quality (DEQ, 2010). 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). Under these laws, DEQ is required to identify water bodies that do not fully meet water quality standards, or where beneficial uses are threatened or impaired. These water bodies are then characterized as "water quality limited" and thus targeted for Total Maximum Daily Load (TMDL) development. The TMDL process is used to determine the total allowable amount of pollutants in a water body of watershed. Each contributing source is allocated a portion of the allowable limit. These allocations are designed to achieve water quality standards.

The Montana Water Quality Act (MCA 75-5-701-705) also directs the DEQ to assess the quality of state waters, insure that sufficient and credible data exists to support a 303(d) listing and to develop TMDL for those waters identified as threatened or impaired. Under the Montana TMDL Law, new or expanded nonpoint source activities affecting a listed water body may commence and continue provided they are conducted in accordance with all reasonable land, soil and water conservation practices. Total Maximum Daily Loads have not been completed for the Ashley Creek drainage. DNRC will comply with the Law and interim guidance developed by DEQ through implementation of all reasonable soil and water conservation practices, including Best Management Practices, commitments in the State Forest Land Management Plan, and the Forest Management Rules.

Reaches of Ashley Creek listed in need of TMDL development are located below the outlet of Ashley Lake. Aquatic life and primary contact recreation are the beneficial uses listed as partially supported in the 2010 list. The listed probable causes and sources of impairment in these reaches are shown in Table 3-4.

Table 3-4: Causes and Sources for Water Quality Limited Designation in Ashley Creek from Ashley Lake to Smith Lake (DEQ 2010)

Probable Causes	Probable Sources	Associated Uses	TMDL Completed
Alteration in stream-side or littoral vegetative covers	Channelization Crop Production (Crop Land or Dry Land) Grazing in Riparian or Shoreline Zones Loss of Riparian Habitat	Aquatic Life	NO
Chlorophyll-a	Crop Production (Crop Land or Dry Land) Grazing in Riparian or Shoreline Zones	Primary Contact Recreation	NO
Nitrogen (Total)	Crop Production (Crop Land or Dry Land) Grazing in Riparian or Shoreline Zones	Aquatic Life Primary Contact Recreation	NO
Oxygen, Dissolved	Source Unknown	Aquatic Life	NO

Phosphorus (Total)	Crop Production (Crop Land or Dry Land) Grazing in Riparian or Shoreline Zones	Aquatic Life Primary Contact Recreation	NO
Sedimentation/Siltation	Crop Production (Crop Land or Dry Land) Grazing in Riparian or Shoreline Zones Loss of Riparian Habitat	Aquatic Life	NO
Temperature, water	Loss of Riparian Habitat Source Unknown	Aquatic Life	NO

Montana Streamside Management Zone (SMZ) Law: By the definition in ARM 36.11.312 (5), there is one stream in the proposed project area. This channel is located in the southeast corner of the proposed project area, and is a class 3 stream. It has a defined channel, but is not continuous, and does not flow more than 6 months of the year. The rules and requirements for class 3 streams are listed in ARM 36.11.302 and ARM 36.11.305. The remaining drainage features in the proposed project area are dry draws with no defined channel.

Forest Management Rules: By definition in ARM 36.11.403 (95), the NW ¼ of the SE ¼ of section 36 of the proposed project area contains a wetland of approximately 15 acres. As required in ARM 36.11.426, this wetland should have a 50-foot Wetland Management Zone (WMZ) delineated around its perimeter.

Sediment Delivery

Sediment delivery in the project area was evaluated on the existing road system, which is mainly moderate standard. Most of this system meets applicable best management practices for surface drainage or erosion control. Portions of the existing road system have erosion control and surface drainage that requires minor improvement, but road grades are moderate and the road system is located away from draws and streams except at crossings. No other sources of erosion or deposition were identified through field review. The intermittent tributary to Ashley Lake becomes subsurface below the proposed project area. All evidence of a channel disappears, and no surface water is delivered to Ashley Lake except during extreme runoff events. No deficiency in large woody debris was found in this stream, and channel function is within the range expected of an intermittent class 3 stream. Large woody debris will not be analyzed further in this analysis since there is an adequate amount to support channel function, and the project is located far enough from this stream that no impacts are expected. None of the other draws in the proposed project area delivers to another body of water, so no sediment has been delivered to any downstream waters outside of the project area.

Water Yield

Water yield impacts were evaluated by looking at past activities in and around the proposed project area, which include timber management, agriculture, and home site development. These activities have led to reductions in forest canopy cover, and construction of roads.

Following field reconnaissance of the proposed project area, it was determined that a detailed water yield analysis would not be necessary for the proposed project area. 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). The defined stream channel in the southeast corner of the project

area has a stable, intermittent channel with no evidence of instability from water yield increases, and very little scouring effect from annual runoff events. All evidence of this channel disappears below the project area and before reaching Ashley Lake. As a result, water yield increases resulting from past activities have not been sufficient to create overland flow or a defined stream channel below the proposed project area, or in any of the broad draws throughout the project area.

WATER RESOURCE EFFECTS

Sediment Delivery

No Action Alternative- Direct and Indirect Effects

Direct and indirect effects of the No Action alternative would be similar to the conditions described under the existing conditions for sediment delivery. The sediment delivery would be unaffected by the no action alternative, and the intermittent streams in the proposed project area would continue to be affected by natural and pre-existing conditions.

No Action Alternative- Cumulative Effects

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

Action Alternative- Direct and Indirect Effects

The action alternative would improve the erosion control and surface drainage on up to 7.8 miles of existing road, and bring it up to applicable BMP standards. No new road construction is proposed with the action alternative, and no stream or draw crossing structures would be installed under the action alternative. Improvement of surface drainage features would generate bare soil, which may lead to increased risk of erosion and sediment delivery. This risk would reduce in approximately 2-3 years as vegetation becomes re-established on these sites through grass seeding. The risk of sediment delivery from these sites and activities to downstream areas is very low risk due to a lack of stream channels and a lack of stream channel connectivity to other bodies of water.

Action Alternative- Cumulative Effects

Risk of sediment delivery in the proposed project area would be reduced from current levels over the long term. Short term risk of increased sediment delivery would last for approximately 2-3 years due to exposure of bare soil where road work would occur. Improvement of erosion control and surface drainage on the existing road system would reduce erosion rates from current levels and reduce the risk of sediment loading to downstream areas.

Water Yield

No Action Alternative- Direct and Indirect Effects

Direct and indirect effects of the No Action alternative would be similar to the conditions described under the existing conditions for water yield. The water yield would be unaffected by the no action alternative, and the intermittent streams in the proposed project area would continue to be affected by natural and pre-existing conditions.

No Action Alternative- Cumulative Effects

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

Action Alternative- Direct and Indirect Effects

The proposed action alternative would harvest seed trees from approximately 598 acres. No measurable impacts to stream channel stability from water yield increases are anticipated from the proposed harvesting for the following reasons: 1) The well-drained nature of the soils would absorb additional available water and not produce increased surface runoff, and would in turn produce little or no detectable change in water yield from upland sites, 2) The ephemeral draws within the project area are stable and vegetated with a dense mat of grass and forb vegetation, making them capable of handling potential water yield increases without destabilizing, and 3) The stability of channels where they exist would be sufficient to handle potential increases. It is not expected that possible increases in water yield would create surface flow to any other body of water beyond that occurring under the existing conditions.

Action Alternative- Cumulative Effects

Risk of water yield impacts from past activity in and around the proposed project area have mainly been a result of timber management. On sites where timber was harvested, there has been substantial vegetative and hydrologic recovery with no apparent impact to stream channels or draws from water yield increases.

There is a low risk of watershed cumulative effects from the action alternative for the following reasons: 1) The well drained nature of the soils would absorb additional available water and not produce increased surface runoff, and would in turn produce little or no detectable change in water yield from upland sites, 2) The ephemeral draws within the project area are stable and vegetated with a dense mat of grass and forb vegetation, making them capable of handling potential water yield increases without destabilizing, and 3) All but approximately 20 acres of the proposed harvesting would occur in ephemeral draws with no surface delivery to another body of water, and the remainder of the harvest

would be located near an intermittent stream channel with no surface delivery to another body of water, therefore potential increases in sediment or water yield from harvest activities would not affect downstream waters.

SOILS

Introduction

Landform Description

The landform and parent materials in the project area are generally quartzite and argillite bedrock soils on ridges, and glacial till on lower slopes. 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. Surface layers are volcanic ash-influenced loess, are highly productive and easily damaged.

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 ocular estimates of existing levels of coarse woody debris during field reconnaissance. 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, 1998) and the Soil Survey of Flathead National Forest Area, Montana (USDA, 1998) 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 productivity will include DNRC owned land within the Ashley Lake project area.

Existing Conditions

Soil Physical Properties

Soil physical properties were assessed in the proposed project area by a DNRC watershed specialist in 2011. The DNRC has conducted timber harvesting on this parcel since the 1950s. Timber sale records dating back to the 1960s indicate most of the proposed project area has 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 are spaced at between 100 and 120 feet apart, and none were identified as erosion or sediment sources. None of the existing trails were found in unfavorable locations, such as draw bottoms or wet areas. 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 visually estimating the current levels of coarse woody debris. Much of the proposed project area appeared to have less than 10 tons/acre, which is at the low end of the recommended range discussed in *Managing Coarse Woody Debris in Forests of the Rocky Mountains* (Graham et al, 1994) on similar habitat types. Subalpine fir habitat types in Montana are recommended to have a range of 12 to 24 tons/acre to maintain forest productivity and nutrient cycling.

Slope Stability

Soil types in the project area are primarily gentle (0-40%) glacial till deposits on hilly terrain. Portions of the upper slopes are glaciated mountain slopes on 40-60% gradient, and the southeast corner of the proposed project area contains steep stream breaklands leading to a class 3 stream bottom. The Web Soil Survey (NRCS, 1998) and the Soil Survey of Flathead National Forest Area, Montana (USDA, 1998) 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 Ashley Lake project area and their associated management implications is found in ***Table 3-6***.

SOIL EFFECTS

No Action Alternative- Direct and Indirect Effects

The No Action Alternative would have no direct or indirect effects on soil physical properties. No ground-based activity would take place under this alternative, which would leave the soil in the project area unchanged from the description in the Existing Conditions portion of this analysis. All impacts from past management activities would continue to improve or degrade as dictated by natural and pre-existing conditions.

No Action Alternative- Cumulative Effects

This alternative would have no cumulative impacts to soil physical properties 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 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- Direct and Indirect Effects

Soil Physical Properties

Direct and indirect effects of the proposed action alternative to soil physical properties were estimated 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 96 of the total 598 acres proposed for harvesting in the Ashley Lake 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 3.0 to 33.8 percent of the acres treated, with an average disturbance rate of 16.1% (DNRC, 2009). 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. Several of the monitoring sites on similar soils did not meet the analysis goals due to operation of ground based equipment on wet soils. This shows that soil types in the proposed project area are susceptible to impacts when soils are not dry or frozen. If operations occur during dry or frozen conditions, the expected impacts are expected to be substantially less than the average disturbance found in past soil monitoring. As a result, the extent of impacts expected would likely be similar to those reported by DNRC (2009), or approximately 3.0 to 33.8 percent of ground-based harvested acres. With implementation of BMPs and mitigation measures, estimated impacts are expected to occur in the low range of those found in past management. The proposal includes 598 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, are not included in soil impacts assessments, and promote reforestation of the site. The expected impacts to the soil resource as a result of the Action Alternative are summarized in ***Table 3-5***. These activities would leave approximately 16.1 percent of the proposed harvest units in an impacted condition. This level is slightly above the range analyzed for in the *EXPECTED FUTURE CONDITIONS* section of the *SFLMP*, but 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 3-5: Summary of Direct Effects of Alternatives on Soils

Description of Parameter	No Action	Action Alternative
Acres of Harvest	0	598
Acres of Tractor Yarding	0	598
Acres of Ground Based Impacts[1]	0	96
Percent of Harvest Area with Impacts	0%	16.1%

[1] 16.1% of tractor units based on average impacts found on similar soils and sites by DNRC soil monitoring

Nutrient Cycling

Direct and indirect effects to nutrient cycling would include an increase in coarse and fine woody debris from the action alternative. 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.

Action Alternative- Cumulative Effects

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, all 598 acres proposed for harvesting have had previous ground-based 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. Most existing trails are suitable for use, but additional trails may also be required based on site-specific conditions. Cumulative impacts to soil physical properties under the Action Alternative are still expected to remain near or 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).

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.

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.

Figure 3-1: Soil Map Types for the Ashley Lake Project

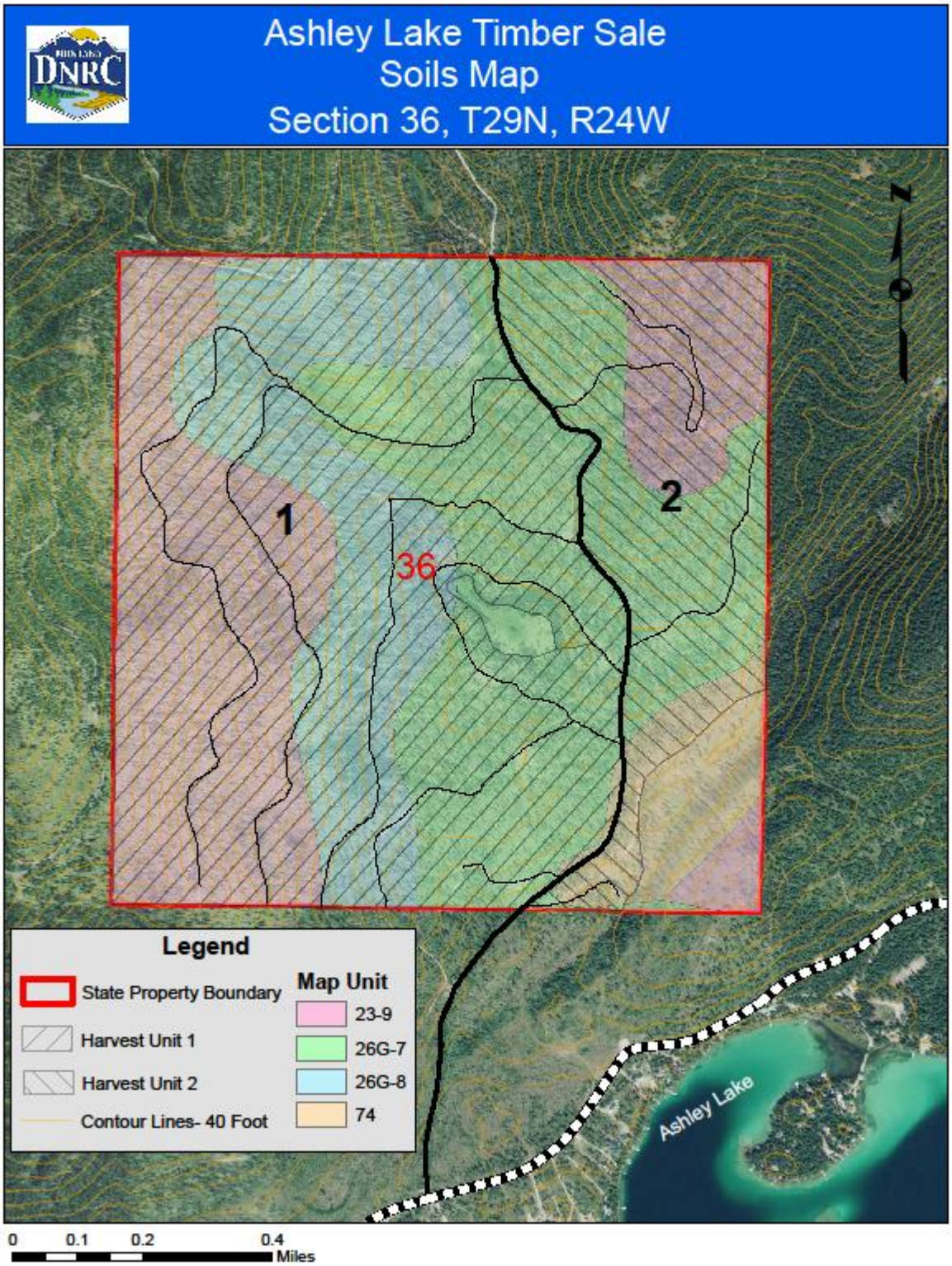


TABLE 3-6: SOIL MAP UNIT DESCRIPTIONS FOR THE ASHLEY LAKE SEED TREE PROJECT AREA						
Map Unit	**Name**	**Soil & Vegetation Descriptions**	**Management Considerations**			
			K factor/erosion potential***	**Timber**	**Roads**	**Comments**
23-9	Glaciated Mountain Slopes, 40-60%	Soils of this map unit have been formed from volcanic ash over metasedimentary rocks. Vegetation is dry mixed and moist mixed forest of subalpine fir or western redcedar over an understory of shrubs and forbs.	K=0.10 to 0.32 Erosion potential is considered low to moderate	Potential Prod:Mod/High Equipment: Cable/Tractor Regen: Can be limited by grass competition	Roads perform well with standard location, construction and maintenance practices.	Road cuts and fills may be difficult to re-vegetate
26G-7	Glacial Moraines, 0-20%	Soils of this map unit have been formed from volcanic ash over glacial till. Vegetation is dry mixed forest of mainly Douglas-fir over an understory of shrubs.	K=0.10 to 0.32 Erosion potential is considered low to moderate	Potential Prod: Moderate Equipment: Tractor Regen: Can be limited by grass competition	Roads perform well with standard location, construction and maintenance practices. Raveling may occur on cut slopes.	Road cuts and fills may be difficult to re-vegetate
26G-8	Glacial Moraines, 20-40%	Soils of this map unit have been formed from volcanic ash over glacial till. Vegetation is dry mixed forest of mainly Douglas-fir over an understory of shrubs.	K=0.10 to 0.32 Erosion potential is considered low to moderate	Potential Prod: Moderate Equipment: Tractor Regen: Can be limited by grass competition	Roads perform well with standard location, construction and maintenance practices. Raveling may occur on cut slopes.	Road cuts and fills may be difficult to re-vegetate
74	Stream Breaklkands, 60-90%	Soils of this map unit have been formed from volcanic ash over glacial drift. Vegetation is dry mixed forest of mainly Douglas-fir over an understory of shrubs and forbs.	K=0.02 to 0.10 Erosion potential is considered low	Potential Prod: Moderate Equipment: Cable/tractor Regen: Can be limited by grass competition	Roads perform well with standard location, construction and maintenance practices. Slope steepness may increase cost.	Some steep slopes may limit tractor operation.

*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, 1998)

**Erosion Factor K indicates that 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, 1998).

WILDLIFE

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 alternative presented Chapter 2. The following issue statements were developed from concerns raised by DNRC specialists and public 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 habitat 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, which could adversely affect the quality of wildlife habitat.

- **Canada lynx.** The proposed activities could reduce landscape connectivity and the availability of suitable Canada lynx habitat types (i.e. denning, young foraging, mature foraging, forested travel/"other"), reducing the ability of the area to support Canada lynx.

- **Grizzly bears.** The proposed activities could alter the availability of grizzly bear visual screening and could increase human access, which could displace bears and increase the risk of human-caused bear mortality.

- **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 nesting habitats.

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

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

Analysis Areas

Analysis areas are delineated at multiple scales appropriate for analyses of: 1) direct and indirect effects, and 2) cumulative effects. These scales are described in more detail below.

Direct and Indirect Effects Analysis Area

The direct and indirect effects analysis area is the project area (Figure 3-2 –ANALYSIS AREAS). The project area consists of 640 acres of DNRC managed lands in Section 36, T29N, R24W.

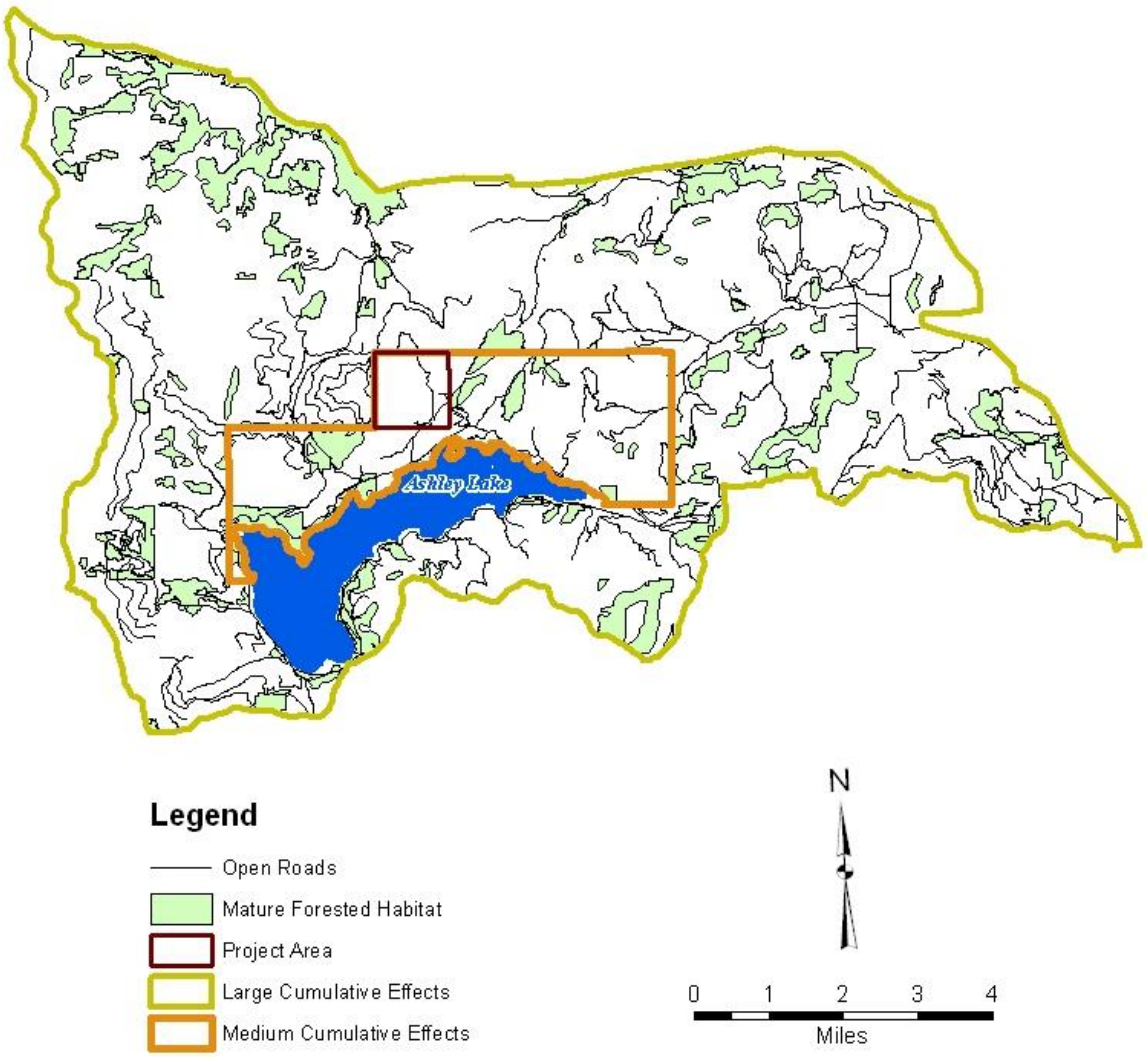
Cumulative Effects Analysis Areas

The cumulative effects analysis area refers to a broad surrounding landscape scale and varies according to the issue or wildlife species being discussed (FIGURE 3-2 – ANALYSIS AREAS). Cumulative effects analysis areas are summarized in TABLE 3-7 –ANALYSIS AREAS. Cumulative effects analysis areas include the direct and indirect effects analysis area and also include 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 being discussed (e.g., snags and coarse woody debris, grizzly bears). All issues with the exception of bald eagles and white-tailed deer were analyzed at the large cumulative effects analysis area described below. The bald eagle cumulative effects analysis area was delineated according to the distance from the nest and the medium cumulative effects analysis area was delineated according to the location of white-tailed deer winter range in the vicinity of the project area (*unpublished interagency map, 2008*).

Table 3-7 Analysis Areas - Descriptions of the direct and indirect effects analysis area and cumulative effects analysis areas.

TABLE 3-7: WILDLIFE ANALYSIS AREAS			
Analysis Area	**Description**	**Total Acres**	**Issue(s)/Species Analyzed**
Direct & Indirect Effects	Section 36, T29N, R24W (project area)	640	direct & indirect effects for all issues/species
Medium Cumulative Effects	Portions of white-tailed deer winter range (*unpublished interagency map, 2008*) located adjacent to the project area and north of Ashley Lake	5,910	white-tailed deer winter range
Large Cumulative Effects	The Ashley Creek Watershed and portions of the Logan Creek and Spring Creek Watersheds (6th field)	46,848	snags and coarse woody debris, mature forested habitats and connectivity, Canada lynx, grizzly bears, gray wolves, big game
Eagle Cumulative Effects	The 2.5 mile radius area surrounding a bald eagle nest located on Ashley Lake	12,566	bald eagles

Figure 3-2: Wildlife Analysis Area Map- Wildlife analysis areas for the proposed Ashley timber sale.



Analysis Methods

Analysis methods are based on DNRC *State Forest Land Management Rules* designed to promote biodiversity. Biodiversity is promoted by taking a coarse-filter approach as well as a fine-filter approach. The coarse-filter approach favors an appropriate mix of stand structures and compositions on state lands (*ARM 36.11.404*) and assumes that if landscape patterns and processes are maintained, then a full complement of species would persist and biodiversity would be maintained. Because the coarse-filter approach may not adequately address the full range of biodiversity on DNRC lands, DNRC also employs a complementary fine-filter approach which addresses the habitat requirements of threatened, endangered, and sensitive species (*ARM 36.11.406*).

The coarse-filter wildlife analysis section includes analyses of direct, indirect and cumulative effects of the proposed alternatives on: 1) mature forested habitats and landscape connectivity, and 2) snags and coarse woody debris. Effects to old growth (*Green et al. 1992*) were dismissed from analysis because the project area does not contain old growth. Specialized analysis methods are discussed in each section.

The fine-filter wildlife analysis section includes analyses of the direct, indirect and cumulative effects of the proposed alternatives on: 1) species listed as threatened or endangered under the Endangered Species Act of 1973, 2) species listed as sensitive by DNRC, and 3) species managed as big game by DFWP. Specialized analysis methods are discussed in the sections pertaining to each species.

Existing conditions are described for each relevant species or issue and were assessed with the following techniques: field visits, scientific literature consultation, Montana Natural Heritage Program (MNHP) data queries, DNRC Stand Level Inventory (SLI) data analysis, aerial photograph analysis, and consultation with professionals. Cumulative effects analyses account for all known past and current activities, as well as planned future agency actions and include

- DNRC 2005 Ashley Lake Timber Sale – Seed tree/shelterwood harvests on approximately 628 acres within Section 36, T29N, R24W with 9 miles of road maintenance.

- USFS 2009 (proposed) Ashley-Herrig Resource Management Project – Treatment of 1546 acres including non-commercial harvest on 367 acres and commercial harvest on 1179 acres. Non-commercial treatments include pre-commercial thin and understory fuels reduction. Commercial treatments include commercial thin, shelterwood harvest, seed tree harvest, clearcut, and overstory removal. Plans include construction of 1.9 miles of new roads and 4.7miles of temporary roads. Treatments are occurring within: Sections 22 and 26, T29, R24W, Section 31 T29N R23W, Sections 12, 14, 24, T28N, R25W Sections 2, 4, 8, 11, 12, 16, 20, 22, 26, and 28, T28N, R24W, and Sections 6 and 10 T28N, R23W. See TABLE W-2 –USFS HARVEST for approximate acres of harvest types that may occur within each analysis area.

Table 3-8: USFS Harvest - Approximate acres of each harvest type proposed by the USFS Ashley-Herrig resource management project that may occur in each wildlife analysis area.

TABLE 3-8: USFS HARVEST			
Analysis Area	**Commercial Harvest**	**Pre-Commercial Thin**	**Non-Commercial Fuels Reduction**
Medium cumulative effects	196	0	15
Large cumulative effects	860	146	41
Bald eagle cumulative effects	274	138	39

Coarse-Filter Wildlife Analysis

The coarse-filter wildlife analysis discloses the existing conditions and the anticipated direct, indirect and cumulative effects of the proposed alternatives on 1) mature forested habitats and landscape connectivity and 2) snags and coarse woody debris.

Mature Forested Habitats 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 abundant, large diameter trees and dense canopy cover provide many wildlife species with food, shelter, breeding sites, and travel corridors. Historically, the spatial configuration of mature forested habitats 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 habitats, is important for many wildlife species. Patch size may affect the distribution wildlife species that are either attracted to, or avoid forest edges. Additionally, connectivity of mature forested habitats may facilitate movements of species that avoid openings in canopy cover, or inhibit movements of species that are attracted to openings in canopy cover. For example, discontinuous mature forested habits 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 habitats. Consequently, timber harvest may negatively affect wildlife species dependent on mature forests by reducing the amount and connectivity of these habitats. Conversely, wildlife species adapted to early-successional habitats may benefit from timber harvests and similar natural disturbance events. The following analysis discloses existing conditions and the anticipated

direct, indirect, and cumulative effects of the proposed activities on mature forested habitats and connectivity.

Analysis Area

The analysis area for direct and indirect effects is the project area (FIGURE 3-2 –ANALYSIS AREAS). The analysis area for cumulative effects is the large cumulative effects area described in TABLE 3-7 –ANALYSIS AREAS (FIGURE 3-2 –ANALYSIS AREAS). The large cumulative effects analysis area represents an area large enough to support a diversity of species that use mature forested habitats and/or require connected forested habitats.

Analysis Methods

Analysis methods for mature forested habitats and landscape connectivity include field evaluations and Geographical Information System (GIS) analysis of aerial-photographs and USFS canopy cover data (VMap 9.1.1). Factors considered in the analysis include: 1) the degree of timber harvesting, 2) availability of mature forested habitats (100+ years in age, ≥40% canopy cover), 3) average patch size, 4) open road density, and 5) the availability of potential travel corridors.

Existing Conditions

The direct and indirect effects analysis area currently does not contain mature stands (100+ years in age, ≥40% canopy cover) TABLE 3-9 –MATURE FOREST). Canopy cover is low (≤10%) and consists primarily of western larch and Douglas-fir. Regeneration in the understory consists primarily of lodgepole pine, Douglas-fir, and subalpine fir. Open road density in the project area is 2.3 miles/square mile including some illegal trails. Due to the lack of mature forested habitat in the project area, the area is not likely to provide travel corridors for wildlife species that prefer mature forested habitat cover. However, connectivity in the southeastern portion of the project area may be provided by riparian habitat associated with a tributary to Ashley Lake. The project area does not occur in any particular area of documented importance for wildlife habitat connectivity.

The large cumulative effects analysis area currently contains approximately 6,396 acres of mature stands (100 plus years in age, ≥40% canopy cover) of mixed conifers (TABLE 3-9 –MATURE FOREST). Within the cumulative effects analysis area, mature forest exists in scattered small to large patches (Average: 64 acres, range: 3-1,384 acres) with the majority of connected mature patches occurring in the northwest portion of the analysis area (FIGURE 3-2 –ANALYSIS AREAS). In the vicinity of the project area, mature forest patches are small and disconnected, potentially inhibiting movement of wildlife species requiring connected mature forest. Open road density in the large cumulative effects analysis area is 2.8 miles/square mile and the total road density is 3.5 miles/square mile. These roads may further inhibit wildlife movement, particularly in the vicinity of Ashley Lake, where traffic levels are relatively high due to residential development around the lake.

Table 3-9: Mature Forest - Mature forested habitat (100+ years in age, ≥40% canopy cover) existing condition and expected post-harvest condition (acres). Percent of the total analysis area is in parentheses.

TABLE 3-9: MATURE FOREST			
Analysis Area	**Existing Average Patch Size**	**Existing Mature Forest**	**Post-Harvest Mature Forest**
Direct & indirect effects	0	0	0
Cumulative effects	64	6,396 (14%)	6,396 (14%)

Snags and Coarse Woody Debris

Issue: The proposed activities could reduce the availability of snags and coarse woody debris, which could adversely affect the quality of wildlife habitat.

Introduction

Snags and coarse woody debris are important components of forest ecosystems that provide important functions including: 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*). Snags and defective trees (i.e. partially dead, spike top, broken top) are used by a wide variety of wildlife species for nesting, roosting, and cover. Primary cavity users (i.e. woodpeckers) excavate nesting and roosting cavities in snags. These cavities are used as nesting, roosting, and resting sites by a variety of secondary cavity users, such as small mammals and birds, which are unable to excavate their own cavities. Snags also provide foraging opportunities for insectivorous wildlife species. Snag-habitat value for wildlife varies according to tree species, diameter, and snag density. Thick-barked species (such as western larch and ponderosa pine) tend to provide high quality snag habitat. Snag size is also important. Many species that nest in smaller diameter snags will also use large snags; however, the opposite is not true. Additionally, many cavity-nesting species prefer high density snag habitat and rely on adjacent snags for foraging opportunities.

Coarse woody debris is used by a variety of wildlife species for foraging, shelter, lookout sites, and food-storage. Additionally, coarse woody debris provides forest-dwelling amphibians and reptiles with a stable environment (i.e. moisture and temperature). Coarse woody debris habitat value varies according to size, length, decay, and distribution of coarse woody debris. 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. The following analysis discloses existing conditions and the anticipated direct, indirect, and cumulative effects of the proposed activities on coarse woody debris and snags.

Analysis Area

The analysis area for direct and indirect effects is the project area (FIGURE 3-2 –ANALYSIS AREAS). The analysis area for cumulative effects is the large cumulative effects area described in TABLE 3-7 – ANALYSIS AREAS (FIGURE 3-2 –ANALYSIS AREAS). The large cumulative effects analysis area represents an area large enough to support a diversity of species that use coarse woody debris and snags.

Analysis Methods

Analysis methods for snag and coarse woody debris include ocular estimates of snag and coarse woody debris and GIS analysis of open road networks. Factors considered include: 1) the level of harvesting, 2) availability of snags and coarse woody debris, and 3) risk of firewood harvesting.

Existing Conditions

Low snag density and moderate levels of coarse woody debris were observed in the project area during field assessments. Throughout the project area, approximately 10-20 tons coarse woody debris per acre and 1-2 snags per acre of variable size (8-21+ inch dbh) exist. The majority of these snags are western larch and Douglas-fir. Most of large snags (>21 inch dbh) are located in the southeastern portion of the project area. Firewood cutting risk is currently high due to the presence of open roads (2.3 miles/square mile open road density). The network of open roads connecting the project area to the high-traffic North Ashley Lake Road, located directly 0.5 miles to the south of the project area, provides legal firewood cutting access. Additionally, illegal motorized trails are present in the project area, further reducing the availability of coarse woody debris and snags.

In the cumulative effects analysis area, snag and coarse woody debris levels on surrounding parcels likely vary widely depending on ownership, motorized access, harvest history, and natural disturbance history. The previous DNRC Ashley Lake Timber Sale (2005) likely resulted in reduced availability of coarse woody debris and snags; however, amounts of each were retained to meet DNRC *State Forest Land Management Rules* (*ARM 36.11.411* and *ARM 36.11.*414) (see Analysis Methods section of the Introduction for a detailed description of the project). Snags and coarse woody debris are frequently collected for firewood, especially near open roads, and firewood gathering occurs in the cumulative effects analysis area. The open road density in the large cumulative effects analysis area is 2.8 miles/square mile. The highest density of open roads is located in the southern portion of the large cumulative effects analysis area near the project area, and therefore, this area is likely to receive greater firewood cutting pressure. The northwestern portion of the large cumulative effects analysis area contains fewer open roads, and is likely to receive less firewood cutting pressure.

Fine Filter Wildlife Analysis

The fine-filter wildlife analysis discloses the existing conditions of wildlife resources and the anticipated direct, indirect, and cumulative effects that may result from the No-Action and Action Alternatives described in Chapter 2. Wildlife species considered include: 1) species listed as threatened or endangered under the Endangered Species Act of 1973, 2) species listed as sensitive by DNRC, and 3) species managed as big game by DFWP. TABLE 3-10 –FINE-FILTER describes how each species was either included in the following analysis, or removed for further analysis due to lack of suitable habitat or failure of proposed activities to affect required habitat components.

Table 3-10: Fine Filter - Status of species considered in the fine filter wildlife analysis and basis for inclusion or exclusion

Table 3-10: STATUS OF SPECIES CONSIDERED IN THE FINE FILTER ANALYSIS	
SPECIES/HABITAT	**DETERMINATION- BASIS**
THREATENED AND ENDANGERED SPECIES	
Grizzly bear (*Ursus arctos*) Habitat: Recovery areas, security from human activity	***Included*** – The project area is located approximately 2 miles from non-recovery occupied habitat, described by *Wittinger* (*2002*). Therefore, grizzly bears may occur within the project area.
Canada lynx (*Felis lynx*) Habitat: Subalpine fir habitat types, dense sapling, old forest, deep snow zone	***Included*** – The project area contains approximately 622 acres of lynx temporary non-habitat.
SENSITIVE SPECIES	
Bald eagle (*Haliaeetus leucocephalus*) Habitat: Late-successional forest more than 1 mile from open water	***Included*** – A bald eagle nest is located 1.9 miles from the project area and the home range of the pair includes the southern portion of the project area.
Black-backed woodpecker (*Picoides arcticus*) Habitat: Mature to old burned or beetle-infested forest	*No further analysis conducted* – No recently (<5 years) burned areas occur in 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 salamander (*Plethodon idahoensis*) Habitat: Waterfall spray zones, talus near cascading streams	*No further analysis conducted* – 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 further analysis conducted* – 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 loon (*Gavia immer*) Habitat: Cold mountain lakes, nest in emergent vegetation	*No further analysis conducted* –Ashley Lake, which is located approximately 0.25 miles south of the project area, receives use by nesting common loons (M*NHP tracker data*). Nesting habitat occurs throughout the lake and the minimum distance between a documented nest and portions of the project area where mechanized activity would occur is approximately 1.0 miles. The entire project area is located >500 feet from any portion of the lake. Thus, no direct, indirect or cumulative effects to common loons would be expected to occur as a result of either alternative.
Fisher (*Martes pennanti*) Habitat: Dense mature to old forest less than 6,000 feet in elevation and riparian	*No further analysis conducted* – Approximately 640 acres of a preferred fisher cover type (i.e. western larch/Douglas-fir) occur within the project area, however the area contains inadequate structure to provide suitable fisher habitat. Thus, no direct, indirect, or cumulative effects to fishers would be expected to occur as a result of either alternative.
Flammulated owl (*Otus flammeolus*) Habitat: Late-successional ponderosa pine and Douglas-fir forest	*No further analysis conducted* –Approximately 5.4 acres of flammulated owl habitat occur within the project area, which is too small to provide viable habitat conditions for this species. Thus, negligible direct, indirect or cumulative effects to flammulated owls would be expected to occur as a result of either alternative.
Gray Wolf (*Canis lupus*) Habitat: Ample big game populations, security from human activities	Included – The project area is located approximately 2 miles from the home range of the Ashley wolf pack.
Harlequin duck (*Histrionicus histrionicus*) Habitat: White-water streams, boulder and cobble substrates	*No further analysis conducted* – No suitable high-gradient stream or river habitats occur in the project area. No direct, indirect or cumulative effects to harlequin ducks would be expected to occur as a result of either alternative.
Northern bog lemming (*Synaptomys borealis*) Habitat: Sphagnum meadows, bogs, fens with thick moss mats	*No further analysis conducted* – No suitable sphagnum bogs or fens occur in the project area. Thus, no direct, indirect, or cumulative effects to northern bog lemmings would be expected to occur as a result of either alternative.
Peregrine falcon (*Falco peregrinus*) Habitat: Cliff features near open foraging areas and/or wetlands	*No further analysis conducted* – No suitable cliffs/rock outcrops occur in the project area. Thus, no direct, indirect, or cumulative effects to peregrine falcons would be anticipated as a result of either alternative.
Pileated woodpecker (*Dryocopus pileatus*) Habitat: Late-successional ponderosa pine and larch-fir forest	*No further analysis conducted* – No suitable mature ponderosa pine, western larch/Douglas-fir habitats occur in the project area. Thus, no direct, indirect, or cumulative effects to pileated woodpeckers would be anticipated as a result of either alternative.
Townsend's big-eared bat (*Plecotus townsendii*) Habitat: Caves, caverns, old mines	*No further analysis conducted* – 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 are anticipated as a result of either alternative.

BIG GAME SPECIES	
Mule Deer (*Odocoileus hemionus*)	***Included*** – The project area contains white-tailed deer winter range habitat (*unpublished interagency map, 2008*).
White-tailed Deer (*Odocoileus virginianus*)	
Elk (*Cervus canadensis*)	

Threatened and Endangered Species

Canada Lynx

Issue: The proposed activities could reduce landscape connectivity and the availability of suitable Canada lynx habitat types (i.e. denning, young foraging, mature foraging, forested travel/"other"), reducing the ability of the area to support Canada lynx.

Introduction

Canada lynx are listed as threatened under the *Endangered Species Act*. Canada lynx are medium-size cats that prey primarily on snowshoe hares and occupy a mosaic of young and mature forests that provide hunting and denning habitats (*Ruediger et al. 2000*). Lynx foraging habitat in western Montana consist of young coniferous stands and dense, mature forested stands, which provide snowshoe hare habitat (*Squires et al. 2010*). Lynx denning habitat typically consists of mature forests with abundant coarse woody debris, which provides hiding cover for kittens (*Squires et al. 2008*). Additionally, lynx typically avoid large openings in the winter; hence, densely forested cover is important for travel and security (*Squires et al. 2010*). Forest management considerations for lynx include providing a mosaic of young and mature lynx habitats and well-connected large patches of mature forested cover.

Analysis Area

The analysis area for direct and indirect effects is the project area (FIGURE 3-2 –ANALYSIS AREAS). The analysis area for cumulative effects is the large cumulative effects analysis area described in TABLE 3-7 – ANALYSIS AREAS (FIGURE 3-2 –ANALYSIS AREAS). The large cumulative effects analysis area represents an area that approximates the size of two lynx home ranges (*Ruediger et al. 2000*).

Analysis Methods

Analysis methods include field evaluations, aerial photograph interpretation, and Geographical Information System (GIS) analysis of SLI data and suitable lynx habitats. Habitat was considered suitable for lynx if it consisted of subalpine or hemlock habitat types or associated habitat types (*ARM 36.11.403(40)*) and did not overlap winter ranges used by high concentrations of big game animals and associated predators (*ARM 36.11.403(41)(a)*). Suitable lynx habitat was further subdivided into the following habitat types: 1) denning, 2) young foraging, 3) mature foraging, 4) forested travel/other habitats, and 5) temporary non-habitat (*ARM 36.11.435(2)*). Habitat conditions were assigned to habitat

types based upon a variety of vegetation characteristics important to lynx and snowshoe hares (i.e. canopy cover, stand age class, stems/acre, and coarse woody debris) (*Ruediger et al. 2000*). Forested travel/other habitat is a general habitat category that provides habitat for secondary prey species and contains moderate levels of forest structure usable by lynx. Temporary non-habitat consists of non-forest and open forested stands that are not expected to be used by lynx until adequate horizontal cover develops. On non-DNRC lands, the availability of lynx habitat types is not known; however, mature forested cover (100+ years in age, ≥40% canopy cover) was estimated from aerial photograph interpretation because this habitat is important lynx, especially during the constraining winter season (*Squires et al.* 2010). Factors considered in the analysis include: 1) the level of harvesting, 2) the availability of lynx habitat types, and 3) landscape connectivity.

Existing Conditions

The project area contains 622 acres of lynx temporary non-habitat (TABLE 3-11 –LYNX HABITAT). Canopy cover in the project area is currently ≤10%, although some scattered patches of young, dense subalpine fir and Douglas-fir exist. The availability of canopy cover is lower than levels typically required by lynx, rendering the area temporarily unsuitable for appreciable use by lynx. Riparian habitat associated with a tributary to Ashley Lake is available to lynx in the southeast portion of the analysis area and may provide a travel corridor for travel. However, due to the lack of crown canopy cover (≥40% canopy cover of sapling, pole, or sawtimber stands), it is unlikely that the project area provides much connectivity to adjacent lynx habitat.

In the large cumulative effects analysis area, approximately 128 acres of mature foraging habitat and 487 acres of forested travel/other habitat are available to lynx on DNRC lands (TABLE 3-11 –LYNX HABITAT). An additional 647 acres of temporary non-habitat are present on DNRC lands, but are currently expected to be unsuitable for use by lynx due to lack of adequate horizontal cover. On non-DNRC lands, there are approximately 6,396 acres of mature forested habitat that could provide lynx habitat if adequate cover types and horizontal cover occur. The remaining 40,451 acres are comprised of natural openings, young stands, and sparse stands with low canopy cover. Specific lynx use of the cumulative effects analysis area is unknown.

In the vicinity of the project area, connectivity of mature forested habitat is low, likely inhibiting lynx travel, especially in the winter. The majority of large connected patches of mature forested habitat occur in the northwest portion of the cumulative effects analysis area. This area is likely to provide the highest levels of connectivity in the cumulative effects analysis area (see **MATURE FORESTED COVER AND CONNECTIVITY** in the coarse filter analysis section for further information). The DNRC Ashley Lake timber sale (2005) initially adversely affected lynx habitat across 622 acres of the project area and reduced suitable habitat availability in the cumulative effects analysis area. The USFS Ashley-Herrig project (proposed) also has potential to adversely affect lynx habitat in the foreseeable future.

Table 3-11: Lynx Habitat – Estimates of existing and post harvest lynx habitats within the project area and cumulative effects analysis area (DNRC lands only). Percent refers to the percent of the total lynx habitat each habitat category represents.

Table 3-11: Lynx Habitat				
Lynx Habitat Category	**Acres of Lynx Habitat (Percent of Lynx Habitat)**			
	Direct & Indirect Effects		**Cumulative Effects**	
	Existing	**Post-Harvest**	**Existing**	**Post-Harvest**
Mature Foraging	0 (0)	0 (0)	128 (10.2%)	128 (10.2%)
Denning	0 (0)	0 (0)	0 (0)	0 (0)
Forested Travel/Other	0 (0)	0 (0)	487 (38.6%)	487 (38.6%)
Temporary Non-Habitat	622 (100%)	622 (100%)	647 (51.2%)	647 (51.2%)
Total Acres Lynx Habitat	**622**	**622**	**1262**	**1262**

Grizzly Bears

Issue: The proposed activity could alter the availability of grizzly bear visual screening and could increase human access, which could displace bears and increase risk of human-caused bear mortality.

Introduction

Grizzly bears are opportunistic omnivores that inhabit a variety of habitats in Montana. Preferred grizzly bear habitats include meadows, riparian zones, avalanche chutes, subalpine forests, and big game winter ranges, all of which provide seasonal food sources. Grizzly bears are currently listed as Threatened under the *Endangered Species Act of 1973* and primary threats are related to human-bear conflicts and long-term habitat loss associated with human development (*Mace and Waller 1997a*). Forest management considerations for grizzly bears include providing visual screening along open roads and reducing disturbance levels during the non-denning season.

Analysis Area

The analysis area for direct and indirect effects is the project area (FIGURE 3-2 –ANALYSIS AREAS). The analysis area for cumulative effects is the large cumulative effects analysis area described in TABLE 3-7 – ANALYSIS AREAS (FIGURE 3-2 –ANALYSIS AREAS). The large cumulative effects analysis area approximates the size of a female grizzly bear's home range (*Mace and Waller 1997b*).

Analysis Methods

Analysis methods include field evaluations, Geographical Information System (GIS) of SLI data, and aerial photograph interpretation to identify potential hiding cover and estimate open and restricted road density. Grizzly bear hiding cover is defined as vegetation that could hide 90% of a grizzly bear at a distance of 200 feet. Visual screening for hiding cover was identified by evaluating forest stand size class and the total crown density of all trees in the stand. Seedlings/sapling stands are included in hiding cover estimates if they are >4 feet tall and contain ≥350 trees/acre. On non-DNRC lands mature forested cover (100+ years in age, ≥40% canopy cover) was estimated to approximate the availability of hiding cover available. Factors considered in the analysis include: 1) the degree of harvesting, 2) the availability of visual screening for hiding cover, and 3) open and restricted road density.

Existing Conditions

The project area is located 2 miles outside of non-recovery occupied habitat as mapped by grizzly bear researchers and managers (*Wittinger 2002*). There are no records of grizzly bears in the vicinity of the analysis area (MNHP tracker data); however given the distance from the project area to non-recovery occupied habitat, use of the area by grizzly bears is possible. Due to past harvesting activities, there is limited grizzly bear visual screening in the project area. Some visual screening is available in areas with dense regenerating conifers and shrubs and in areas that were not entered in the DNRC Ashley Lake Timber Sale (2005) including habitat near a small wetland and riparian habitat associated with a small tributary to Ashley Lake in the southeastern portion of the project area. These low riparian habitats may provide important grizzly bear habitats. Currently, open road density in the proposed project area is approximately 2.3 miles/square and total road density is 8.4 miles/square mile. Additionally, unauthorized motorized vehicles access the project area via restricted roads and old skid trails.

The cumulative effects analysis area contains 7,098 acres of non-recovery occupied habitat. There are no records of grizzly bears in the cumulative effects analysis area (MNHP tracker data); however, use of the area is possible. On DNRC lands within the cumulative effects analysis area, there are approximately 1,180 acres of grizzly bear visual screening. On non-DNRC lands, approximately 6,396 acres of mature forested habitat is present in the analysis area, which likely provide suitable visual screening for grizzly bears. Currently, open road density in cumulative effects analysis area is approximately 2.8 miles/square mile and total road density is 3.5 miles/square mile. The proximity of the project area to human development poses a risk to grizzly bears and degrades habitat quality. The project area is located 0.25 miles from the north shore of Ashley Lake, which is a residential area, and 0.1 miles from the high-traffic North Ashley Lake Road.

Sensitive Species

Bald Eagle

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 nesting habitats.

Introduction

Bald eagles are diurnal raptors associated with significant 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 project area (FIGURE 3-2 –ANALYSIS AREAS). The analysis area for cumulative effects is the bald eagle cumulative effects analysis area described in TABLE 3-7 –ANALYSIS AREAS (FIGURE 3-2 –ANALYSIS AREAS).

Analysis Methods

Analysis methods include field evaluations, aerial photograph interpretation, and Geographical Information System (GIS) analysis of bald eagle habitats including nest site areas, primary use areas, and home ranges (*ARM 36.11.429*). Bald eagle habitats are defined according to distance from active nests (i.e. nests that have been active within the past 5 years (*ARM 36.11.403(2)*)). Nest site areas are located within a 0.25 mile radius of nests, bald eagle primary use areas are located within a 0.25 to 0.5 mile radius of nests, and bald eagle home ranges are located within a 0.5 to 2.5 mile radius of nests. 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 breeding habitats to open roads and harvest units.

Existing Conditions

The project area is located 2.5 miles from 1 active bald eagle nest and contains approximately 207 acres of habitat classified as bald eagle home range. The density of existing large potential nest and perch trees is low (1-2 trees/acre) in the project area as a result of past logging associated with the DNRC Ashley Lake Timber Sale (2005). The nest is located on the north shore of Ashley Lake. It was first documented in 1981 and has been occupied in 4 of the last 5 years. In this time period, the pair fledged an average of 1.2 chicks/year (range: 0-2 chicks/year). The DNRC-managed portion of the pair's home range habitat is located approximately 0.25 miles from Ashley Lake. Appreciable residential development, including homes and roads, is situated between the lake and the proposed project area. The project area does not contain any known flight paths (i.e. containing large snags, large perch trees,

emergent trees, roost trees). However, some large trees are available and use of the project area is possible.

The cumulative analysis area contains approximately 207 acres (1.6% of the cumulative effects analysis area) of DNRC-managed habitat classified as bald eagle home range. The remaining bald eagle habitat is managed by Plum Creek (41.2%), private land owners (35.6%), USFS (20.6%), and Stoltze Lumber (0.9%). The majority of bald eagle nesting activities are likely to occur within nest site and primary habitats, which are located primarily on USFS lands. The high-traffic North Ashley Lake Road traverses the bald eagle home range and may be an important source of disturbance to nesting eagles.

Gray Wolves

Issue: The proposed activities could disturb gray wolves and reduce 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 frequently take vulnerable ungulate prey (i.e. young individuals, older individuals, and individuals in poor condition). 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 populations and/or 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 Area

The analysis area for direct and indirect effects is the project area (FIGURE 3-2 –ANALYSIS AREAS). The analysis area for cumulative effects is the large cumulative effects analysis area described in TABLE 3-7 – ANALYSIS AREAS (FIGURE 3-2 –ANALYSIS AREAS).

Analysis Methods

Analysis methods include field evaluation, aerial photograph interpretation, and GIS analysis of available habitats. 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 habitat characteristics.

Existing Conditions

The project area is located approximately 2 miles from the home range of the Ashley wolf pack. No wolf rendezvous sites, den sites, or wolf use of the analysis area has been documented in the project area (*K. Laudon, DFWP wolf management specialist, 2011, personal communication*); however, wolf use of the area could occur at any time. The entire project area (640 acres) is considered valuable by DFWP as

winter range for white-tailed deer and moose (*unpublished interagency map, 2008*). However, the area is currently poor winter range due to the low canopy cover and mid-story in the area and is unlikely to provide access to prey (see **BIG GAME** under sensitive species for further information).

The large cumulative effects analysis area contains 6,230 acres of the estimated home range of the Ashley wolf pack in the northwest portion of the analysis area. The large cumulative effects analysis area is designated as white-tailed deer and moose winter range by DFWP (*unpublished interagency map, 2008*). The analysis area contains approximately 21,899 acres (46.7% analysis area) of white-tailed deer winter range located in the southern and eastern portions of the large cumulative effects analysis area and 46,100 acres (98.4% analysis area) of moose winter range.

Big Game Winter Range

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

Introduction

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

Analysis Area

The analysis area for direct and indirect effects is the project area (FIGURE 3-2 –ANALYSIS AREAS). The analysis area for cumulative effects is the medium cumulative effects analysis area described in TABLE 3-7 –ANALYSIS AREAS (FIGURE 3-2 –ANALYSIS AREAS). The medium cumulative effects analysis area approximates an area large enough to provide winter habitat for approximately 300 wintering white-tailed deer.

Analysis Methods

Analysis methods include field evaluations, aerial photograph interpretation, and GIS analysis of available winter range (*unpublished interagency map, 2008*). The availability of mature forested habitat was used to assess the quality of big game winter range. Factors considered in the analysis include: 1) the degree of timber harvesting, and 2) the availability and habitat characteristics of big game winter range.

Existing Conditions

The entire project area (640 acres) is designated as white-tailed deer winter range by DFWP (*unpublished interagency map, 2008*). No mule deer or elk winter range exists in the project area. Due to the lack of mature forested habitat, use of the area by big game is likely limited. No evidence of

winter browsing by big game was observed during site visits. The previous DNRC Ashley Lake Timber Sale (2005) reduced canopy cover from ≥40% to ≤10%, likely displacing wintering big game from the area in winters when snow is deep (see **MATURE FORESTED HABITAT AND CONNECTIVITY** under the coarse-filter analysis section).

The medium cumulative effects analysis area contains approximately 5,873 acres (99.4% analysis area) of white-tailed deer winter range. The medium cumulative effects analysis area is located on the western edge of a large section of white-tailed deer winter range extending into the Flathead Valley (*unpublished interagency map, 2008*). Approximately 830 acres (14.1% analysis area) of mature forested habitat exists in the analysis area and likely provides suitable canopy cover to provide snow intercept and reduce wind velocity.

WILDLIFE EFFECTS

Mature Forested Habitats and Connectivity

No Action Alternative- Direct and Indirect Effects

None of the proposed forest management activities would occur. Mature forest would develop slowly over time, increasing the availability and connectivity of mature forested habitats. Connectivity of mature forests would not be affected by changes to road density or patch size. Thus, since: 1) no appreciable change in the availability 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 availability and connectivity would be anticipated as a result of the No-Action Alternative.

No Action Alternative- Cumulative Effects

None of the proposed forest management activities would occur. Mature forest would develop slowly over time in the project area, increasing the availability and connectivity of mature forested habitats. Any proposed or ongoing activities on other ownerships may affect the availability and connectivity of mature forested habitats in the cumulative effects analysis area. Thus, since: 1) no appreciable change in the availability 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 availability and connectivity would be anticipated as a result of the No-Action Alternative.

Action Alternative- Direct and Indirect Effects

No mature forested habitat is available in the project area. Canopy cover is currently ≤10% and the seed tree removal proposed for this area would remove the majority of this canopy cover. Mature forest would develop slowly over time, increasing mature forested habitat connectivity. No additional open or restricted roads are planned for construction. Thus, since: 1) no appreciable change in the availability 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 availability and connectivity would be anticipated as a result of the Action Alternative.

Action Alternative- Cumulative Effects

No mature forested habitat is available in the project area and connectivity would not be affected by the proposed activities. The DNRC Ashley Lake timber sale (2005) affected mature forested habitat availability and connectivity and the USFS Ashley-Herrig project (proposed) may affect mature forested habitat and connectivity. DNRC Ashley Lake Timber Sale (2005) occurred in the project area and removed approximately 628 acres of mature forested habitat reducing canopy cover in the project area from ≥40% to ≤10%. The USFS Ashley-Herrig plans that may affect mature forest cover include commercial harvests (i.e. shelterwood, seed tree cut, commercial thin, overstory reduction, clearcut) on approximately 860 acres. No other known past, ongoing or proposed timber harvest activities are expected to affect mature forested habitat and connectivity in the cumulative effects analysis area. Thus, since: 1) no appreciable change in the availability 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 availability and connectivity would be anticipated as a result of the Action Alternative.

Snags and Coarse Woody Debris

No Action Alternative- Direct and Indirect Effects

No changes to snags and coarse woody debris would be expected. Existing snags would continue to provide wildlife habitats, and new snags would be recruited as trees die. 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 gathering would occur, no direct and indirect effects to snags and coarse woody debris availability and wildlife habitat quality would be anticipated as a result of the No-Action Alternative.

No Action Alternative- Cumulative Effects

No changes to snags and coarse woody debris would be expected as no harvesting on DNRC lands would occur. Existing snags would continue to provide wildlife habitat attributes, and new snags would be recruited as trees die. 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 gathering would occur on DNRC lands, no cumulative effects to snags and coarse woody debris availability and wildlife habitat quality would be anticipated as a result of the No-Action Alternative.

Action Alternative- Direct and Indirect Effects

Snag recruits and some existing snags would be removed from 598 acres of the direct and indirect effects analysis area due to timber felling operations. Currently, low snag densities and moderate levels of coarse woody debris are available to wildlife in the project area. Given operability and human safety constraints, existing non-merchantable snags would be left standing where possible on DNRC lands. Additionally, across the project area, at least 1 large snag and 1 large snag recruitment tree per acre (>21 inches dbh) would be retained (*ARM 36.11.411*). If large snags are absent, the largest available snags and/or recruitment trees would be retained. Firewood cutting risk in the project area is high due to accessibility provided by the network of open roads including the South Ashley Lake Road. No additional open roads are proposed for construction and some illegal trails would be closed. Thus, since: 1) the proposed harvest activities would remove some snags and snag recruits, but retention guidelines would apply (*ARM 36.11.411*), 2) coarse woody debris levels would not be expected to change (*ARM 36.11.414*), and 3) some illegal trails would be closed, reducing human access for firewood gathering, minor adverse direct and indirect effects to snags and coarse woody debris availability and wildlife habitat quality would be anticipated as a result of the Action Alternative.

Action Alternative- Cumulative Effects

In the cumulative effects area, the previous DNRC Ashley Lake Timber Sale (2005) and the USFS Ashley-Herrig project (proposed) are the only known harvests contributing to cumulative effects. All DNRC timber harvests require that deadwood resources including snags and coarse woody debris are retained to meet *ARM 36.11.411* and *ARM 36.11.*414; however, snag and coarse woody debris abundance were likely reduced by the previous harvest activities. No additional open or restricted roads are proposed for construction on DNRC lands and some illegal trails would be closed. Thus, since: 1) snags and coarse woody debris were retained in the previous harvest and would be retained in the proposed harvest (*ARM 36.11.411* and *ARM 36.11.*414*),* and 2) some illegal trails would be closed, reducing human access for firewood gathering, minor adverse cumulative effects to snags and coarse woody debris availability and wildlife habitat quality would be anticipated as a result of the Action Alternative.

Threatened and Endangered Species

Canada Lynx

No Action Alternative- Direct and Indirect Effects

None of the proposed forest management activities would occur. The 622 acres of temporary non-lynx habitat present in the analysis area would persist and connectivity would remain low due to the lack of mature forested habitat. Thus, since: 1) no changes to lynx habitat type availability would occur, and 2) no further changes to landscape connectivity would occur, no adverse direct or indirect effects to landscape connectivity and Canada lynx habitat type availability would be anticipated as a result of the No-Action Alternative.

No Action Alternative- Cumulative Effects

None of the proposed forest management activities would occur. The approximately 128 acres of mature habitat, 487 acres of forested travel/other habitat, and 647 acres of temporary non-lynx habitat occurring on DNRC-managed lands would persist and connectivity would remain low in the majority of the analysis area. Thus, since: 1) no changes to lynx habitat type availability would occur, and 2) no changes to landscape connectivity would occur, no cumulative effects to landscape connectivity and Canada lynx habitat type availability would be anticipated as a result of the No-Action Alternative.

Action Alternative- Direct and Indirect Effects

Approximately 622 acres of temporary non-lynx habitat currently exist in the project area. The proposed seed tree harvest would remove the majority of the remaining canopy cover; however, limited changes to lynx habitat would be expected. After harvest, the classification of the 622 acres of temporary non-lynx habitat would not change. Dense patches of subalpine fir and Douglas-fir regeneration would be retained where possible, although some canopy cover would be removed as a result of logging disturbance. Landscape connectivity is currently low due to the lack of mature forested habitat available in the project area. Riparian habitat associated with the tributary to Ashley Lake in the southeastern portion of the project area would not be affected by the proposed activities. If present in the vicinity of the project area, lynx could be temporarily displaced by forest management activities. Thus, since: 1) no changes to lynx habitat type availability would occur, and 2) no changes to landscape connectivity would occur, minimal adverse direct and indirect effects to landscape connectivity and Canada lynx habitat type availability would be anticipated as a result of the Action Alternative.

Action Alternative- Cumulative Effects

There is currently approximately 128 acres of mature habitat, 487 acres of other habitat, and 647 acres of temporary non-lynx habitat on DNRC lands present in the large cumulative effects analysis area. No timber sales are proposed or ongoing on these DNRC lands. Approximately 622 acres of the temporary non-lynx habitat present in the project area would be affected by the proposed activities; however, the classification of these acres would not change due to limited alterations that would occur to existing forest structure. In the cumulative effects area, the previous DNRC Ashley Lake Timber Sale (2005) and the USFS Ashley-Herrig project (proposed) are the only known harvests contributing to cumulative effects. Thus, since: 1) no changes to lynx habitat type availability would occur, and 2) no changes to landscape connectivity would occur, minimal adverse cumulative effects to landscape connectivity and Canada lynx habitat type availability would be anticipated as a result of the Action Alternative.

Grizzly Bears

No Action Alternative- Direct and Indirect Effects

None of the proposed forest management activities would occur. No changes to grizzly bear habitat would be expected. Some regenerating trees and shrubs currently providing visual screening would be removed by logging equipment, but visual screening would be retained near the wetland and the tributary to Ashley Lake. No changes in open or restricted road density would occur. Thus, since: 1) some visual screening would be removed by logging equipment, and 2) no changes to open or restricted road density would occur, no direct or indirect effects associated with grizzly bear displacement or human-caused bear mortality risk would be anticipated as a result of the No-Action Alternative.

No Action Alternative- Cumulative Effects

None of the proposed forest management activities would occur. No changes to grizzly bear habitat would be expected. Thus, since: 1) no timber harvesting would alter present visual screening, and 2) no changes to restricted or open road density would occur, no cumulative effects to associated with grizzly bear displacement or human-caused bear mortality risk would be anticipated as a result of the No-Action Alternative.

Action Alternative- Direct and Indirect Effects

The proposed harvest would remove the majority of the remaining overstory canopy cover; however, limited changes to grizzly bear habitat would be expected. Visual screening is currently limited and would be minimally affected by the proposed activities. Efforts would be made to protect existing patches of regenerating conifers that currently provide some visual screening cover and the proposed activities would not occur in the low riparian habitat. Additionally, contract requirements would assist in mitigating bear-human conflict risk by specifying that contractors are not permitted to carry firearms on the work site and that unnatural attractants (e.g. garbage) must kept/disposed of in a bear-resistant manner. No new open or restricted roads are proposed for construction and some illegal trails would be closed. If present in the vicinity of the project area, grizzly bears could be temporarily displaced by forest management activities. Thus, since: 1) minimal changes in existing levels of visual screening would occur, and 2) some illegal trails would be closed and no new open or restricted roads would be constructed, negligible adverse direct or indirect effects associated with grizzly bear displacement or human-caused bear mortality risk would be anticipated as a result of the Action Alternative.

Action Alternative- Cumulative Effects

The proposed activities would remove the majority of remaining canopy cover and some shrubs and regenerating conifers. However, efforts would be made to protect existing patches of regenerating conifers currently providing some visual screening and vegetation near low riparian habitat would not be affected by the proposed activities. Increased use of road systems during the proposed project could temporarily increase human disturbance to grizzly bears within the cumulative effects analysis area,

which may displace bears should they be present. The proposed activities would be additive to the USFS Ashley-Herrig project (proposed), any timber management activities on private lands, and existing disturbance associated with areas of high human development and use along Ashley Lake. Thus, since: 1) some visual screening would be removed by logging equipment, and 2) no changes to open or restricted road density would occur, negligible cumulative effects associated with grizzly bear displacement or human-caused bear mortality risk would be anticipated as a result of the Action Alternative.

Sensitive Species

Bald Eagles

No Action Alternative- Direct and Indirect Effects

None of the proposed forest management activities would occur. Timber harvest would not occur within the 207 acres of DNRC-managed bald eagle home range habitat. Bald eagle habitat characteristics would persist and disturbance levels would remain the same. 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.

No Action Alternative- Cumulative Effects

None of the proposed forest management activities would occur. All large snags and large trees within the 207 acres of DNRC-managed bald eagle home range habitat would remain intact. Bald eagle habitat characteristics would persist and disturbance levels would remain the same. Thus, since: 1) no change in bald eagle habitat characteristics would occur, and 2) no increased disturbance levels 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.

Action Alternative- Direct and Indirect Effects

The proposed timber harvest would affect 207 acres of bald eagle home range habitat located in the southwest portion of the project area. Within the home range habitat, some habitat characteristics important to bald eagles, such as large snags and large emergent trees, could be removed via harvest or wind throw. However, existing non-merchantable snags would be left standing where possible on DNRC lands, and across the project area, at least 1 large snag and 1 large snag recruitment tree per acre (>21 inches dbh) would be retained (*ARM 36.11.411*). Additionally, considering the distance to Ashley Lake and the level of development between the analysis area and the nest, extensive use of the area by bald eagles is not likely. No new roads are planned for construction, but the proposed activities would increase traffic on 0.1 miles of road within the bald eagle home range habitat. The project would occur in the summer months during the breeding season and in the fall. If present in the area at this time,

bald eagles could be temporarily displaced to other areas of their home range. Thus, since: 1) bald eagle use of DNRC-managed lands is likely minimal, 2) some large trees or snags may be removed within bald eagle home range habitat, but at least 1 large snag and 1 large snag recruit per acre would be retained (*ARM 36.11.411*), and 3) disturbance levels would increase due to traffic and harvest activities primarily in the summer and fall for approximately 1 year, 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.

Action Alternative- Cumulative Effects

The proposed timber harvest would remove some important bald eagle habitat characteristics (i.e. large snags, large emergent trees) within 207 acres (1.6% of the total bald eagle habitats) of DNRC-managed bald eagle home range habitat. However, existing non-merchantable snags would be left standing where possible on DNRC lands, and across the project area, at least 1 large snag and 1 large snag recruitment tree per acre (>21 inches dbh) would be retained (*ARM 36.11.411*). The proposed activities would occur in the summer and early fall and would be additive to any current or ongoing activities. Private landowners manage 35.6% of the bald eagle cumulative effects analysis area, and any projects removing important bald eagle habitat characteristics or increasing disturbance levels could have a negative effect on the eagles. However, the USFS manages the nest site habitat and primary habitat associated with the nest, which results in greater protection for the nesting birds. Within the eagle cumulative effects analysis area, the proposed activities would increase traffic levels on 0.6 miles of the North Ashley Lake Road and 0.7 miles of a DNRC road which is open to the public. Increased traffic would be additive to any activities on other ownerships that use the North Ashley Lake Road for access including the proposed USFS Ashley-Herrig Project if it occurs during the same time period. The Ashley-Herrig project may also affect eagles via habitat treatments occurring in the eagle cumulative effects analysis area including: commercial harvest on 274 acres, pre-commercial thin on 138 acres, and non-commercial fuels reduction on 39 acres (approximate acres based on USFS maps). Thus, since: 1) some large trees or snags may be removed within DNRC-managed bald eagle home range habitat, but at least 1 large snag and 1 large snag recruit per acre would be retained (*ARM 36.11.411*), 2) disturbance levels would increase due to increased traffic volume in a portion of the bald eagle home range habitat primarily in the summer and fall for approximately 1 year, and 3) effects would be additive to projects planned on private ownerships or projects using the Ashley Lake Road, 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.

Gray Wolves

No Action Alternative- Direct and Indirect Effects

None of the proposed forest management activities would occur. Wolves would not be disturbed by proposed DNRC forest management activities, and the 598 acres of big game winter range present in the project area would remain intact. Thus, since: 1) no disturbance to wolf den or rendezvous sites would

occur, and 2) no change in availability of big game habitats is expected, 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.

No Action Alternative- Cumulative Effects

None of the proposed forest management activities would occur. Wolves would not be disturbed by proposed DNRC forest management activities, and the 598 acres of big game winter range present in the project area would remain intact. Any ongoing or proposed activities on other ownerships could adversely affect wolves. Thus, since: 1) no disturbance to wolf den or rendezvous sites would occur, and 2) no change in availability of big game habitats is expected, 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.

Action Alternative- Direct and Indirect Effects

The proposed activities would reduce canopy cover in 598 acres of white-tailed deer and moose winter range. However, considering the low quality of this habitat due to lack of canopy cover for snow intercept and wind velocity reduction, the effect to big game is expected to be minor (see **BIG GAME** under sensitive species for further information). Additionally, there are no known rendezvous or den sites in the project area. Wolf use of the area is possible, and if present, wolves could be temporarily displaced from the vicinity of the project area by forest management activities for approximately 1 year. 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)*). Thus, since: 1) no disturbance to wolf den or rendezvous sites would occur and 2) no change in availability or quality of big game habitats is expected, minor direct and indirect effects to wolves associated with displacement or changes in prey availability would be anticipated as a result of the Action Alternative.

Action Alternative- Cumulative Effects

The proposed activities would slightly reduce canopy cover in 598 acres of white-tailed deer and moose winter range. The alteration of cover proposed under the action alternative would be additive to reductions that occurred under the DNRC Ashley Lake timber sale (2005)), and reductions which may occur in association with the USFS Ashley-Herrig project (proposed). The USFS Ashley-Herrig proposed activities within the analysis area include approximately 196 acres of commercial harvest and 15 acres of non-commercial fuels reduction. Additionally, any projects on other ownerships could reduce the availability of big game habitats or disturb wolf den or rendezvous sites. 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)*). Thus, since: 1) no disturbance to wolf den or rendezvous sites would occur, and 2) no change in availability of big game habitats is expected, negligible cumulative effects to wolves associated with displacement or changes in prey availability would be anticipated as a result of the Action Alternative.

Big Game Winter Range

No Action Alternative- Direct and Indirect Effects

None of the proposed forest management activities would occur. The 598 acres of white-tailed deer winter range proposed for harvest would persist in its existing condition. Thus, since: 1) the availability and habitat characteristics of big game winter range would not change, no direct and indirect effects to big game winter range quality would be anticipated as a result of the No-Action Alternative.

No Action Alternative- Cumulative Effects

None of the proposed forest management activities would occur. The 598 acres of white-tailed deer winter range proposed for harvest would persist in its existing condition. Thus, since: 1) the availability and habitat characteristics of big game winter range would not change, no cumulative effects to big game winter range quality would be anticipated as a result of the No-Action Alternative.

Action Alternative- Direct and Indirect Effects

The proposed seed tree harvest would reduce canopy cover (currently ≤10%) in white-tailed deer winter range. Additionally, big game could be temporarily displaced from the vicinity of the project area by forest management activities for approximately 1 year. However, the area is poor winter range due to the lack of mature forested canopy cover and provides little snow intercept. Thus, the proposed activities would be expected to have limited effects on big game. Harvest equipment would remove some of the regenerating seedlings that provide limited visual screening. Thus, since: 1) the availability of big game winter range would persist, 2) some canopy cover would be removed, and 3) displacement of big game would be temporary (approximately 1 year), minor adverse direct and indirect effects to big game winter range quality would be anticipated as a result of the Action Alternative.

Action Alternative- Cumulative Effects

The proposed activities would slightly reduce canopy cover (currently ≤10%) in white-tailed deer winter range. However, considering the lack of mature forested canopy cover in the area, the proposed activities would not be expected to appreciably affect big game. Thus, only limited use of the area by white-tailed deer would be anticipated. Most white-tailed deer use likely occurs in the western portion of the medium cumulative effects analysis area, where larger mature forested habitat patches are located. No changes to open or restricted road density would occur under the proposed activities, but some illegal trails would be closed. The alteration of cover proposed under the action alternative would be additive to that which occurred under the DNRC Ashley Lake timber sale (2005), and which may occur in association with the USFS Ashley-Herrig project (proposed). Thus, since: 1) the availability and habitat characteristics of big game winter range would persist, 2) some canopy cover would be removed, and 3) displacement of big game would be temporary (approximately 1 year), minor cumulative effects to big game winter range quality would be anticipated as a result of the Action Alternative.

AIR QUALITY

Issues expressed during initial scoping by the public and internal were:

- Road dust created from hauling logs across native or gravel surfaced roads may affect air quality.
- Burning of slash residue from logging may reduce air quality.

Analysis Area

The analysis area used to assess direct, indirect, and cumulative impacts to air quality includes Flathead County of Montana Airshed 2 as defined by the Montana/Idaho Airshed Group. The methodologies used to analyze effects to air quality include estimating the location, amount, and timing of dust or smoke generated by project-related activities.

Existing Conditions

Air quality for the project area is considered good. Currently, the project area contributes very low levels of air pollution into the analysis area or local population centers. Temporary and localized reductions in air quality within the project area may occur in the summer and fall. These reductions are due mostly to road dust generated by motorized residential and recreational traffic on native surface roads and occasionally from smoke produced from burning slash piles. None of the air quality reductions affect local population centers at levels beyond Environmental Protection Agency (EPA) standards. All burning activities conducted by land management entities (which includes DNRC, USFS, Plum Creek and Stoltze Land & Lumber Co.) comply with emission levels authorized by the Montana/Idaho Airshed Group. The project is located outside the Kalispell impact zone.

AIR QUALITY EFFECTS

No Action Alternative-Direct, Indirect and Cumulative Effects

The existing condition would not change under the No Action Alternative in either the project area or Airshed 2.

Action Alternative- Direct and Indirect Effects

Log hauling and other project related traffic on native surface or gravel roads would increase the amount of road dust produced during dry periods. Post harvest burning associated with slash disposal or site preparation would produce smoke emissions. The increased smoke emissions are not expected to exceed air quality standards, and would be temporary, localized reductions to air quality such as currently occurs. Burning would be accomplished within the requirements imposed by the Montana Department of Environmental Quality, Montana/Idaho Airshed Group, and Flathead County Health

Department. To mitigate road dust concerns, dust abatement will be required on native surface roads if hauling occurs during dusty periods.

Action Alternative- Cumulative Effects

Dust and smoke produced from implementing the Action Alternative would be in addition to smoke and dust associated with activities on private lands, recreational use of state lands, and prescribed burning on federal, state, or industrial private lands. All major burners operate under the requirements of the Montana/Idaho Airshed Group that regulates the amount of emissions produced cumulatively to avoid exceeding air quality standards. Dust abatement applied when hauling during dusty periods would mitigate effects from road dust on local residents.

ECONOMICS

An issue expressed during initial scoping was:

- Timber harvesting in the proposed project area may not be economically viable.

Analysis Area

The geographic scope of the economic analysis is Flathead and Lincoln counties.

Analysis Methods

The economic analysis for the timber sale proposal will include estimates of costs, revenues, and returns to the trust beneficiaries; these estimates are intended for the relative comparison of alternatives and are not intended for use as absolute estimates of return. The stumpage value was estimated by subtracting operating costs from current delivered log prices, minus costs. Operating costs include estimated road development, logging, hauling, FI payments, profit margins, and risk. The *Western Wood Products Association Inland Lumber Price Index* for 2011 was used for estimating the delivered price of the logs.

FI fees are estimated using the current FI fee schedule set at $25.13 per MBF.

The employment multiplier used in this analysis is an average of 10.0 jobs supported by every MMBF of timber harvested in the analysis area (*Bureau of Business and Economic Research, 2008*). The exactness of this employment multiplier is limited as the real change in employment varies from sale to sale. Jobs calculated using this multiplier represent mostly existing direct industry jobs that are maintained 1 full year due to this timber sale.

Existing Condition

The proposed action would take place on state lands managed by the Kalispell Unit. Timber sales in this area generally supply raw materials for lumber and pulp industries in Flathead and Lincoln counties.

Though the overall economy of each county is different, they share forestry and logging industries. Employment and wages for Forestry and logging in the two county area are described in detail in Table 3-12: (Employment and Wage). Forestry and logging employment data (*Montana Department of Labor and Industry, Research and Analysis Bureau*) is likely lower than actual employment due to missing data on a number of small informal logging and milling operations.

Table 3-12: EMPLOYMENT AND WAGE 2009

COUNTY	INDUSTRIAL SECTOR	JOBS	NUMBER OF ESTABLISHMENTS	TOTAL WAGES
Flathead	Forestry and Logging	125	47	$5,260,358
Lincoln	Forestry and Logging	97	36	$4,899,571

DNRC earns revenue for trusts beneficiaries by selling timber on trust lands into regional markets at competitive prices. Revenues from timber fluctuate more than other trust revenue sources due to price volatility in regional, national, and international timber and wood products markets. Currently, DNRC's target sale volume is an annual statewide-sustainable yield of 53.2 MMBF. Table 3-13: Timber Sale Revenue shows gross revenue from harvests, FI fees collected, management expenses, net distributed income to the trusts, and the forest management programs net profit margin over the last 5 years.

Table 3-13: DNRC 5-YEAR TIMBER SALE REVENUE

FISCAL YEAR	GROSS REVENUE	FI FEES COLLECTED	MANAGEMENT EXPENSES	NET DISTRIBUTED INCOME	NET PROFIT MARGIN
2010	$9,150,692	$1,196,307	$4,813,104	$3,141,281	34.3%
2009	$8,453,067	$868,511	$4,198,453	$3,389,343	40.1%
2008	$11,099,301	$1,098,577	$4,142,145	$5,858,579	52.8%
2007	$8,799,298	$1,316,404	$4,303,727	$3,179,167	36.1%
2006	$15,875,615	$2,875,277	$4,036,348	$8,963,990	56.5%
2005	$16,575,683	$2,924,052	$3,747,131	$9,904,500	59.8%

In addition to timber sale revenues, FI fees are collected on non-Morrill Grant lands and used to finance projects that improve the health, productivity, and value of forested trust lands. FI activities may include piling and disposing of logging slash, reforestation, thinning, site preparation, noxious weed control, acquiring access and maintenance of roads necessary for timber harvesting, other activities necessary to improve the condition and income potential of forested state lands, and to comply with other legal requirements associated with timber harvesting (77-5-204, MCA).

ECONOMIC EFFECTS

No Action Alternative- Direct and Indirect Effects

Timber harvesting and road construction would not take place. Revenue from the project area would not be realized at this time. If timber from this project is not sold, equivalent volumes would need to come from sales elsewhere. Additionally, local mills may not be able to substitute the potential loss of logs that would not be generated from this alternative. Trust funding would not benefit from this alternative.

No Action Alternative- Cumulative Effects

DNRC has a statewide sustained-yield annual harvest goal of 53.2 MMBF. If this project were not sold, this volume could come from sales elsewhere, but timber substituted may be from other areas and not benefit this region of the State.

Action Alternative- Direct and Indirect Effects

An estimated $169,000 in revenue would be deposited into the representative trust accounts and an estimated $32,669 into the FI account. Approximately $7,000 in road maintenance work would be accomplished.

Using the employment multiplier of 10 jobs per MMBF of timber harvested (*Bureau of Business and Economic Research, 2008*); this sale would provide work for approximately 13 positions.

Action Alternative- Cumulative Effects

Implementation of the Action Alternative would contribute volume to the annual sustained yield of 53.2 MMBF. The yield establishes a relatively stable supply of State Trust land timber for the regional market. The State's regional market share is growing more significant as other timber supply sources dwindle. While the region's market health ultimately relies upon energy and lumber prices established in international markets, an affordable local timber supply is still necessary for regional processing facilities to remain competitive and open.

The Action Alternative would also contribute proportionally to public school funding. Funds distributed by the State trusts partially offset tax dollars needed to fund public education. The cumulative effect of this proposed action in conjunction with revenue generating activities of other trust land is the continued financial contribution to public education in Montana. Tax dollars offset by these contributions either go to improve the State of Montana's budget for other public services or they benefit Montana taxpayers by partially reducing their tax burden.

The Action Alternative would also contribute to the Forest Improvement (FI) fund. In the long term, FI funding represents an investment in forest health, future income-generating opportunities, fire protection, and other associated benefits. The economic benefits of work conducted with FI funds

cannot be directly measured, but they represent an additional cumulative effect related to the proposed action.

Table 3-14: COSTS AND BENEFITS ASSOCIATED WITH THE PROJECT BY ALTERNATIVE		
COSTS AND BENEFITS	**ALTERNATIVES**	
	NO ACTION	**ACTION**
Estimated Total Harvest Volume (MMBF)	0	1.30
Road Development Costs ($/MBF)	0	5.38
Estimated Stumpage Value ($/MBF)	0	130.00
FI Fee ($/MBF)	0	25.13
Estimated Stumpage Value + FI ($/MBF)	0	155.13
Estimated Stumpage Value+ FI + Development Cost ($/MBF)	0	185.64
Total timber-dollar value (Estimated Stumpage Value+ FI +Development Cost X Estimated Harvest Volume)	0	241,332
Total Revenue ($) to the State (Stumpage Value and FI)	0	201,669
Total Revenue ($) to the Involved Trusts (Stumpage Value)	0	169,000

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References

Arjo, W.M., D.H. Pletscher, and R.R. Ream. 2002. Dietary overlap between wolves and coyotes in Northwestern Montana. Journal of Mammalogy 83:754-766.

DNRC, 1996. *State Forest Land Management Plan*. Montana Department of Natural Resources and Conservation. Missoula, MT.

DNRC, 2009. DNRC Compiled Soils Monitoring Report on Timber Harvest Projects. Missoula, MT.

DNRC. 2003. Montana administrative rules for forest management. DNRC. Forest Management Bureau, Missoula, Montana.

Fuller, T. K., W. E. Berg, G. L. Radde, M. S. Lenarz, and G. B. Joselyn. 1992. A history and current estimate of wolf distribution and numbers in Minnesota. Wildlife Society Bulletin 20:42-55.

Garrott, R., S. Creel, and K. Hamlin. 2006. Monitoring and assessment of wolf-ungulate interactions and population trends within the Greater Yellowstone Area, SW Montana and Montana Statewide. Unpublished report at http://www.homepage.montana.edu/~rgarrott/wolfungulate/index.htm.

Green, P., et al. 1992. Old growth forest types of the northern region. R-1 SES. Missoula, MT : USDA Forest Service, Northern Region, 1992. p. 60.

Heinemeyer, K. and J. Jones. 1994. Fisher biology and management in the western United States: a literature review and adaptive management strategy. USDA Forest Service, Northern Region, Missoula, MT 108pp.

Jones, J.L. 1991. Habitat use of fisher in north-central Idaho. M.S. Thesis, University of Idaho, Moscow, Idaho. 147 pp.

Kunkel, K, T.K. Ruth, D.H. Pletscher, and M.G. Hornocker. 1999. Winter prey selection by wolves and cougars in and near Glacier National Park, Montana. Journal of Wildlife Management. 63:901-910.

Losensky, J.B. 1997. Historical vegetation of Montana. *Prepared for* DNRC. Unpublished report on file at DNRC Forest Management Bureau, Missoula, Montana.

Mace, R.D., and J.S. Waller. 1997a. Final report: grizzly bear ecology in the Swan Mountains, Montana. Montana Fish, Wildlife and Parks, Helena, MT. 191pp.

Mace, R.D., and J.S. Waller. 1997b. Spatial and temporal interactions of male and female grizzly bears in northwest Montana. Journal of Wildlife Management 61(1):39-52.

NRCS, 1998. MT619 - Soil Survey of Flathead National Forest Area, Montana. Web Soil Survey. <http://websoilsurvey.nrcs.usda.gov/app/>

Parks, C.G. and D.C. Shaw. 1996. Death and decay: a vital part of living canopies. Northwest science 70:46-53.

Pfister, R.D., B.L. Kovalchik, S.F. Arno, and R.C. Presby. 1977. Forest habitat types of Montana, United States Forest Service., Intermountain Forest and Range Experimental Station, General Technical Report, GTR-INT-34, Ogden, UT.

Roy, K.D. 1991. Ecology of reintroduced fishers in the Cabinet Mountains of Northwestern Montana. MS Thesis, University of Montana, Missoula, 94 pp.

Ruediger, B., J. Claar, S. Mighton, B. Nanaey, T. Tinaldi, F. Wahl, N. Warren, D. Wenger, A. Williamson, L. Lewis, B. Holt, G. Patton, J. Trick, A. Vandehey, and S. Gniadek. 2000. Canada Lynx Conservation Assessment (2nd Edition). USDA Forest Service, USDI Fish and Wildlife Service, USDI Bureau of Land Management, and USDI National Park Service. Missoula, MT. 122 pp.

Squires, J.R. N.J. Decesare, J.A. Kolbe, and L.F. Ruggiero. 2010. Seasonal resource selection of Canada lynx in managed forests of the Northern Rocky Mountains. Journal of Wildlife Management, 74(8):1648-1660.

University of Montana, "Bureau of Business and Economic Research"

USDA Forest Service. 1998. Soil Survey of the Flathead National Forest Area Montana. USDA Forest Service and Natural Resources Conservation Service.

Wittinger, W.T. 2002. Grizzly bear distribution outside of recovery zones. Unpublished memorandum on file at U.S. Forest Service, Region 1, Missoula, Montana. 2 pp.