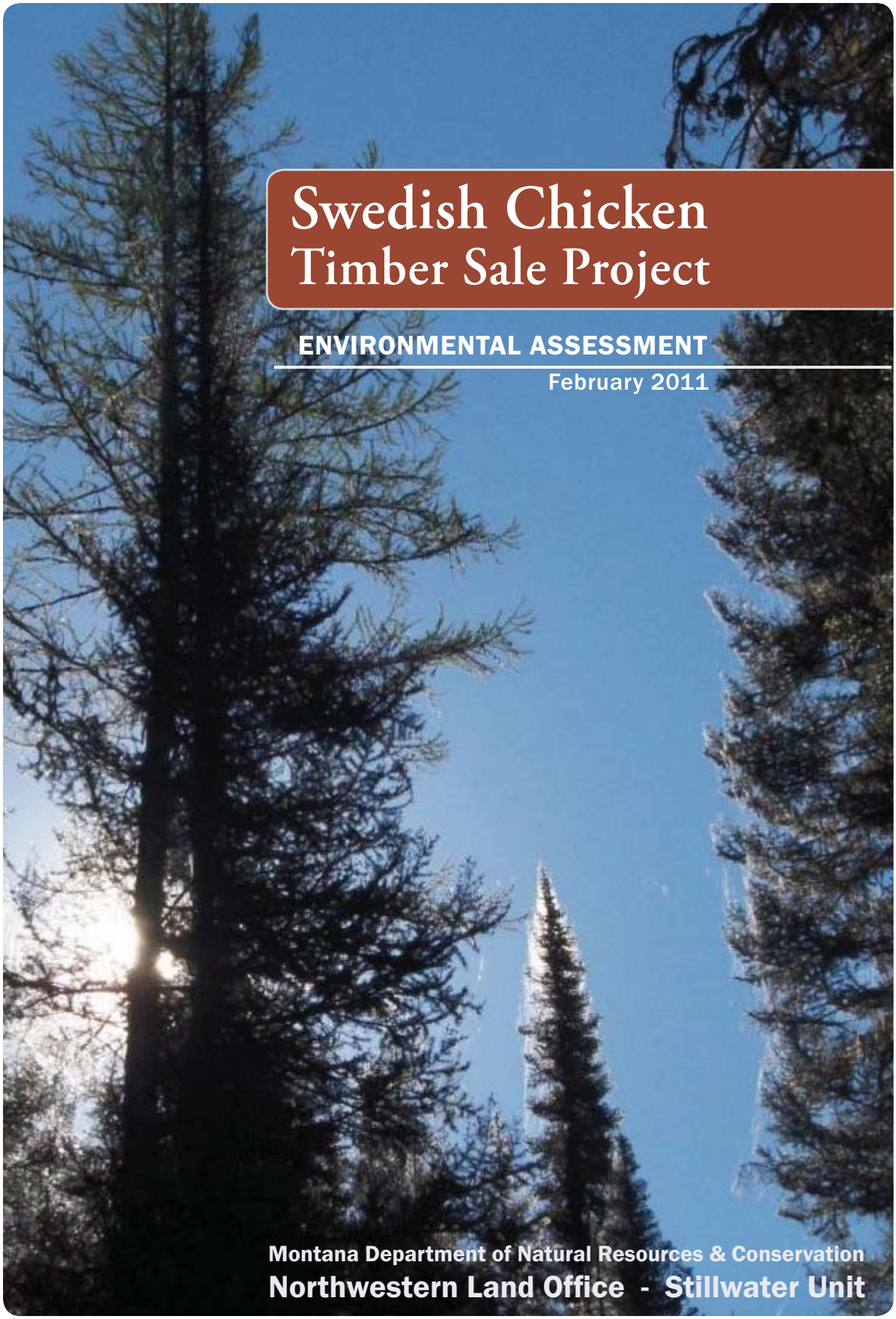
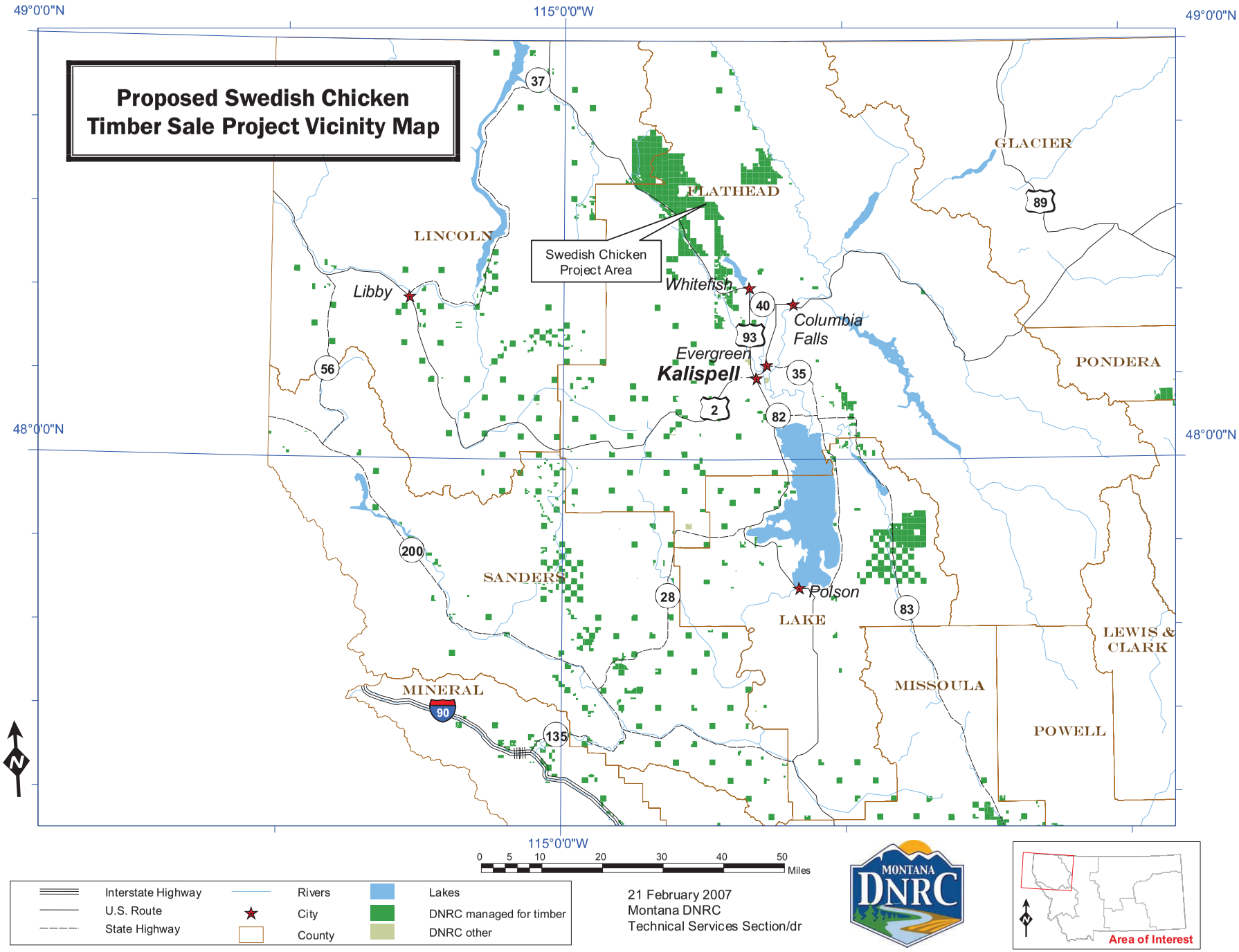


Swedish Chicken Timber Sale Project

ENVIRONMENTAL ASSESSMENT

February 2011

Montana Department of Natural Resources & Conservation
Northwestern Land Office - Stillwater Unit


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

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Environmental Assessment

FINDING

FINDING

Proposed Swedish Chicken Timber sale project

Montana DNRC

A Department of Natural Resources and Conservation (DNRC) Interdisciplinary Team (ID Team) has completed the Environmental Assessment (EA) for the proposed Swedish Chicken Timber Sale Project. The project area is located approximately 25 miles north of Whitefish in Sections 3,10,11,13,14, and 24, all in Township 33N, Range 23W. This timber sale project would provide income for the Common School Trust.

The Forest staff and the ID Team conducted extensive data collection and reconnaissance of the project area over a 2-year period. In addition, DNRC initiated the public scoping process for this project by placing notices in the Whitefish Pilot and sending the Initial Proposal Letter and maps to; individuals, agencies, industry representatives, and other organizations that expressed interest in Stillwater State Forest's management activities. The information provided to the public allowed interested parties to become familiar with the proposed project and provide input and recommendations *(Pages I-4 and II-4)*.

The scoping period for public comment was open for 30 days. Public input received by the DNRC consisted of 3 emails and 1 letter. Using this collected information, an Action Alternative was developed that utilized the comments received during the public-scoping period and the recommendations from members of the ID Team.

After a thorough review of the EA, project file, public correspondence, Montana Statutes, State Forest Land Management Plan (SFLMP), and adopted rules, I have made the following 3 decisions:

1. Alternative Selected:

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

- The No-Action Alternative includes existing activities, but does not include a timber harvest.
- The Action Alternative involves harvesting 4 million board feet (MMbf) of timber from approximately 376 acres. Several types of harvest treatments would be used to meet the described management objectives. A combination of seed tree with reserves (261 acres) and intermediate treatment (26 acres) old-growth maintenance (89 acres) is prescribed in the harvest units designed for this project. A variation of silvicultural prescriptions across the landscape would emulate the effects of mixed-severity fires *(page II-12)*.

Maintenance and minor drainage improvements would occur on approximately 12.8 miles of open roads. A new road 1.3 miles in length will be constructed and maintained as part of the Stillwater State Forest transportation system. In addition, approximately 0.9 miles of temporary road would be utilized and reclaimed after the project is complete and 1.5 miles of restricted roads would receive brushing, maintenance and drainage improvements as part of the project.

I have selected the Action Alternative.

Rationale for Decision

I have selected the Action Alternative with considerations to the following rationale:

- The Action Alternative meets the *PURPOSE OF PROPOSED ACTION, (page I-3)* and *OBJECTIVES OF PROPOSED ACTION (page I-4);* as stated in the EA.
- The lands involved in this project are held by the State of Montana in trust for the support of specific beneficiary institutions. DNRC is required by law to administer these trust lands to produce the largest measure of reasonable and legitimate return over the long run *(Enabling Act of February 22, 1889; 1972 Montana Constitution, Article X, Section 11;* and *77-1-202, Montana Codes Annotated [MCA])*. The SFLMP and associated rules provide the management philosophy and framework to evaluate which alternative would maximize real income while sustaining the production of long-term income.

  This project was designed to provide revenue to the trust beneficiaries. An estimated $402,000 in revenue would be earned for the Common School trust. In addition, approximately $156,000 would be deposited in the Forest Improvement account, and improvements and additions to the DNRC's transportation system worth an estimated $110,000 will be completed. (*Page III-47)*
- On March 13, 2003, DNRC adopted *Administrative Rules for Forest Management (Forest Management Rules ARM 36.11.401 through 456).* This project is designed in accordance with these rules.
- The proposed timber sale project contributes to harvest levels mandated by state statute (*MCA 77-5-222).*
- DNRC is required to salvage timber damaged by insects, diseases, fires, or wind before it loses value to decay, provided such harvesting is economically warranted (*MCA 77-5-207*).
- The analyses of identified issues did not reveal information to persuade DNRC to choose the No-Action Alternative.

How the Chosen Alternative Addresses Concerns and Issues

The Action Alternative includes activities to address the concerns expressed by the public and DNRC specialists, which include, but are not limited to, the following:

- The effects to water quality, fisheries, and soil would be reduced by:
  - meeting or exceeding all applicable Streamside Management Zone (SMZ) rules and following the Forest Management Rules;
  - adding erosion-control measures that will reduce sediment delivery to streams over the long-term *(pages II-9, III-29 – III-32);*
  - minimizing the area of adverse soil impacts through the implementation of BMPs that include planning skid-trail systems and limiting the landing size. Woody debris would be retained for nutrient cycling and long-term soil productivity (*pages III-27, III 39 – III-41*).

This alternative was designed to retain important wildlife habitat components such as snags, coarse woody debris, visual screens, and seasonal security (*pages II-9 – II-10*). In reference to connectivity of mature forested habitats, four of the 5 riparian connectivity corridors identified in the project area would not be altered with the proposed harvesting. In consideration of grizzly bear habitat, where

feasible, hiding cover and visual screening in the form of brush, shrubs, and trees would be retained along open roads, and hiding cover throughout the harvested areas would be expected to regenerate 5 to 15 years after proposed treatment. Seasonal use and timing of activities were considered in designing the project to reduce potential impact on grizzly bears. No changes to motorized access for the general public would occur.

This alternative is designed to perpetuate tree species that are considered appropriate for the sites being harvested, and to address concerns regarding the effects to forest revegetation.

- Large, phenotypically-superior western larch, Douglas-fir, and western white pine will be retained to provide seed for natural regeneration in harvest units. Western larch and rust-resistant western white pine seedlings will be interplanted in the harvest units to ensure that a component of those species is perpetuated (*pages II-12 and II-13*).
- Noxious weed spread will be limited by washing equipment prior to being allowed on site, grass seeding roads and disturbed areas, and applying herbicides along roadsides and on site-specific weed infestations. (*Page II-8*).
- A total of 89 acres of timber stands that meet DNRC old-growth definition *(ARM 36-11-403 [48])* will be entered with timber harvests. A maintenance harvest that retains most of the large trees would take place on these 89 acres. Following this harvest, approximately 12,646 acres of old-growth will remain on the Stillwater Unit. This amounts to 10.8 percent of the total forested acres on the Unit.

2. Significance of Impacts

For the following reasons, I find that the Action Alternative will not have significant impacts on the human environment:

I find that no impacts are regarded as severe, enduring, geographically widespread, or frequent. Further, I find that the quantity and quality of various resources, including any that may be considered unique or fragile, will not be adversely affected to a significant degree. I find no precedent for future actions that would cause significant impacts, and I find no conflict with local, State, or Federal laws, requirements, or formal plans. In summary, I find that the identified adverse impacts will be avoided, controlled, or mitigated by the design of the project to the extent that the impacts are not significant.

Locally Adopted Environmental Plans and Goals

In June 1996, DNRC began a phased-in implementation of the SFLMP. The SFLMP establishes the Department's philosophy for the management of forested trust land. In May 2003, DNRC adopted rules concerning the SFLMP. The SFLMP philosophy and associated rules are incorporated into the design of the proposed project.

Precedent Setting and Cumulative Impacts

The project area is located on state-owned lands that are "principally valuable for the timber that is on them or for growing timber or for watershed protection" (*MCA 77-1-402*).

Taken individually and cumulatively, the proposed activities are common practices and no project activities are being conducted on fragile or unique sites.

The proposed project conforms to the management philosophies of DNRC and is in compliance with existing laws, rules, policies, and standards applicable to this type of proposed action.

Should DNRC Prepare an EIS?

Based on the following considerations, I find that an Environmental Impact Statement (EIS) does not need to be prepared:

The EA adequately addresses the issues identified during project development and displays the information needed to make the decisions.

Evaluation of the potential impacts of the proposed Swedish Chicken Timber Sale Project indicates that no significant impacts would occur.

The ID Team provided adequate opportunities for public review and comment. Public concerns were incorporated into the project design and analysis of impacts.

/s/ Brian Manning

Unit Manager, Montana DNRC – Stillwater Unit

Date: February 16th, 2011

Environmental Assessment

CHAPTER I
Purpose and Need

Chapter I – Purpose and Need

Proposed Action

Montana Department of Natural Resources and Conservation (DNRC), Stillwater Unit, is proposing the Swedish Chicken Timber Sale Project. The project area encompasses 1,804 acres and is located approximately 25 miles north of Whitefish in Sections 3, 10, 11, 13, 14, and 24, all in Township 33N Range 23W *(see Vicinity Map on the inside front cover)*. This timber sale project would provide income for the Common Schools Trust.

Two alternatives, an Action and a No-Action, are being analyzed. If the Action Alternative is selected, 4 million board feet (MMbf) of timber would be harvested from approximately 376 acres. A combination of regeneration, intermediate and old-growth maintenance harvest treatments would be applied. All haul roads would require the necessary maintenance and improvements to ensure compliance with Best Management Practices (BMPs). Approximately 0.7 miles of temporary road and 1.3 miles of permanent road would be constructed. An additional 1.3 miles of road would be reconstructed to access the harvest areas.

Purpose of Proposed Action

The lands involved in the proposed action are held in trust by the State of Montana for the support of specific beneficiary institutions, such as public schools, State colleges and universities, and other specific State institutions, such as the School for the Deaf and Blind *(Enabling Act of February 22, 1889; 1972 Montana Constitution, Article X, Section 11)*. The Board of Land Commissioners (Land Board) and DNRC are legally required to administer these trust lands to produce the largest measure of reasonable and legitimate long-term return for these beneficiary institutions *(Section 77-1-202, Montana Codes Annotated [MCA])*.

The DNRC began implementing the State Forest Land Management Plan (SFLMP) on June 17, 1996. On March 13, 2003, the Department adopted Administrative Rules for Forest Management (Forest Management Rules) *(Administrative Rules of Montana [ARM] 36.11.401 through 456)*. The SFLMP outlines the Department's management philosophy, and the Forest Management Rules contain specific management requirements. The SFLMP philosophy is:

"Our premise is that the best way to produce long-term income for the trust is to manage intensively for healthy and biologically diverse forests. Our understanding is that a diverse forest is a stable forest that will produce the most reliable and highest long-term revenue stream… In the foreseeable future, timber management will continue to be our primary source of revenue and our primary tool for achieving biodiversity objectives."

Objectives of Proposed Action

In alignment with the management philosophy of the SFLMP and in compliance with the Forest Management Rules, the DNRC has set the following specific project objectives:

- Harvest 4 MMbf of sawtimber to generate revenue for the Common School Trust and to contribute to the sustainable yield for the DNRC timber-management program, as mandated by State Statute 77-1-202, MCA.
- Regenerate new stands of healthy trees, improve the growth and vigor of retained trees, and reduce fire hazards.
- Promote biodiversity by managing for appropriate stand structures and species compositions.
- Within the project area, locate, design, and construct those roads described in the Stillwater Unit's Transportation Plan which are necessary to access the proposed harvest units; the amount of road constructed would be based upon alternatives developed through the Montana Environmental Policy Act (MEPA) process.
- Complete site improvements on existing roads to improve drainage, water quality, and safety.
- Improve transportation systems.
- Promote long-term water quality and soil conservation during logging and road construction operations by applying BMPs.

Environmental Assessment Process

Environmental Assessment Development

This Environmental Assessment (EA) was prepared in compliance with the MEPA of 1971. The intent of MEPA is to foster better decisions and wise actions by ensuring that relevant environmental information is available to public officials and citizens before decisions are made and actions are taken. MEPA requires the state government to use interdisciplinary planning and consider environmental effects in its decision-making process.

Public Scoping and Public Involvement

The public scoping process, which begins during the initial stage of an EA, is used to inform the public that a state agency is proposing an action. The public has the opportunity to express their comments or concerns about the possible effects of the project.

In June 2010, DNRC initiated the public scoping process for this project by placing notices in the Whitefish Pilot and sending the Initial Proposal Letter and maps to individuals, agencies, industry representatives, and other organizations that had expressed interest in Stillwater State Forest's management activities.

The scoping period for public comment was open for 30 days. Public input received by the DNRC consisted of 3 emails and 1 letter. The issues and concerns identified through public scoping were summarized and used to further refine the project.

Interdisciplinary Team

As required by MEPA, the DNRC assembled an Interdisciplinary Team (ID Team) to plan this project and analyze the potential environmental effects. This team is comprised of a wildlife biologist, a hydrologist, a silviculturist, and several foresters. In July of 2010, the team began gathering information and compiling potential issues related to the existing environmental conditions.

Decisions to Be Made

As a result of this EA, the following decisions are to be made and will be incorporated into the *FINDING*.

- Do the alternatives presented for this project meet the objectives?
- Would implementing the selected alternative cause significant effects on the human environment?
- Should an Environmental Impact Statement (EIS) be prepared?

Other EAS/EISS or Plans that Influence the Project Proposal

Beaver/Swift/Skyles Timber Sale Project EA. DNRC. April 2009.

Chicken-Antice Timber Sale EA. DNRC. December 2008.

Final HCP EIS. DNRC. September 2010.

Lupfer III Timber Sale Project Checklist EA. DNRC. April 2010.

Olney Urban Interface Project Checklist EA. DNRC. March 2009.

SE Stryker Timber Sale Project EA. DNRC. March 2010.

Other Agencies with Jurisdiction/Permit Requirements

Montana Airshed Group

DNRC is a member of the Montana/Idaho Airshed Group, which aims to minimize impacts from smoke generated by burning activities related to forest management. This is achieved by coordination between the group's members. As a member of the Airshed Group, the DNRC agrees to burn only on days that are approved for good smoke dispersion, as determined by the Smoke Management Unit in Missoula, Montana.

Montana Department of Fish, Wildlife & Parks

A Stream Protection Act Permit (124 Permit) is required from the Department of Fish, Wildlife and Parks (DFWP) for activities that may affect the natural shape and form of a stream's channel, banks, or tributaries. Such activities include the installation and/or replacement of numerous stream crossing culverts.

Montana Department of Environmental Quality

A short-term Exemption from Montana's Surface Water Quality Standards *(318 Authorization),* issued by the Department of Environmental Quality (DEQ), may be required if temporary activities (such as removing a culvert in a stream) would introduce sediment in amounts above natural levels into streams, and if Montana DFWP recommends it.

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 forest management related 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.

Issues

During the scoping process, DNRC resource specialists and members of the public raised issues, and/or requested information about the project's potential impacts on the environment. Related to the comments we received, there were issues that the ID Team studied and completed detailed analyses on, and there were those comments that either did not relate to the specific proposed actions, or were easily discussed and a detailed analyses was not required. The next two sections will address the *ISSUES STUDIED IN DETAIL* and *ISSUES AND QUESTIONS DROPPED FROM FURTHER ANALYSIS.*

Issues Studied in Detail

These issues were considered by the DNRC during development of project alternatives, which is described in *CHAPTER II*. A summary of the issues that resulted during the assessment of this project is presented by resource in *TABLE I-1 – SUMMARY AND TRACKING OF ISSUES STUDIED IN DETAIL*.

TABLE I-1 – SUMMARY AND TRACKING OF ISSUES STUDIED IN DETAIL

RESOURCE AREA	ISSUE	WHERE ADDRESSED IN EA PACKAGE
VEGETATION	Cover types and age-class distributions may be affected by timber harvesting related to this project and other timber harvesting projects.	CHAPTER II - ALTERNATIVES, Pages II-4 and II-18; CHAPTER III—EXISTING ENVIRONMENT AND ENVIRONMENTAL EFFECTS, Pages III-5 through III-9
	Timber harvesting and road building in old-growth timber stands may affect the amount and distribution of old-growth remaining on Stillwater Unit.	CHAPTER II - ALTERNATIVES, Pages II-5 and II-16; CHAPTER III—EXISTING ENVIRONMENT AND ENVIRONMENTAL EFFECTS, Pages III-10 through III-13
	The timber sale design should promote a healthy and vigorous forest, reduce the risks of wildfires, and move the species composition towards levels and types that were present historically.	CHAPTER II - ALTERNATIVES, Pages II-5 and II-18 through II-19; CHAPTER III—EXISTING ENVIRONMENT AND ENVIRONMENTAL EFFECTS, Pages III-10 through III-16
FOREST FUELS	Forest fuel loadings are at a high level, causing many areas to be susceptible to intense fires.	CHAPTER II - ALTERNATIVES, Page II-19; CHAPTER III—EXISTING ENVIRONMENT AND ENVIRONMENTAL EFFECTS, Pages III-17 through III-19

RESOURCE AREA	ISSUE	WHERE ADDRESSED IN EA PACKAGE
NOXIOUS WEEDS	Logging equipment and soil disturbance could introduce weeds into harvest units, skid trails, and landings.	CHAPTER II - ALTERNATIVES, Page II-20; CHAPTER III—EXISTING ENVIRONMENT AND ENVIRONMENTAL EFFECTS, Pages III-19 through III-20
HYDROLOGY / FISHERIES	Timber harvesting and road construction has the potential to increase water yield, which, in turn, may affect stream erosive power, sediment production and stream channel stability.	CHAPTER III—EXISTING ENVIRONMENT AND ENVIRONMENTAL EFFECTS, Pages III-21 through III-32
	Timber harvesting and road construction may increase sediment delivery into streams and affect water quality and aquatic resources and species.	CHAPTER III—EXISTING ENVIRONMENT AND ENVIRONMENTAL EFFECTS, Pages III-21 through III-32
	Timber harvesting activities may adversely impact the fisheries habitat parameters of large woody debris, stream shading and stream temperature. New roads may adversely affect fisheries habitat connectivity at road crossings.	CHAPTER III—EXISTING ENVIRONMENT AND ENVIRONMENTAL EFFECTS, Pages III-21 through III-32
	Past mitigation measures—specifically Forestry Best Management Practices (BMPs)—may not adequately protect soil, water and fisheries resources.	CHAPTER III—EXISTING ENVIRONMENT AND ENVIRONMENTAL EFFECTS, Pages III-21 through III-32
SOILS	Ground-based harvest techniques can displace and compact soils which can adversely affect the hydrologic function, soil structure and long-term productivity of the impacted area.	CHAPTER III—EXISTING ENVIRONMENT AND ENVIRONMENTAL EFFECTS, Pages III-33 through III-41
	Reduced infiltration capacity of impacted soils can result in overland flow and off-site erosion, typically localized to main skid trails and log landing sites.	CHAPTER III—EXISTING ENVIRONMENT AND ENVIRONMENTAL EFFECTS, Pages III-33 through III-41
	Removal of both coarse and fine woody material during timber harvest operations can reduce nutrient pools required for future forest stands and can affect the long-term productivity of the site.	CHAPTER III—EXISTING ENVIRONMENT AND ENVIRONMENTAL EFFECTS, Pages III-33 through III-41
ECONOMICS	The proposed action may affect revenue generated for Common School Trust funds, funding for Forest Improvement (FI) projects, timber-related employment, and the regional economy. The economic analysis is one criteria used by the decision-maker as guidance for formulating a decision.	CHAPTER III—EXISTING ENVIRONMENT AND ENVIRONMENTAL EFFECTS, Pages III-44 through III-48

RESOURCE AREA	ISSUE	WHERE ADDRESSED IN EA PACKAGE
WILDLIFE	The proposed activities could alter mature forested habitats and landscape connectivity. This could affect species that rely upon these mature forested habitats and/or alter connectivity and the ability of wildlife requiring corridors to move through the landscape.	CHAPTER III—EXISTING ENVIRONMENT AND ENVIRONMENTAL EFFECTS, Pages III-49 through III-55
	The proposed activities could reduce the snag and coarse woody debris (CWD) densities, leading to a decline in the quality of habitat for wildlife species that are dependent upon these resources, which could alter their survival and/or reproductive ability.	CHAPTER III—EXISTING ENVIRONMENT AND ENVIRONMENTAL EFFECTS, Pages III-49 through III-51 and III-55 through III-59
	The proposed activities could alter cover, increase human access, and reduce secure areas, which could adversely affect grizzly bears by displacing them from important habitats and/or increasing the risk to bears of human-caused mortality.	CHAPTER III - EXISTING ENVIRONMENT AND ENVIRONMENTAL EFFECTS, Pages III-49 through III-51, III-59, and III-60 though III-65
	The proposed activities could change stand conditions, which could reduce or modify lynx foraging, denning habitat, and other suitable habitats, rendering it unsuitable for supporting lynx.	CHAPTER III—EXISTING ENVIRONMENT AND ENVIRONMENTAL EFFECTS, Pages III-49 through III-51, III-59, and III-65 though III-72
	The proposed activities could displace gray wolves from important habitats, particularly denning and rendezvous sites, and/or alter prey availability.	CHAPTER III—EXISTING ENVIRONMENT AND ENVIRONMENTAL EFFECTS, Pages III-49 through III-51, III-59, and III-72 though III-75
	The proposed activities could reduce the amount and/or quality of fisher habitats, which could alter the use of the area by fisher.	CHAPTER III—EXISTING ENVIRONMENT AND ENVIRONMENTAL EFFECTS, Pages III-49 through III-51, III-60, and III-75 though III-79
	The proposed activities could remove canopy cover and snags needed for foraging and nesting by pileated woodpecker, and/or displace pileated woodpeckers from active nests, resulting in increased mortality to pileated woodpecker chicks.	CHAPTER III—EXISTING ENVIRONMENT AND ENVIRONMENTAL EFFECTS, Pages III-49 through III-51, III-60, and III-80 though III-83
	The proposed activities could remove elk security cover, which could affect hunter opportunity and local quality of recreational hunting.	CHAPTER III—EXISTING ENVIRONMENT AND ENVIRONMENTAL EFFECTS, Pages III-49 through III-51, III-60, and III-83 though III-87

Issues and Questions Dropped from Further Analysis

Issue/Request:

DNRC should identify and permanently remove all lands unsuitable for timber production from the timber base in order to provide certainty for wildlife security and identify the forest's economic potential in the future.

Rationale/or response for eliminating the issue/request from further study:

The method by which DNRC calculates the annual harvest (annual sustainable yield) from forested State Trust Lands takes these concerns into consideration without permanently removing lands from the forested land base. Forest land areas that are both unsuitable for timber production, and unsuitable for timber harvest, are identified and omitted from the area on which DNRC runs its sustainable yield calculation. Other areas are also omitted, such as roads and areas that are intended to support wildlife, watershed, and biodiversity commitments. Therefore, the annual sustainable yield is not based upon an inflated timber base, but upon a land area that can support both timber production and harvest at a sustainable rate over time, while abiding by constraints and considerations set forth in the Forest Management Rules and the SFLMP.

Although wildlife species may inhabit areas that are unsuitable for timber production, DNRC understands that many more wildlife species in fact depend upon areas that are suitable for timber production. The incorporation of important ecological commitments from the Forest Management Rules and SFLMP into the annual sustainable yield calculation is acknowledgement of this fact, thus providing for certain levels of wildlife security and habitat on lands that may be harvested in the future and have been harvested in the past.

Calculating the annual sustainable yield under the constraints detailed above also ensures there will be a significant amount of commercial timber on forested lands from which to provide a sustainable rate of return to the trust beneficiaries over the long term.

Additionally, *MCA 77-5-116* prohibits the designation of forested state trust land as a wildlife management area, natural area, open space, or for old-growth preserves for the purposes of preservation or non-use of land, unless full market value is obtained and secured for the respective trust beneficiary.

Issue/Request:

MEPA alternatives must fully examine other viable economic options.

Rationale for eliminating the issue/request from further study:

According to the SFLMP, DNRC has determined that the best way to produce long-term income for the trust beneficiaries from forested state trust lands is to manage those lands intensively for healthy and biologically diverse forests through the use of timber management activities. However, the SFLMP also states that DNRC would "pursue other income opportunities as guided by changing markets for new and traditional uses. These uses may replace timber production when their revenue exceeds long-term timber production revenue potential" *(ROD 1996)*. It is in the best interest of the trust beneficiaries for DNRC to consider other profitable revenue-generating opportunities, and DNRC has a long history of exploring and implementing a diversity of revenue-generating uses and project types. At this time, DNRC has determined that forest management continues to be the best use of these project area lands in producing revenue over the long-term for the trust beneficiaries.

MEPA requires that agencies consider a reasonable range of alternatives, given the

complexity of the project and issues that are raised during project scoping. Each agency has considerable discretion in determining the appropriateness and viability of economic options brought forward, and whether or not to elevate them for consideration within the environmental analysis. The public has the opportunity through public scoping to suggest other options that exceed the value of long-term timber production on forested state trust lands. During the scoping process an initial proposal was released to the public that initiated a 30-day comment period. This provided the public with an opportunity to become involved with the project. Within that proposal we asked the public to suggest other opportunities that would produce long-term revenue to the state trusts other than timber management. The DNRC received no fully developed proposals.

Issue/Request:

When will the DNRC develop conservation strategies for sensitive species: wolves, and bald eagles?

Rationale/or response for eliminating the issue/request from further study:

DNRC currently addresses habitat for these species under the fine-filter approach and has Forest Management Rules *(ARMs 36.11.427 through 36.11.442)* that address various endangered, threatened, and sensitive species, such as, wolves, grizzly bears, and bald eagles.

Issue/Request:

This [EA] should disclose the net economic gain or loss of logging lands unsuitable for timber management for biological or economic reasons.

Rationale/or response for eliminating the issue/request from further study:

This issue is beyond the scope of the project. The analysis within an EA is required to analyze the impacts on the human environment associated with the alternatives being considered, in this case, the "no action" and "action" alternatives. An analysis of the economic suitability of various DNRC lands for various types of management would not provide a necessary and adequate assessment for meeting requirements of MEPA for the type of project that is being proposed. Additionally, within this project area, no biologically unsuitable lands for timber management were identified, although the area does contain some brushed-in areas, creeks, and springs. Foresters have also considered the whole project area, with scrutiny applied to the economics of harvesting and reforestation. The proposed Action Alternative utilizes conventional, cost-effective ground-based harvesting systems and a minor amount of skyline harvesting systems. Helicopter harvesting systems were considered during reconnaissance of the project, but were dropped based upon costs associated with those systems. Reforestation activities are also common and economically feasible on the areas proposed for harvesting.

Issue/Request:

Will climate change affect growth and yield of these forests and habitat for species?

Rationale/or response for eliminating the issue/request from further study:

Evidence of widespread climate change has been well-documented and reported *(Intergovernmental Panel on Climate Change 2001 and 2007)*. Over time, changes in tree species, their geographic distribution, and a decline in health and productivity may be expected within Montana forests *(EPA 1997)*. Given possible changes in the amounts and types of trees and other plants observed in forests, unique vegetation community associations and new climax community types may also begin to appear in the future *(Fox 2007)*.

Understanding changes in tree species composition in forests, and the ability of various tree species to thrive under changing climate conditions, may take decades. Predicting possible effects of climate change in forests at local levels is also difficult due to large-scale variables at play, such as possible increases in global evaporation rates, and possible changes in global ocean currents and the jet stream. Such outcomes could influence locally-observed precipitation amounts and possible influences on natural disturbance regimes (such as changing the average intensity, frequency, and scale of fire events). Normal year-to-year variation in weather also confounds the ability to identify, understand, predict, and respond to influences of climate change.

Given the many variables and difficulty in understanding the ramifications of changing climate, detailed assessment of possible direct, indirect, or cumulative effects of climate change in association with project activities described in this EA is beyond the scope of this analysis. In the face of current uncertainty associated with climate change, DNRC is continuing to manage for biodiversity as guided under the SFLMP. Under the management philosophy of the SFLMP, the DNRC will continue to manage for biodiversity using a coarse-filter approach that favors an appropriate mix of stand structures and compositions on state lands as described by *ARM 36.11.404*, while also working to understand relevant ecosystem changes as research findings and changes in climate evolve.

Issue/Request:

DNRC must use the Green et. al. old-growth definition in its entirety instead of only the minimum number of large trees. Manipulating old-growth using the assumption that it will still be old-growth after logging is untested and not supported by science.

Rationale/or response for eliminating the issue/request from further study:

Under *ARM 36.11.403* the DNRC definition of old-growth is a forest stand that meets or exceeds not only the minimum number, but also the size and age of those large trees, as noted in *"Old Growth Forest Types of the Northern Region," by Green et al*. ARM 36.11.418 further discusses "Old-growth maintenance treatments" as meaning that silvicultural treatments in old-growth stands would be designed to retain old-growth attributes, including large live trees, snags and CWD, but those treatments would remove encroaching shade-tolerant species, create small canopy gaps generally less than one acre in size, and encourage regeneration of shade-intolerant species. This type of treatment is applicable on sites that historically would be characterized by mixed-severity fire regimes. DNRC acknowledges that when treatments in old-growth stands occur, habitat attributes are altered and habitat quality for some associated species of wildlife may be reduced *(Jobes et al. 2004)*. As such, because a logged old-growth stand may meet the *Green et al*. definition after treatment, does not indicate that it will provide high quality habitat for all old-growth associated species. Such stands following logging, however, will possess a definable threshold of very large, old trees that would otherwise take centuries to develop, and which provide important raw materials for other attributes found in most old-growth stands for years into the future (eg. large snags, large downed logs etc.).

Issue/Request:

DNRC should put existing old-growth stands on longer rotations, and place other stands on long rotations so that they develop old-growth characteristics.

Rationale/or response for eliminating the issue/request from further study:

DNRC management decisions regarding old-growth at the project level follow *ARM 36.11.418(a)* and *(c)*. When considering old-growth management at the project level, careful attention is given to many variables including, but not limited to: cover types, stand locations, patch sizes, habitat connectivity, insect/disease risk, etc. This approach has allowed the DNRC to evaluate conservation biology principles and trade-offs at the landscape scale, and has provided improved flexibility to address stand changes and economic losses caused by natural disturbance agents, such as insects, diseases, and wildfire. DNRC must also consider the requirements of MCA 77-5-116, which is a law that prohibits the Department from establishing old-growth deferrals and set-asides without compensation to trust beneficiaries. Environmental effects on old-growth are described under *OLD-GROWTH* in *VEGETATION ANALYSIS in CHAPTER III – EXISTING ENVIRONMENT AND ENVIRONMENTAL EFFECTS.*

Issue/Request:

Disclose the basis for the growth and yield calculation on the SSF. Show the differences between past project yield and current project yield. Are there additional actions being taken to improve yield?

Rationale/or response for eliminating the issue/request from further study:

This request is beyond the scope of this project. It pertains to the sustainable yield calculation which is a complex statewide project. The sustainable yield calculation for the Stillwater Unit and for all of DNRC's forest land is based on the best available forest inventory data, modeling current and future growth, the ability of the forest land to grow trees (site index), current board foot volume, manageable forest acres, logging systems, forest management rules, forest management policy, and expected levels of forest management activities.

Multiple organizations and individuals were shown the process by which the sustained yield calculation was determined and were asked to submit comments during the scoping process. Public input and comments were accepted between July 2003 and September 2004.

Data does not exist to directly compare past project yield to current project yield. Measuring forest yield or growth takes decades if it is to be done for an individual site and intended to compare a past project to the results of the next project. Tracking forest growth and yield is done by large scale forest inventories. DNRC uses growth and volume estimates provided by the United States Forest Service, Forest Inventory and Analysis group (FIA) to monitor changes in yield over time. In addition to FIA data, DNRC is continuously collecting new stand level inventory data and plot data which provides the ability to monitor forest condition, stand size, and stocking. The information provided by these inventories provide a means to see forest-wide changes in yield over time.

Many factors can increase yield rates including replacing older, slower growing stands with younger, faster growing stands; planting harvest units with superior seed stock; and thinning younger stands for the purpose of reducing resource competition and increasing the growth-rate for residual trees. For more information, please refer to the 2004 Sustained Yield Calculation Report online at: *http://dnrc.mt.gov/trust/pdfs/2004_MT_SYC_Report_20041120.pdf*.

Issue/Request:

What methodology and data collection is used to calculate the next sustained yield?

Rationale/or response for eliminating the issue/request from further study:

Stand Level Inventory (SLI) data are being collected for the Northwest and Southwest Land Offices on a ten to fifteen year cycle. SLI data is collected on a twenty year cycle for the other Land Offices. Wildfires and timber sales are updated in the SLI on an annual basis. DNRC inventory crews are collecting forest inventory plot data every field season. The next sustainable yield calculation will utilize all of this forest inventory data. In the past, the sustainable yield study has been conducted by a private contractor that used a complex process involving computer models specifically designed to calculate sustainable yield. For more information, please refer to the 2004 Sustained Yield Calculation Report online at: *http://dnrc.mt.gov/trust/pdfs/2004_MT_SYC_Report_20041120.pdf*.

Environmental Assessment

CHAPTER II
Alternatives

Chapter II – Alternatives

Introduction

This chapter includes a description of the No-Action and Action alternatives, the history of alternative development, mitigations developed for the Action Alternative, and a summary of the predicted effects of implementing each alternative. Detailed environmental analyses are in *CHAPTER III – EXISTING ENVIRONMENT AND ENVIRONMENTAL EFFECTS.*

Alternative Development

Introduction

The Swedish Chicken Project area was initially listed on the *2007 List of Upcoming Timber Sales for the Northwestern Land Office*. The project area was identified for timber harvesting for various reasons, which include reducing stocking densities of shade-tolerant trees in a historically shade-intolerant area while promoting seral tree species, such as planting western larch and rust resistant western white pine, and fulfilling revenue requirements and sustainable yields.

This proposed action has been designed to provide revenue to the Common School Trust while maintaining a healthy, productive forest. As noted in *CHAPTER 1- PURPOSE AND NEED*, timber sales are designed under the management philosophy of the State Forest Land Management Plan (SFLMP*)*, which includes managing for biodiversity at the landscape level. The Forest Management Rules *(ARM 36.11.401* through *36.11.456)* provide direction for conducting the analyses and designing and implementing the project.

DNRC has been developing a Habitat Conservation Plan (HCP) under Section 10 of the Endangered Species Act for several years. If successful, the process would culminate with issuance of an Incidental Take Permit (Permit) by the United States Fish and Wildlife Service (USFWS). The Draft HCP/EIS was distributed for public review in June of 2009. The Final HCP/EIS was distributed in September of 2010. The HCP identifies 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. To ensure DNRC is able to comply with the Preferred Alternative in the Final EIS/HCP if or when the Permit is issued, DNRC has opted to begin a phased-in approach for compliance. For projects on HCP project area lands for which the MEPA decision document is signed after the potential Permit issuance date, DNRC would incorporate all applicable conservation commitments contained in the Selected Alternative in the Final EIS/HCP.

This project has been planned to be in compliance with all the current Forest Management Rules that govern the forest management program and the Preferred Alternative in the Final EIS/HCP, so that it would be in compliance with the Permit, if or when it is issued.

The project area, comprised of 1,805 acres, is expected to produce a portion of the forest products for the State's Sustainable Yield Requirements *(MCA 77-5-223)*. While managing these lands, foresters must also consider *MCA 77-5-207*, the Salvage Timber Program. This law directs DNRC to harvest dead and dying timber before wood decay is substantial and value is lost.

Preparation, Data Collection, and Public Involvement

After identifying the project area, this project was included in the NWLO 5-year listing of upcoming timber sale proposals. The listing was sent to interested parties. The ID Team members began work on the project in the spring/summer of 2010. The role of an ID team is to summarize issues and concerns, develop and define management options, and, in reference to issues, analyze predicted and potential impacts of a proposal upon the human and natural environment.

Throughout 2010, ID Team members and other DNRC personnel were involved in field reconnaissance and data collection in the project area. Information was collected on the following:

- Existing roads to determine needs to improve surface drainage, ditch relief, stream crossings, and safety features.
- Timber-stand characteristics, old-growth stands, and noxious weeds.
- The type, size, and location of insect and disease problems.
- Specific and general geology and watershed characteristics.
- Wildlife and fisheries habitat.

Field data was used in defining the project and analyzing alternatives for their potential effects. Using this information within the framework of the SFLMP and Forest Management Rules, an initial proposal was developed.

Public scoping consisted of an announcement in the Whitefish Pilot. Additionally, an initial proposal letter was sent to interested parties in June 2010 with a 30-day comment period. One letter and three emails were received. The issues and concerns received are summarized in *TABLE I-1 – SUMMARY AND TRACKING OF ISSUES STUDIED IN DETAIL.*

Within the context of public comments, additional field reconnaissance, and additional resource concerns, the ID team considered the need or benefit of additional alternative development. The ID Team determined that the issues directly related to proposed actions could be addressed through minor changes in the project design and/or mitigations.

Project Design Concepts

Several key concepts used in developing this timber sale included the prioritization of timber stands for harvesting, transportation planning, and development of mitigations to reduce some resource impacts. These concepts are discussed in detail below.

Stand Prioritization

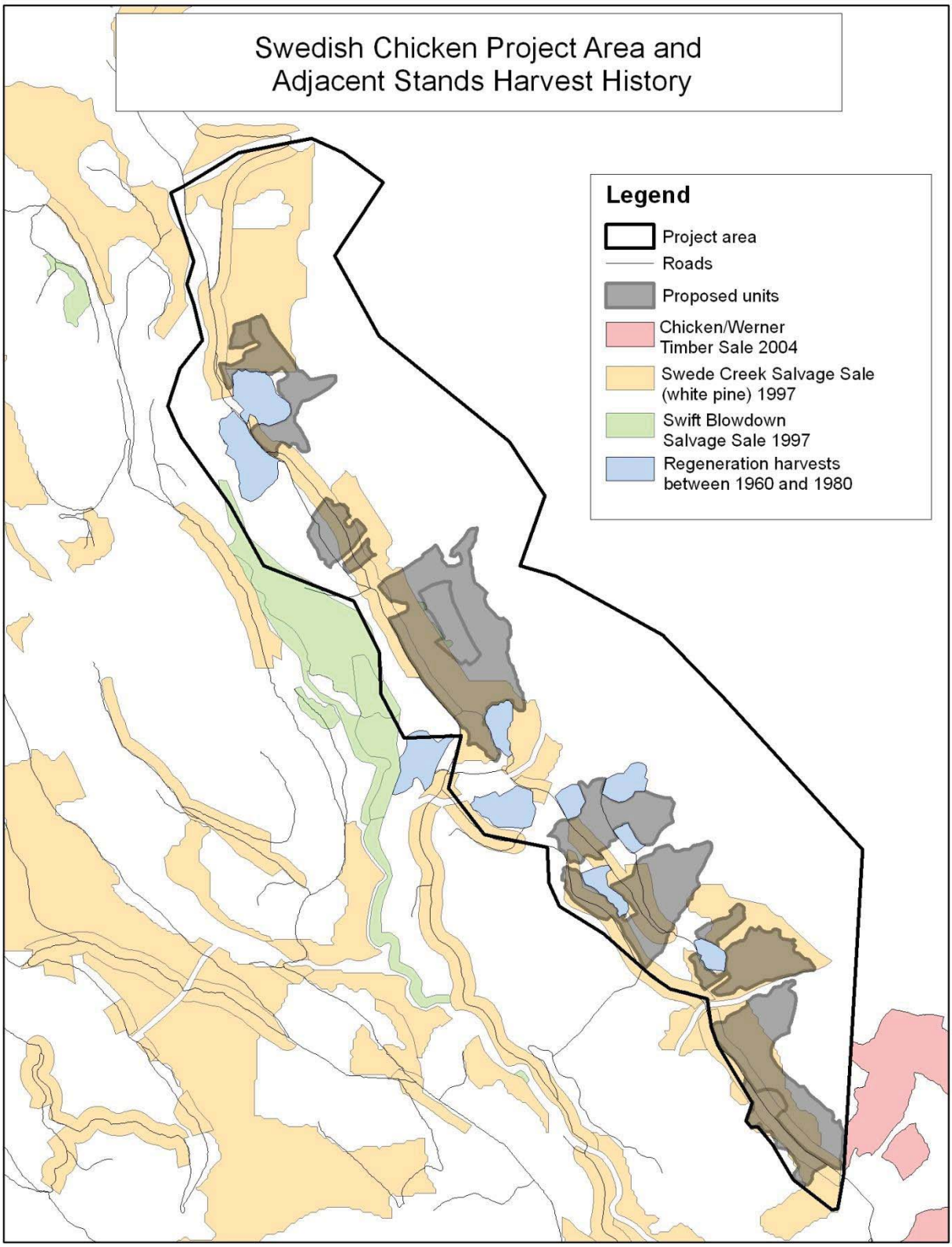
Stands were prioritized for treatment based on:

- **Cover type:** Historically, 99 percent of the project area was a western white pine cover type; the other 1 percent was a Douglas-fir/western larch cover type. Today the project area is 60 percent mixed conifer, 24 percent Douglas fir/western larch, 11 percent subalpine fir and 5% western white pine cover types. The change in cover type was caused by 3 factors: the introduction of white pine blister rust which resulted in the loss of many western white pine, selective salvage harvesting of dead and dying western white pine, and fire suppression. This has led to stands that are now dominated by the shade-tolerant species of subalpine fir, Engelmann spruce, and grand fir. The return of these stands to historic cover types can be accomplished by harvesting the shade-tolerant species and practicing proper site preparation in conjunction with the planting of western larch and rust-resistant western white pine seedlings.
- **Insect and disease issues:** Mountain pine beetle infestation and white pine blister rust has reduced the western white pine presence to scattered individuals; Douglas-fir beetle is attacking and killing the Douglas-fir in some areas; and small pockets of moderate

infestations of mistletoe are in the western larch. The project area has experienced a severe western spruce budworm outbreak over the last few years. All coniferous species found within the project area, with the exception of lodgepole pine, have experienced some defoliation due to budworm, however the subalpine fir has been the most severely attacked. Stress from defoliation has lead to pockets of mortality which is likely to continue for several years.

- **Accessibility and cost:** The project area has many areas that are difficult and expensive to harvest. Some of these areas have steep slopes, numerous streamside management zones and are far from existing roads. As noted in the next section titled, *Transportation Development*, planning efforts were required to look at ways of reducing logging costs now and in the future.
- **Old-growth:** During the course of field reconnaissance, 199 acres of old-growth were verified that had not been previously inventoried. Most of the large diameter trees in the old-growth stands are western larch, Douglas-fir, and some western white pine and Engelmann spruce. The lower canopy levels of the forest are almost 100 percent subalpine fir and grand fir. As insects, diseases, and weather events remove individual large live trees that define a stand as old-growth, the shade tolerant understory (specifically subalpine fir and grand fir) proliferates and replaces those large trees. Over time, this process moves the stands further away from desired conditions. In addition, these shade-tolerant species are susceptible to spruce budworm. The project area is currently experiencing an outbreak of spruce budworm. By treating some of these stands and removing most of the whitewoods (primarily, subalpine fir and grand fir), resources (sun, water and nutrients) become available for the overstory species and the number of trees preferred by spruce budworm are reduced. Post-harvest planting of western white pine would eventually move the stand towards a return to a desired cover type of western white pine.
- **Connectivity and past harvest history:** Past harvest history *(FIGURE II-1 SWEDISH CHICKEN PROJECT AREA AND ADJACENT STANDS HARVEST HISTORY)* within the project area was analyzed in order to help assess connectivity for wildlife, both currently and after harvest if the proposed action alternative were to be implemented. Since the 1960's, very little harvesting has occurred within the project area. Of the three large timber sales that have occurred adjacent to, or within the project area, two were salvage sales in which dead and/or dying trees were removed before they lost commercial product value.

Figure II-1 Swedish Chicken Project Area and Adjacent Stands Harvest History



Transportation Development

The development of a transportation plan for the Swedish Chicken Project is a primary objective of forest management in this area.

Transportation planning for this project includes:

- Assessment of existing road locations and standards: Roads have been reviewed to see if BMPs are met, whether or not the standard is suitable for this proposal and future uses, and what improvements or road abandonments would be required to meet safety standards and BMPs. The ID Team utilized the rules associated with Road Management *(ARM 36.11.421)*
- Open-road density: The project area is located within 2 grizzly bear management sub-units of the Northern Continental Divide Ecosystem Recovery Area. The DNRC is committed to designing projects that result in no net increase in open road densities over the 1996 baseline (*ARM 36.11.432.1.c.ii*).
- Grizzly Bear Security Core: Proposed new roads east of Upper Whitefish Road in sections 11 and 14 have the potential to reduce identified security core habitat. DNRC is committed to designing projects that result in no net decrease in security core based on the 1996 baseline (*ARM 36.11.432.1.d.i)*
- Road development costs: Roadwork and maintenance can be expensive. The ID Team reviewed various components related to roads including the sediment delivery assessment, BMP effectiveness, depreciation of infrastructure such as life expectancy of culverts, and future needs for roads. The ID Team tried to keep the costs less than $30.00 per ton.
- Road planning to access state land for continued forest management: Areas of the forest are not accessible with ground-based or skyline harvest systems. DNRC would minimize the number of roads and optimize the locations of those roads across the landscape for the purpose of reaching these areas, now and in the future.

Mitigations Applied During Project Design

To accomplish the various elements of the proposed project, certain mitigation measures were designed into the project. Mitigation measures are designed to reduce impacts and protect resources during harvesting and road-improvement activities. Many of the listed mitigations are written into the *Forest Management Rules*; others have been utilized with desired results by DNRC in similar projects. For a more complete list of mitigations, refer to *APPENDIX A – STIPULATIONS AND SPECIFICATIONS*. The following is a brief list of mitigations that address some issues involved in this project:

Access and Roads

- Current road restrictions would stay in-place for the general public; any road opened for this project would be restricted to administrative use only.
- The longest segment of temporary road is located in Unit 10 and would be reclaimed to a level that prohibits the use of motorized vehicles.
- An earthen berm would be installed on Stryker Basin Road in Section 19, T34N, R23W to provide additional grizzly bear security habitat.

Aesthetics

- The size and number of landings would be limited.
- In most harvest areas, trees of all diameter size classes and species would be retained. To help provide structure or different forest levels (overstory, mid-story, and understory) for both the near term and long term, retention trees would generally be the healthiest trees with full crowns, although cull trees and snags would also be retained.
- In areas where cable logging is required, the width of the cable corridor would be limited and a minimum distance between corridors would be

required to reduce the amount and visibility of corridors in the harvest areas.

- The temporary road into Unit 10 and all jump-ups would be reclaimed after harvesting. Jump-up roads are short, low-standard roads leading off the main road to the landing where trees are processed into logs. This would reduce visual impacts along the open roads as well as reduce the safety concerns related to log processing.
- Grass-seeding would be applied to sites of disturbed soil along road right-of-ways.
- A higher concentration of trees would be left within 100-foot buffers in units along the Upper Whitefish and Lower Whitefish roads.

Noxious Weed Management

- All tracked and off-road wheeled equipment would be cleaned of noxious weeds prior to beginning project operations.
- Prompt vegetation seeding of disturbed roadside sites would be required. Roads used and closed as part of this proposal would be reshaped and seeded.
- DNRC foresters shall monitor the project area for weeds and strive to contain and suppress Category 2 weeds, such as orange hawkweed and tansy ragwort.

Old-Growth and Timber Stand Structural Diversity

- Those portions of units 2, 5, and all of 9a and 9b that meet DNRCs old growth definition would be harvested with an old-growth maintenance treatment that combines elements of sanitation cutting with improvement cutting and group selection. Entering these stands provides the DNRC with the opportunity to initiate reintroduction of shade-intolerant species by removing shade-tolerant whitewoods and planting rust resistant western white pine seedlings, and also begin the process of moving these stands toward the desired future condition. The attributes of an old-growth stand, such as maintaining multiple canopy levels, large diameter snags and live trees, downed woody debris, ground cover, and species diversity would be retained.
- Existing old-growth stands and those areas not proposed for harvesting in the Action Alternative would have a longer growing period before they are potentially harvested with a regeneration treatment in the future. This, in turn, provides the DNRC the opportunity to manage some stands with longer rotation periods.
- Trees of all size classes would be retained; where openings are created, sites for new regeneration would be provided.
- Snags would be retained as directed in the Forest Management Rules and as described under *ALTERNATIVE DESCRIPTIONS* in this chapter.
- Certain portions of the harvest areas would be left uncut; these areas may include large healthy trees, snag patches, small healthy trees, rocky outcrops, Streamside Management Zones (SMZs), small wetlands, etc.

Recreation

- The winter log hauling would be limited to 1 year.
- During winter logging operations, log hauling may not take place on weekends. Although, the operators may use their personal or repair vehicles to get to the job site.
- Log hauling would not take place between the periods of December 24 and January 2.
- The road would be plowed so that the snow berm is winged off, making a suitable trail for snowmobiles.
- Information would be disseminated to the public through signs, press releases, and pre-operation meetings with DNRC winter recreation license-holders.

Soils

Due to the soil types, Units 1-6 would require less than, or equal to, 18 percent soil moisture content prior to logging; this would minimize soil compaction and rutting, and maintain drainage features.

Tractor skidding should be limited to slopes of less than 40 percent unless the operation can be completed without causing excessive erosion. Based on site review, short, steep slopes above incised draws may require adverse skidding to a ridge, or winchline skidding from more moderate slopes of less than 40 percent.

Watershed and Fisheries

- SMZs and Riparian Management Zones (RMZs) would be established along streams, lakes, and/or wetlands in or adjacent to the harvest areas.
- Spur A Road would be brushed, and would have improvements made to the road surface and ditches to meet BMPs. Following site preparation, several culverts would be removed and the stream channels rehabilitated.
- All applicable *Forestry Best Management Practices (BMPs)*, the *Streamside Management Zone Law and Rules*, and *Forest Management Rules,* would be applied for fisheries, soils, and wetland riparian management zones (*ARMs 36.11.425* and *36.11.426*).
- All road-stream crossings in the project area have been, and would continue to be, monitored for sedimentation and road-prism deterioration.
- The BMP audit process would continue. This project would likely be reviewed in an internal audit, and may be selected at random as a statewide audit site.

Wildlife

- Visual screening would be provided along open roads where practicable.
- Access on new temporary roads would be restricted to administrative use only.
- Snags, snag recruits, and coarse woody debris will be managed according to *ARM 36.11.411 through 36.11.414*, particularly favoring western larch and western white pine. Clumps of existing snags could be maintained where they exist to offset areas without sufficient snags.
- Proposed harvest units were designed to avoid 4 of the 5 riparian connectivity corridors identified in the project area in order to protect and preserve their value for wildlife.
- Forested corridors would be retained to maintain landscape connectivity and patches of dense vegetation, when possible, to provide security cover.
- Seed tree units have been designed to provide screening for bears by ensuring that vegetation or topographic breaks are no greater than 600 feet in at least one direction from any point in the unit.
- Harvesting activities would be conducted to limit disturbance to grizzly bear habitats by: harvesting certain units (3a, 3b, and 4) during the denning period (November 16-March 31); harvesting certain units (portions of unit 5, 6, 7, 8, 9a, and 9b) during short-duration, high intensity periods of less than 30 days or during the denning period; or harvesting from open roads (portions of units 1, 2, 5, 6, 8, 9a, 9b, and 10).
- Roads and skid trails that are opened with the proposed activities would be reclosed to reduce the potential for unauthorized motor vehicle use. Berm removal, construction, road use, and berm replacement on the Spur A Road would occur during the denning period (November 16-March 31) to prevent changes in open road density in the Lazy Creek subunit. Road construction and

use of the North Chicken Road along with the use of the existing South Chicken Road would occur during the denning period (November 16-March 31) or during short-duration, high intensity periods of less than 30 days. The existing closure on the Stryker Basin Road would be reinforced to improve grizzly bear security habitats in the Upper Whitefish subunit.

Alternative Descriptions

The No-Action and Action alternatives are described in this section. The decisionmaker may select a modification or combination of these alternatives.

No-Action Alternative

No timber harvesting, improvements to existing roads, or revenue generation for the Common School Trust would take place in the area of the Swedish Chicken Timber Sale Project at this time. Salvage logging, firewood gathering, recreational use, fire suppression, noxious weed control, and other ongoing forest-improvement management activities may occur.

Nonpoint-source sediment delivery (sediment that cannot be traced back to a single origin or source) from roads within and accessing the Project Area not fully meeting BMPs may occur.

Natural events, such as plant succession, tree mortality due to insect infestations and disease infections, windthrow, down fuel accumulation, in-growth of ladder fuels, and wildfires would continue.

Future proposed management activities, including timber harvesting, Land Use License requests, and easements would go through the appropriate environmental analyses before implementation.

This alternative can be used as a baseline for comparing the effects that the Action Alternative would have on the environment. The No-Action Alternative is considered a possible alternative for selection.

Action Alternative

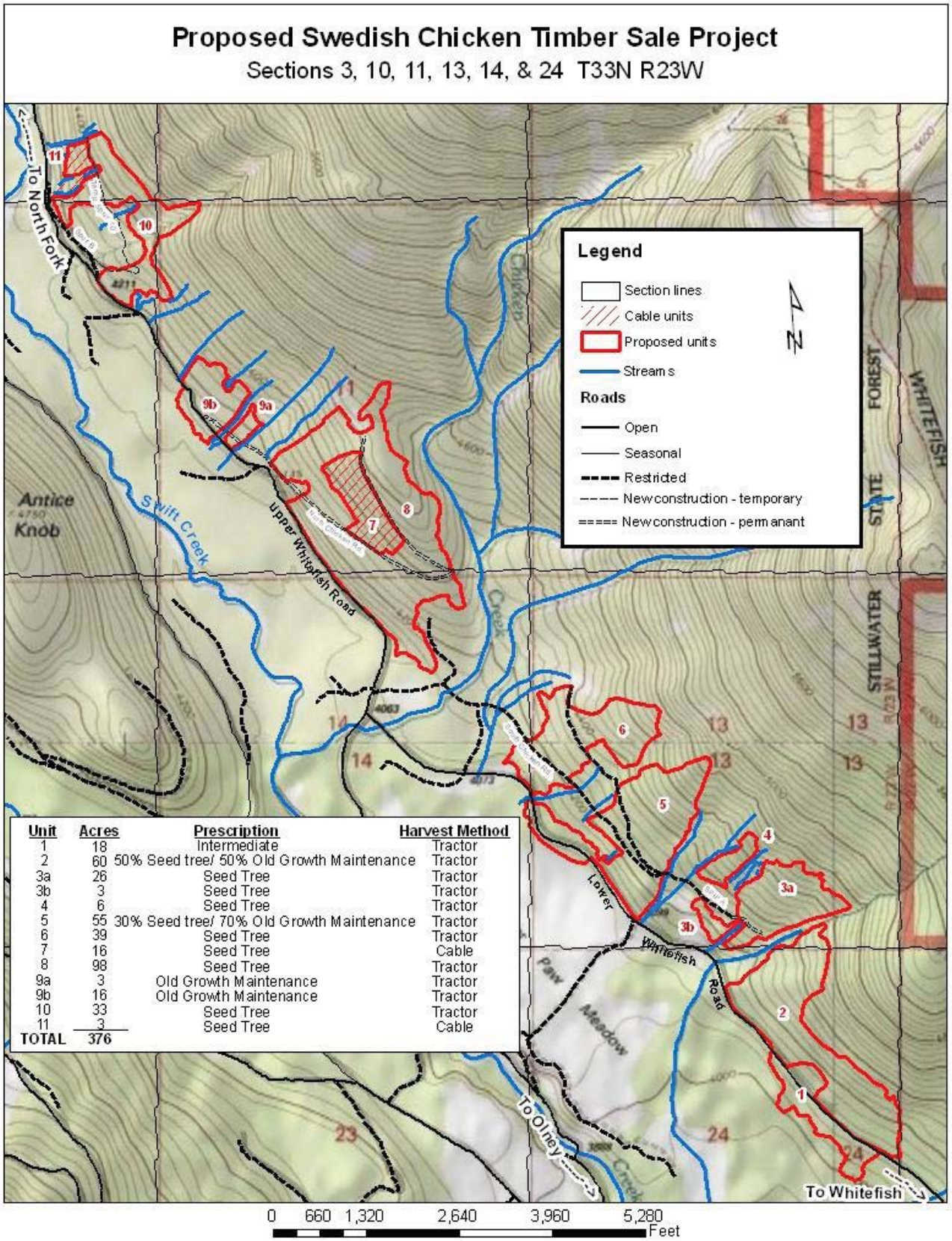
The ID Team developed strategies for harvesting timber within the framework of the SFLMP, the Forest Management Rules, and the Preferred Alternative in the Final EIS/HCP. Opportunities for harvesting timber were identified based on current and desired timber-stand conditions. Proposed treatments were developed that would, in the long term, move the stand conditions toward desired age classes, species compositions, structures, and stocking densities. Proposed treatments would also maintain long-term site productivity, thereby ensuring the long-term capability of trust lands to produce revenue for the trust.

The following sections describe the prescriptions as they relate to timber management and are followed by *ROADS AND ACCESS*.

Timber-Management Activities

Under this alternative, approximately 4 MMbf would be harvested from an estimated 376 acres using a combination of harvest treatments and both skyline and ground-based harvest systems. *FIGURE II-2 – PROPOSED SWEDISH CHICKEN TIMBER SALE PROJECT* displays the proposed harvest locations, harvest treatments, and roads.

FIGURE 11-2 – PROPOSED SWEDISH CHICKEN TIMBER SALE PROJECT



Unit	Acres	Prescription	Harvest Method
1	18	Intermediate	Tractor
2	60	50% Seed tree/ 50% Old Growth Maintenance	Tractor
3a	26	Seed Tree	Tractor
3b	3	Seed Tree	Tractor
4	6	Seed Tree	Tractor
5	55	30% Seed tree/ 70% Old Growth Maintenance	Tractor
6	39	Seed Tree	Tractor
7	16	Seed Tree	Cable
8	98	Seed Tree	Tractor
9a	3	Old Growth Maintenance	Tractor
9b	16	Old Growth Maintenance	Tractor
10	33	Seed Tree	Tractor
11	3	Seed Tree	Cable
TOTAL	376		

Several types of harvest treatments would be used to meet the described management objectives. A variation of silvicultural prescriptions across the landscape would emulate the effects of mixed-severity fires.

The preferred tree species for retention would be disease-free western white pine, western larch, and Douglas-fir. Western white pine and western larch seedlings would be planted in most units after harvesting has been completed.

For the regeneration prescriptions specifying "reserve trees", extra trees would remain individually or in clumps within the harvest unit. Reserve trees would include existing snags, extra seedtrees, vigorous trees of various age classes, and large seral trees that have a high potential to become future cavity-nesting sites. To provide for structural and species diversity, small clumps of younger trees may also be retained as reserve trees.

Where available, 2 snags and 2 live recruitment trees 21 inches dbh or greater, per acre, would be left as wildlife trees. When 21-inch and greater trees are not available, the next size class trees would be left. In some harvest areas, the snags and recruitment trees may be left in groups, or in special leave areas, such as SMZs. If 2 snags cannot be found, up to 4 live recruitment trees would be left.

In compliance with the *Montana SMZ Law*, limited selective harvesting of individual trees may occur in SMZs. Harvesting in SMZs is planned for Units 10 and 11. Depending on an area's timber and hydrologic characteristics, harvesting in SMZs around springs and wetlands would be determined on a case-by-case basis.

In areas planned for regeneration, sapling-sized trees of low vigor that remain after the harvesting of sawlogs would be felled or cut. These trees and excess logging slash would be piled or trampled. On the units being piled or trampled, a maximum of 30 percent of the area would be disturbed with an excavator or dozer in order to have enough exposed soil to regenerate seedlings. Within those areas too steep for an excavator or dozer, site preparation would be achieved through broadcast burning. This would occur within units 7, 11, and portions of 8. This is the fuels reduction and site preparation phase of forest-improvement practices.

The proposed treatments would leave 10 to 15 tons of woody debris greater than 3 inches in diameter per acre. This debris would be spread across the harvest area to ensure that the *Hazard Reduction Law (76-13-401* through *76-13-424, MCA)* is met. Slash generated from the harvest may be collected, ground or chipped and utilized as biomass. If not utilized this way, the slash may be piled in either landing piles or smaller piles, and then burned during periods when air-quality standards can be met.

TABLE II-1 - PROPOSED PRESCRIPTIONS FOR THE SWEDISH CHICKEN TIMBER SALE PROPOSAL displays the harvest areas and their associated harvest treatments and harvest systems.

Harvest Treatments

Seedtree with reserves (269 acres): This treatment would regenerate portions of the unit by cutting all merchantable timber, with the exception of 6 to 10 of the larger-diameter western larch, Douglas-fir, western white pine, and Engelmann spruce per acre. The selected leave trees would show the most vigor, contain the healthiest crowns, and have the potential to produce healthy cone crops. Additional reserve trees, as noted above, would also be retained.

Intermediate treatment (18 acres): This is a collective term for any treatment designed to enhance growth, quality, vigor, and composition of the stand prior to final harvest. On these acres, intermediate treatments would incorporate the selective cutting or removal of trees in order to enhance current stand conditions and future desired outcomes. Intermediate treatments would be used to improve species composition, regulate stand density, and enhance timber quality and forest health.

Old-growth maintenance (89 acres)

Silvicultural treatments in old-growth stands would meet *ARM 36.11.418* and specifically *Section c(ii).*

Through primarily an intermediate harvest this treatment would remove encroaching shade-tolerant species (subalpine fir and grand fir), and create small canopy gaps, generally less than one acre in size, to promote regeneration of shade-intolerant species (particularly western white pine). The treatment would be designed to retain various old-growth attributes, including, at a minimum the number of large live trees required to be classified as old-growth, snags, and coarse woody debris. This treatment would also enhance the growth, quality, vigor and composition of tree species within the stands being treated.

TABLE II-1 - PROPOSED PRESCRIPTIONS FOR THE SWEDISH CHICKEN TIMBER SALE PROPOSAL

PROPOSED HARVEST AREA	HARVEST TREATMENT	TOTAL ACRES HARVESTED/ ESTIMATED VOLUME (Mbf)	HARVEST PARTICULARS	FOLLOW-UP TREATMENTS
1	Intermediate	18/257	– Utilize an intermediate harvest prescription, favoring western larch and Douglas-fir. – 35-foot spacing on leave trees. – Tractor log.	Pile and burn slash.
2	Seed tree with reserves 50%. Old-growth maintenance 50%.	60/858	– Utilize a seed tree and old-growth maintenance harvest prescription, favoring western larch and Douglas-fir. – Leave 8-12 TPA in the seed tree treatment areas. – Tractor log.	– Pile and burn slash. – Mechanically site-prep open areas. – Plant with western white pine and western larch within the seed tree portion of unit, scalp and interplant western white pine within openings of the intermediate treatments.
3a	Seed tree with reserves.	26/140	– Utilize a seed tree harvest prescription, favoring western larch and Douglas-fir. – Leave 6-8 seed trees per acre. Additional healthy co-dominate and intermediate trees would remain on site. – Tractor log.	– Pile and burn slash. – Mechanically site-prep. – Plant with western white pine and western larch.
3b	Seed tree with reserves.	3/16	– Utilize a seed tree harvest prescription, favoring western larch and Douglas-fir. – Leave 6-8 seed trees per acre. Additional healthy codominate and intermediate trees would remain on site. – Tractor log.	– Pile and burn slash. – Mechanically site-prep. – Plant with western white pine and western larch.

PROPOSED HARVEST AREA	HARVEST TREATMENT	TOTAL ACRES HARVESTED/ ESTIMATED VOLUME (Mbf)	HARVEST PARTICULARS	FOLLOW-UP TREATMENTS
4	Seed tree with reserves.	6/32	– Utilize a seed tree harvest prescription, favoring western larch and Douglas-fir. – Leave 6-8 TPA seed trees per acre. Additional healthy codominate and intermediate trees would remain on site. – Tractor log.	– Pile and burn slash. – Mechanically site-prep. – Plant with western white pine and western larch.
5	Seed tree with reserves 30%. Old-growth maintenance 70%.	55/660	– Utilize a seed tree and old-growth maintenance harvest prescription, favoring western larch and Douglas-fir. – Leave 8-12 TPA in the seed tree treatment. – Tractor log, some winch line may be required.	– Pile and burn slash. – Mechanically site-prep open areas. – Plant with western white pine and western larch within the seed tree portion of unit, scalp and interplant western white pine within openings of the intermediate treatments.
6	Seed tree with reserves.	39/355	– Utilize a seed tree harvest prescription, favoring western larch and Douglas-fir. – Leave 6-8 seed trees per acre. Additional healthy codominate and intermediate trees would remain on site. – Tractor log, some winch line may be required.	– Pile and burn slash. – Mechanically site-prep. – Plant with western white pine and western larch.
7	Seed tree with reserves.	16/101	– Utilize a seed tree harvest prescription, favoring western larch and Douglas-fir. – Leave 6-12 seed trees per acre. Additional healthy codominate and intermediate trees would remain on site. – Skyline harvesting.	– Broadcast burn. – Plant with western white pine and western larch.
8	Seed tree with reserves.	98/1,098	– Utilize a seed tree harvest prescription, favoring western larch and Douglas-fir. – Leave 6-12 seed trees per acre. Additional healthy codominate and intermediate trees would remain on site. – Tractor log.	– Broadcast burn some portions of this unit and pile and burn slash in the rest. – Mechanically site-prep within areas not broadcast burned. – Plant with western white pine and western larch.

PROPOSED HARVEST AREA	HARVEST TREATMENT	TOTAL ACRES HARVESTED/ ESTIMATED VOLUME (Mbf)	HARVEST PARTICULARS	FOLLOW-UP TREATMENTS
9a	Old-growth maintenance	3/29	– Old-growth maintenance harvest prescription, favoring western larch and Douglas-fir. – Subalpine fir and grand fir would be retained in groups in some areas and in other areas all trees would be removed, seral species would be thinned. – Tractor log.	– Pile and burn slash. – Scalp and interplant with western white pine.
9b	Old-growth maintenance	16/152	– Old-growth maintenance harvest prescription, favoring western larch and Douglas-fir. – Subalpine fir and grand fir would be retained in groups in some areas and in other areas all trees would be removed, seral species would be thinned. – Tractor log.	– Pile and burn slash. – Scalp and interplant with western white pine.
10	Seed tree with reserves.	33/323	– Utilize a seed tree harvest prescription, favoring western larch and Douglas-fir. – Leave 8-12 TPA. – Tractor log.	– Pile and burn slash. – Mechanically site-prep within areas not broadcast burned. – Plant with western white pine and western larch.
11	Seed tree with reserves.	3/29	– Utilize a seed tree harvest prescription, favoring western larch and Douglas-fir. – Leave 8-12 TPA. – Skyline harvesting.	– Broadcast burn. – Plant with western white pine and western larch.

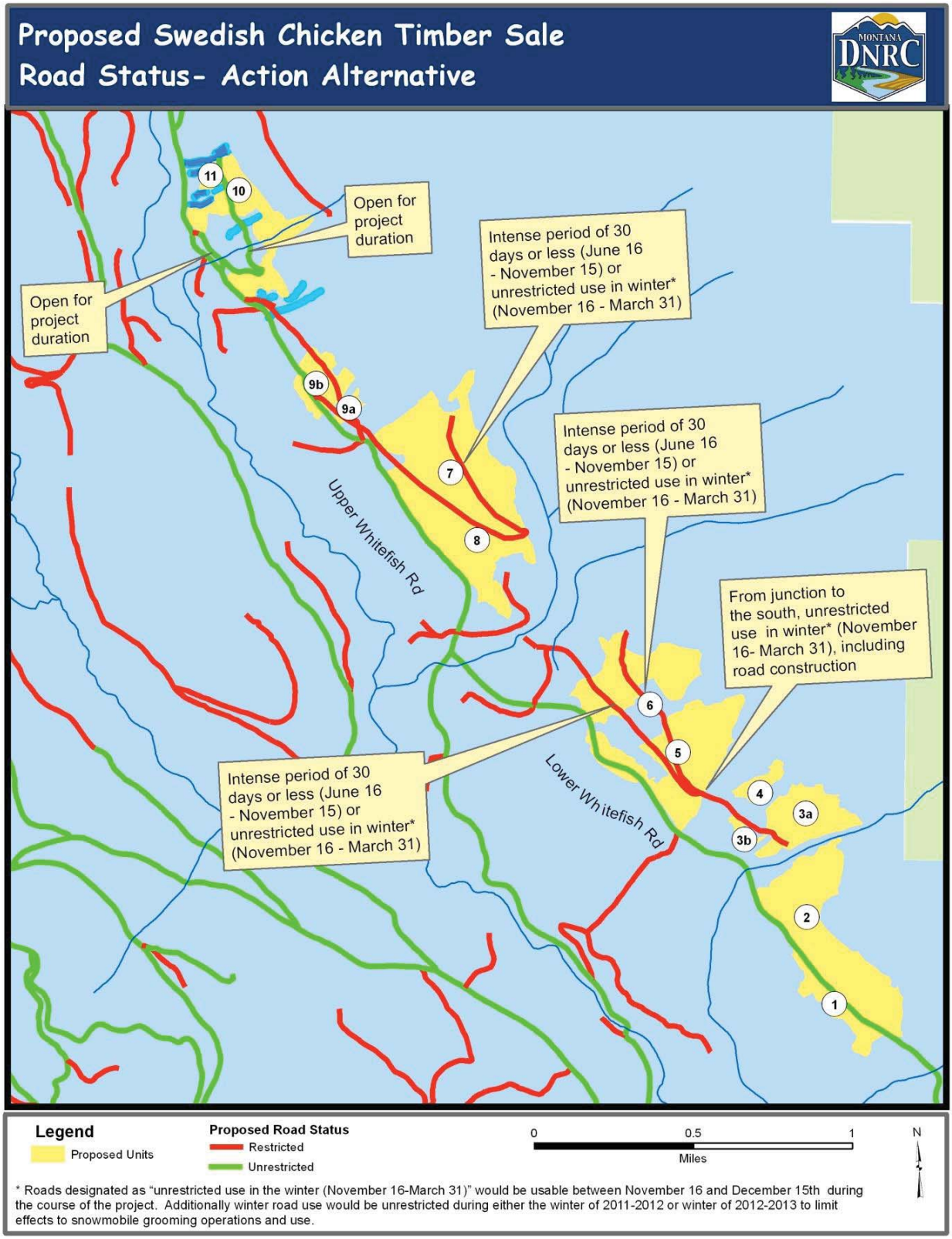
Roads and Access

- Some changes to the current transportation system and road management would occur with the Transportation Plan design for this alternative. *FIGURE II-2 – SWEDISH CHICKEN PROPOSED PROJECT MAP* and *TABLE II-2 - ROADS* shows an overall plan for roads, but several specific actions include:
- Existing roads would be brushed and graded as needed. Several culverts would be removed and/or replaced with larger-diameter culverts that are designed to meet 100-year flood events and improve surface drainage.
- Part of Spur A Road would be low-standard temporary road of new construction. After forest-improvement work has been completed the road would be reclaimed, all existing culverts would be removed, the road would be bermed and closed year-round.
- Temporary Spur 10 would be a low-standard, temporary road of new construction. After harvesting has been completed, the road would be reclaimed and effectively closed to motorized use.
- South Chicken and North Chicken roads would be gated and restricted to administrative use only after harvesting.
- Road work and use within the proposed Action Alternative must adhere to timing restrictions as displayed in *FIGURE II-3 - PROPOSED SWEDISH CHICKEN TIMBER SALE ROAD STATUS UNDER THE ACTION ALTERNATIVE* and *TABLE II-2 - ROADS*. *TABLE II-2 - ROADS* displays the roads, amount of road, standard of road, and a discussion about the road.

TABLE II-2 - ROADS

ROAD	ROAD LENGTH (miles)	STANDARD OF ROAD	ROAD CLASS	USE/TREATMENT
Upper Whitefish Rd.	10.8	Primary – Existing Road	Open	Maintenance and/or have minor drainage improvements installed.
Lower Whitefish Rd.	2.0	Primary – Existing Road	Open	Maintenance and/or have minor drainage improvements installed.
North Chicken Rd.	1.3	Secondary – New Construction	Closed to public year-round with a gate.	New construction. Gated.
South Chicken Rd.	1.3	Secondary – Existing Road	Closed to public year-round with a gate.	Reconstructed with 5 new culvert installations and 7 culvert replacements.
Spur A	0.3	Spur 0.2 existing road, 0.1 new temporary	Bermed; Closed year-round	0.2 miles currently exists and would require brushing and grubbing and have minor drainage improvements installed; 0.1 miles would be new construction. Road would be reclaimed following forest management activities
Spur B	0.2	Spur Existing	Bermed; Closed year-round	Maintenance
Temporary Spur 10	0.6	Spur New construction	Reclaimed; Closed year-round	New construction of low-standard temporary road. Road would be reclaimed following forest management activities.

Figure II-3 Proposed Swedish Chicken Timber Sale Road Status under the Action Alternative



Environmental Effects Summary

TABLE II–2 - SUMMARY OF ENVIRONMENTAL EFFECTS contains a summary of the information found in *CHAPTER III – EXISTING ENVIRONMENT AND ENVIRONMENTAL EFFECTS.* This table displays information on the environment of the Swedish Chicken Project Area and the entire Stillwater State Forest as it relates to the issues associated with the project proposal.

The current, or existing, condition can be viewed as a baseline condition, which can be used to compare with the predicted changes that may result from the selection of either alternative. For more in-depth discussions of the individual resources, see *CHAPTER III – EXISTING ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES.*

The following table compares the direct, indirect, and cumulative effects between the Action and No-Action alternatives. For more detailed descriptions, see *CHAPTER III – EXISTING ENVIRONMENT AND ENVIRONMENTAL CONDITIONS.*

TABLE II-2 - SUMMARY OF ENVIRONMENTAL EFFECTS

RESOURCE	DIRECT AND INDIRECT EFFECTS	CUMULATIVE EFFECTS
VEGETATION		
COVER TYPE AND AGE CLASS	***No-Action Alternative***	
	In the short-term, no changes would be expected.	Other timber sale forest-management actions would increase the amount of western white pine and western larch/Douglas-fir cover types by reducing the mixed-conifer, subalpine fir, and lodgepole pine cover types. Other forest-management actions would increase the amount of area in the 0-to-39 year age class by decreasing the percentage of area in the other age classes.
	Action Alternative	
	Approximately 222 acres of mixed conifer and 19 acres of western white pine cover type would be converted to the western larch/Douglas-fir cover type. Approximately 90 acres of the western larch/Douglas-fir cover type and 45 acres of the subalpine fir cover type would remain the same. No notable changes to age class would be apparent due to DNRC's methodologies for determining age class, but the areas being treated with regeneration harvests would introduce a new age class into the harvested units.	The cumulative effects would be the same as under the No-Action Alternative.

RESOURCE	DIRECT AND INDIRECT EFFECTS	CUMULATIVE EFFECTS
OLD-GROWTH	***No-Action Alternative***	
	In the short-term, no changes would be expected.	No changes to the amount of old-growth would be expected.
	Action Alternative	
	Eighty-nine acres of old-growth would be treated with a maintenance harvest which would maintain the stands as old-growth as defined by DNRC. Treatment of these 89 acres would, over time, trend these stands towards historic western white pine cover type.	Old-growth acres would be maintained at 12,646 acres; the amount of old-growth on Stillwater Unit would remain at 10.8 percent.
INSECTS AND DISEASES	***No-Action Alternative***	
	Mortality would likely continue causing loss of timber volume and value.	Untreated forest stands would continue to contribute to the spread of insects and diseases.
	Action Alternative	
	Mortality would likely continue, but at a reduced level when compared to results of the No-Action Alternative. DNRC would also capture some volume and value from the harvested products.	Salvage harvesting would reduce losses caused by insects and diseases. Regenerated stands would have a species composition more resilient to insects and diseases, and would be more in line with historic conditions.
FOREST FUELS	***No-Action Alternative***	
	No direct effects would take place under this alternative. Fuel loads and distribution would increase.	With the levels of shade-tolerant species and down woody debris that are present, and due to the difficult terrain and limited access, a wildfire would be difficult to suppress and a stand-replacement fire would likely occur.
	Action Alternative	
	The existing overstory would be thinned and fuel loads and ladder fuels would be reduced. In the event of a wildfire, a resulting decrease in fire intensity within harvest areas would help wildfire initial-attack suppression efforts.	Due to the location of the harvest units, the reduction in fuel loads and the amount of canopy, the potential for high-intensity wildfires would be reduced.

RESOURCE	DIRECT AND INDIRECT EFFECTS	CUMULATIVE EFFECTS
NOXIOUS WEEDS	***No-Action Alternative***	
	The risk of additional establishments of weed populations would not increase. Established infestations of noxious weeds are being addressed with an ongoing program of site-specific herbicide spraying.	Open roads in the project area would continue to have dispersed traffic from recreation and other timber-management activities, thus increasing exposure for weed establishment. Monitoring would continue as DNRC personnel travel in the project area.
	Action Alternative	
	Mechanized equipment and ground disturbance could increase or introduce noxious weeds along roads and throughout forested areas. Mitigation measures have been designed for the project to minimize effects. FI money would be collected to help the weed-spraying program and site-specific weed spraying would continue.	Cumulative effects would be the same as under the No-Action Alternative.
WATER RESOURCE		
SEDIMENT DELIVERY AND WATER YIELD	***No-Action Alternative***	
	Sediment from existing sources would continue. No increase in water yield would occur.	The existing direct sediment-delivery sources would continue until repaired by another project or funding source. In-channel sources of sediment would continue to exist and erode as natural events dictate.
	Action Alternative	
	The risk of long-term adverse effects to water quality or beneficial uses would be low because the increase in water yield is below threshold values and BMPs would be conducted on the project area, thereby limiting the amount of sediment. In-channel sources of sediment would be expected to continue to contribute sediment at the current rate. The ECA increase in the Swift Creek-Antice Creek watershed is 1.0 percent. The ECA increase in Swift Creek-Hemlock Creek watershed is 0.2 percent. This level of increase would not be measurable and would not be expected to result in impacts that are different to the current conditions.	The annual water-yield increases would remain below the thresholds of concern and BMPs would be implemented during timber-harvesting and road-construction operations. As a result, the risk of adverse cumulative impacts to water quality and beneficial uses, including fisheries habitat, would be low. The estimated cumulative water-yield increase in the Swift Creek-Antice Creek watershed would be 5.9 percent; the larger Swift Creek-Hemlock Creek watershed would experience an estimated cumulative annual water-yield increase of 5.7 percent. This level would remain below the threshold set in accordance with ARM 36.11.425(g), therefore, a low degree of risk to water quality would result from the implementation of this alternative.

RESOURCE	DIRECT AND INDIRECT EFFECTS	CUMULATIVE EFFECTS
FISH HABITAT	***No-Action Alternative***	
	No reduction in recruitable woody debris and no increases in water temperature would be anticipated.	
	Action Alternative	
	Due to the very small scale of timber harvesting adjacent to these streams, the risk of adverse impacts on recruitable woody debris or stream temperature caused by timber harvesting would be very low.	A majority of the recruitable woody debris would be retained, therefore, adverse affects would not be likely to result from the reduction. Due to the limited amount of shade-producing vegetation that would be removed, a low risk of cumulative temperature increases would result.
SOILS		
	No-Action Alternative	
	No direct or indirect effects to the physical properties of soils in the project area would be expected. Skid trails from previous timber harvesting activity would continue to recover.	No adverse cumulative effects would result.
	Action Alternative	
	The extent of impacts expected would likely be similar to those reported by Collins (DNRC, 2009). For this alternative, this means that 13.7 percent of the harvest area for ground-based operations during summer conditions would have a loss in productivity, and 7 percent on cable yarding units would have a loss in productivity. In addition, cable corridors may pose a slight risk of routing water because the corridor is generally parallel to the fall-line of the hillslope. About 3.3 acres would effectively be removed from forest production. Road construction would likely result in more erosion than native topography; however, BMP implementation would minimize the risk of erosion.	Cumulative effects would be controlled by limiting the area of adverse soil impacts to less than 15 percent of the harvest units (as recommended by the SFLMP) through implementation of BMPs, skid-trail planning on tractor units, and limiting operations to dry or frozen conditions. Due to mitigation measures and the limited area of reentry, the cumulative effects from compaction, erosion, and displacement would be low.

RESOURCE	DIRECT AND INDIRECT EFFECTS	CUMULATIVE EFFECTS
ECONOMICS		
	No-Action Alternative	
	Trust revenue from the project area would not be realized at this time.	No change to the area's economy would be expected, provided a local mill purchases a substituted amount of timber. The deferral of harvesting timber may change the region from which the trees are harvested, which would impact another area of the State.
	Action Alternative	
	An estimated $402,000 in project revenue would be deposited into the Common School trust account, approximately $156,400 would be put into the FI account, and approximately $110,000 would be invested in the maintenance of DNRC's transportation system. This sale would provide work for approximately 40 positions.	This alternative is part of the sustainable yield that contributes a relatively stable supply of state trust land timber for the regional market and, therefore, has an effect on the preservation of economic viability in Montana's timber resources. The net revenue of this sale would add to the Common School trust to offset tax dollars to fund education.
WILDLIFE		
FORESTED HABITATS AND CONNECTIVITY	***No-Action Alternative***	
	No changes in wildlife use would be expected. The forest would continue to age and conditions would move toward shade-tolerant tree species with high amounts of canopy cover.	Continued use would be expected by wildlife species that favor dense stands of shade-tolerant tree species, and by wildlife species that require larger areas of mature forests.
	Action Alternative	
	Adverse effects would be minor since harvesting would reduce stand age, thereby reducing habitats for species associated with older stands, and changes to landscape connectivity would be minor. Overall, some changes to wildlife use would be expected.	Reductions in mature forested habitats associated with this alternative would be additive to losses associated with other harvesting activities. Extensive forested habitats would still exist in the analysis area and landscape connectivity would persist.

RESOURCE	DIRECT AND INDIRECT EFFECTS	CUMULATIVE EFFECTS
SNAGS AND COARSE WOODY DEBRIS	***No-Action Alternative***	
	Negligible effects would be anticipated because no harvesting would alter present or future snag or coarse woody debris concentrations, and no changes to access for firewood gathering would occur.	Snags and snag recruits have been retained with recent harvesting across Stillwater State Forest. Wildlife species relying on snags and coarse woody debris would be expected to persist across the analysis area.
	Action Alternative	
	Minor adverse effects are anticipated because harvesting would reduce snags, recruitment trees and coarse woody debris, and no changes to access for firewood gathering would occur.	Minor adverse effects would be anticipated because harvesting would reduce snags and snag-recruitment trees while increasing coarse woody debris, no changes would occur in access for firewood, and the representation of shade-intolerant tree species would increase slightly.
GRAY WOLF	***No-Action Alternative***	
	No effects would be expected because there would be no change in human disturbance levels, nor any changes to big game winter ranges.	No effects would be expected because there would be no change in human disturbance levels, nor any changes to big game winter ranges.
	Action Alternative	
	Negligible effects are expected since minor short-term increases, but negligible long-term changes, in human disturbance levels are anticipated and no changes to big game winter range would occur.	Negligible effects are expected since, beyond the direct and indirect effects, no further effects would be expected.
GRIZZLY BEAR	***No-Action Alternative***	
	No direct effects to grizzly bears would be expected. No changes in road densities, hiding cover, or security core would be anticipated.	No further adverse cumulative effects would be expected to affect grizzly bears in any of the 3 cumulative-effects analysis areas because of the following factors: 1) No changes in human disturbance levels would be expected. 2) No further losses of hiding cover would occur. 3) No changes to security habitats would be anticipated. 4) No changes to open-road densities would occur.

RESOURCE	DIRECT AND INDIRECT EFFECTS	CUMULATIVE EFFECTS
GRIZZLY BEAR	***Action Alternative***	
	Minor adverse effects are anticipated because minor to moderate levels of disturbance and displacement would likely occur and hiding cover would be lost in the short-term, but no changes to security habitat would occur. Short-term increases in open-road densities would be anticipated, but no changes for the long-term transportation plan would be expected.	Minor adverse cumulative effects to grizzly bears would be expected in the short-term due to the following factors: 1) Minor increases in human-disturbance levels would be expected in each of the cumulative-effects analysis areas. 2) Hiding cover would be reduced in the short-term on a relatively small portion of each of the cumulative-effects analysis areas, but would be expected to recover fairly rapidly. 3) No changes to security habitats would be expected. 4) No changes in long-term open-road densities would be anticipated.
CANADA LYNX	***No-Action Alternative***	
	Minor adverse effects to lynx habitats would be expected to occur due to the following factors: 1) Adequate denning habitats would persist. 2) Sufficient mature foraging habitats would exist. 3) Young foraging habitats would continue developing in the near-term across the cumulative-effects analysis area. 4) Longer-term availability of young foraging habitats would likely decline without disturbance. 5) Limited amounts of lynx habitats would exist in the temporary non-lynx habitat category, meaning most of the lynx habitats would be in a usable state for lynx. 6) Landscape connectivity would persist.	Negligible adverse cumulative effects to lynx habitats would be expected to affect Canada lynx in the cumulative-effects analysis area due to the following factors: 1) Adequate denning habitats would persist. 2) Sufficient mature foraging habitats would exist. 3) Young foraging habitats would continue developing in the near-term across the cumulative-effects analysis area. 4) Longer-term availability of young foraging habitats would likely decline without disturbance. 5) Limited amounts of lynx habitats would exist in the temporary non-lynx habitat category, meaning most of the lynx habitats would be in a usable state for lynx. 6) Landscape connectivity would persist.

RESOURCE	DIRECT AND INDIRECT EFFECTS	CUMULATIVE EFFECTS
CANADA LYNX	***Action Alternative***	
	Minor adverse effects to lynx habitats would be expected to affect Canada lynx in the project area due to the following factors: 1) Adequate denning habitats would persist. 2) Sufficient mature foraging would exist. 3) Young foraging habitats would continue developing in the next 20 to 50 years in the project area. 4) Limited amounts of lynx habitats would be in the temporary non-lynx habitat category, meaning most of the lynx habitats would be in a usable state for lynx. 5) Moderate levels of landscape connectivity would persist, despite an overall slight reduction in landscape connectivity.	Minor adverse cumulative effects to lynx habitats would be expected to affect Canada lynx in each of the cumulative-effects analysis areas due to the following factors: 1) Adequate denning habitats would persist in each of the cumulative-effects analysis areas. 2) Sufficient mature foraging habitats would exist in each of the cumulative-effects analysis areas. 3) Young foraging habitats would continue developing for the next 20 to 50 years across the cumulative-effects analysis areas. 4) Limited amounts of lynx habitats would be in the temporary non-lynx habitat category (less than 30 percent), meaning most of the lynx habitats would be in a usable state for lynx. 5) Reductions in landscape connectivity would not prevent lynx movements through the cumulative-effects analysis areas.
FISHER	***No-Action Alternative***	
	No effects to fishers would be expected.	No additional effects would be anticipated.
	Action Alternative	
	Minor adverse effects would be anticipated since harvesting would largely avoid riparian areas, harvesting would reduce or remove preferred cover types in upland stands, reduction in the amount of connectivity would be minor, and harvesting would reduce snags while increasing coarse woody debris. Also, no appreciable changes would be expected in motorized access.	Minor adverse effects would be anticipated since harvesting would remove upland fisher habitats and mature upland stands in preferred fisher cover types, but considerable upland habitats would persist. Harvesting would have negligible changes to riparian areas, would cause minor reductions in connectivity, and would decrease snags while increasing coarse woody debris. Also, no appreciable changes would be expected in motorized access.
PILEATED WOODPECKER	***No-Action Alternative***	
	Negligible adverse effects are anticipated due to long-term succession-related declines in the abundance of seral tree species such as western larch.	Negligible effects are expected, but no additional impacts would be expected beyond those anticipated with direct and indirect effects.

RESOURCE	DIRECT AND INDIRECT EFFECTS	CUMULATIVE EFFECTS
	Action Alternative	
	Minor adverse effects would be anticipated since harvesting would reduce the amount of continuous forested habitat, and would reduce potential nesting and foraging habitat. Harvest prescriptions would promote the regeneration of seral species.	Minor adverse effects are expected, but no additional impacts are anticipated beyond those associated with direct and indirect effects.
ELK SECURITY HABITAT	***No-Action Alternative***	
	No adverse effects would be expected due to the following factors: 1) No changes in existing elk security habitats would be anticipated and continued maturation of forest cover would improve elk security habitats. 2) The level of human access would remain similar. 3) No appreciable changes to big game survival would be anticipated.	Minor positive effects would be anticipated due to the following factors: 1) No changes in open roads, motorized access, or human access would be anticipated. 2) No further reductions in elk security habitat would occur. 3) Modest levels of security habitat and hiding cover would persist.
	Action Alternative	
	Minor adverse effects would be anticipated due to the following factors: 1) No changes in open roads or motorized access for the general public would be anticipated, therefore access by hunters would not be expected to increase. 2) Minor increases in non-motorized access could increase hunter access. 3) No elk security habitats would be affected. 4) Negligible changes in big game survival would be anticipated.	Minor adverse effects would be anticipated due to the following factors: 1) No changes in open roads or motorized access for the general public would be expected. 2) Changes to non-motorized access would be minor. 3) No elk security habitat would be altered with the proposed activities. 4) Sizeable amounts of security habitat and hiding cover would persist in the cumulative-effects analysis area.

Environmental Assessment

CHAPTER III

Existing Environment and Environmental Consequences

Chapter III – Existing Environment and Environmental Consequences

Introduction

This chapter presents both the existing environment of the project, and the potential consequences to that environment that may occur as a result of implementing the No-Action and Action alternatives presented in *CHAPTER II - ALTERNATIVES*. Discussions of environmental consequences form the scientific and analytical basis for comparing the alternatives. The means by which potential adverse effects would be reduced or mitigated are also described *(see MITIGATIONS APPLIED DURING PROJECT DESIGN* in *CHAPTER II – ALTERNATIVES* and *APPENDIX A – STIPULATIONS AND SPECIFICATIONS)*. The proposed action alternative is limited to the specific timber harvest and the fuel treatments, reforestation activities, and roadwork in the Swedish Chicken Timber Sale Project area—although some components are analyzed across the landscape of Stillwater Unit.

The analysis of effects disclosed in this document includes those occurring from the entire 'scope' of the decision. Scope is defined as the range of actions, alternatives, and impacts to be considered in an environmental review. The discussions of resources and potential effects take advantage of existing information included in the Stand-level Inventory (SLI) and other project documents. The project files for the Swedish Chicken Timber Sale Project encompass additional project-specific information, including resource reports and the results of field investigations.

Direct, Indirect, and Cumulative Effects

Direct effects are those occurring at the same time and place as the initial cause or action. Indirect effects are those that occur later in time, or are spatially removed from the activity but would be considerable in the foreseeable future. Cumulative effects result from incremental effects of actions, when added to other past, present, and reasonably foreseeable future actions, regardless of the agency or person that undertakes such other actions. Cumulative effects can result from individually minor, but collectively significant actions that take place over a period of time.

Vegetation Analysis

Introduction

This section describes conditions of the existing vegetation on Stillwater Unit as a whole, and in the project area specifically, and describes how the No-Action and Action alternatives would affect the various components of this resource. A number of vegetation parameters could be affected by implementation of the alternatives; therefore, each will be analyzed. Forest cover types, age-class distributions, and the amounts, distribution, and attributes of old-growth will be discussed at the landscape and stand levels to facilitate the analysis of direct, indirect, and cumulative effects. Forest fuels, fire regimes, insects, diseases, and noxious weed conditions will be discussed at the project-area level. Past, present, and reasonably foreseeable activities are identified and considered in the analysis of effects.

Analysis Methods

The *Forest Management Rules* direct DNRC to promote biodiversity by taking a coarse-filter approach that favors an appropriate mix of stand structures and composition on state lands *(ARM 36.11.404)*. Static ecological parameters, including landtype, climatic section, habitat type, disturbance regime, and other unique characteristics, influence the forest communities that occur in a given area, and provide a basis for determining and managing for appropriate structures and composition. Dynamic characteristics of forest communities, such as species composition, age-class distribution, cover type, and stand structure, reflect the ecological parameters influencing a site and describe the resulting biodiversity in an area. The described effects of an action on these characteristics explain the contribution of the action toward the goal of promoting biodiversity.

To assess the existing condition of the project area, Stillwater Unit, and surrounding landscape a variety of techniques were used. Field visits, scientific literature, Stand Level Inventory (SLI) data, and consultations with other professionals, all of which provided information for the analysis.

The current cover type distribution was compared to DNRC's desired future conditions. The Stillwater SLI, specifically *STW SLI_2009*, was used to describe current cover types. DNRC's desired future conditions refer to the cover type that DNRC attempts to manage toward in a forest stand. Desired future conditions are determined according to the model described in *ARM 36.11.405*. DNRC's desired future conditions have been delineated in the Forest Management Bureau's *Desired Future Condition DATASET*. This information is available at the Stillwater Unit office in Olney. The *STW SLI_2009* was used to address the cumulative effects on cover type and age-class distributions.

Historic age-class distributions described by *Losensky (1997)* for climatic section M333C, which represents Upper Flathead Valley, were compared to the current age-class distribution on the Stillwater Unit. *STW SLI_2009* was used for this analysis.

The old-growth amounts and distribution for the Stillwater Unit will utilize the old-growth acres found through *STW SLI_2009* and during field verification in the Duck-to-Dog, Olney Interface, Jim Beaver, NE Smith Lake, Beaver Smith, Chicken/Antice, SE Stryker, Coal Ridge timber sales, and this proposed project.

Analysis Areas

The direct, indirect, and cumulative effects for cover types and age classes consider historic conditions from Climatic Section 333c for Stillwater Unit (*Losensky 1997*). The current and desired future forest conditions and old-growth amounts and distribution will be analyzed separately on forested lands that are administered by Stillwater Unit. Stillwater Unit administers Stillwater State Forest, Coal Creek State Forest, most of the scattered lands north of Coal Creek State Forest in Flathead County and the northeastern portion of Lincoln County.

The assessment of direct and indirect effects to old-growth attributes, timber stand health (insect and disease conditions), forest fuels, and noxious weeds were conducted on the project area. The cumulative effects analysis area (CEAA) for timber stand health is based on the Stillwater Unit.

Cover Types and Age Classes

Existing Condition

Cover type refers to the dominant tree species that currently occupy a forested area. *TABLE III-1 – THE CURRENT AND DESIRED FUTURE CONDITIONS OF COVER TYPES ON FORESTED LAND ADMINISTERED BY STILLWATER UNIT (BY PERCENT)* shows the percentage of the current cover types and the percentages of cover types for the desired future condition.

TABLE III-1 – THE CURRENT AND DESIRED FUTURE CONDITIONS OF COVER TYPES ON FORESTED LAND ADMINISTERED BY STILLWATER UNIT (BY PERCENT).

COVER TYPE	CURRENT (PERCENT)	DESIRED FUTURE CONDITION COVER TYPE (PERCENT)
Douglas-fir	3.5	1.4
Subalpine fir	27.0	16.3
Lodgepole pine	11.0	9.9
Ponderosa pine	0.8	1.7
Mixed conifer	25.9	6.5
Western larch/Douglas-fir	24.7	47.4
Western white pine	2.5	14.8
Hardwoods	3.0	3.1
Area that does not have a cover type designated in the SLI*	4.3	

**A major portion of those stands not inventoried with a cover type are stands that were involved in the stand-replacement fires of the Moose Fire of 2001; at the time of data collection in 2001 and 2002, these areas were nonstocked. Since the fire and salvage harvest, reconnaissance shows that many areas are regenerating to the early successional cover types of primarily lodgepole pine or western larch/Douglas-fir.*

Data indicates, as illustrated by *TABLE III-1 - THE CURRENT AND DESIRED FUTURE CONDITIONS OF COVER TYPES ON FORESTED LAND ADMINISTERED BY STILLWATER UNIT (BY PERCENT)*, that mixed-conifer and subalpine fir stands are currently overrepresented compared to DNRC's desired future conditions. Many of the species that comprise the mixed-conifer and subalpine cover types are shade tolerant, and stand structure tends to be multi-storied. The multi-storied structure has resulted, in part, from the in-growth of shade-tolerant trees over time. Therefore, the component of shade-tolerant species increases as the interval between disturbances such as wildfires or timber harvests is lengthened.

The western larch/Douglas-fir and western white pine cover types are currently underrepresented on the forest compared to the desired future condition cover type distribution. Western larch and western white pine are not shade tolerant and have, historically, been perpetuated through fairly intensive disturbances such as wildfires. These disturbances most often created single and two-storied stands of primarily western larch and Douglas-fir overstories; and western larch, western white pine, and Douglas-fir understories. While western larch is not shade tolerant, past silvicultural treatments have promoted multistoried western larch/Douglas-fir stands with numerous age classes represented in small groups of trees within larger stands. The white pine blister rust infection has drastically affected the western white pine cover type over several decades by substantially reducing the number of healthy western white pine that occupy the canopy as an overstory dominant. Additionally, in 1988, a weather event occurred that caused western white pine to become susceptible to bark beetle mortality.

Age-class distributions delineate another characteristic important for determining trends on a landscape level. Comparing the entire Stillwater Unit's administrative area with historical data for the Upper Flathead Valley climatic section *(Losensky 1997)*, *TABLE III-2 – DISTRIBUTION OF AGE CLASSES* shows that Stillwater Unit currently has proportionately less area in the 0-to-39-year (seedling/sapling stands) and 100-to-150-year age classes, and higher proportions of areas in the 40-to-99-year and greater-than-150-year age classes. DNRC's Forest Management Rules reflect the ecological principle that age-class distributions are not static and are dependent upon disturbances, regardless of whether those disturbances are natural, or implemented by man through silvicultural practices.

TABLE III-2 – DISTRIBUTION OF AGE CLASSES

AGE CLASS	HISTORIC PERCENT IN CLIMATIC SECTION M333C	HISTORIC ESTIMATES OF PERCENT ON STILLWATER UNIT	CURRENT PERCENT
0-to-39-year	36	22.8	13.6
40-to-99-year	12	17.9	22.8
100-to-150-year	22	24.7	13.8
150+-year	29	32.8	45.8
No age provided in SLI*			3.9

**A major portion of these stands were partially burned in the Moose Fire of 2001; SLI updates in 2001 and 2002 could not discern which age class to assign these stands.*

A fairly clear picture emerges of the forest conditions when distributions are combined with information on cover types as displayed in *TABLE III-3 – AGE-CLASS DISTRIBUTION OF CURRENT COVER TYPES ON STILLWATER UNIT.*

TABLE III-3 - AGE-CLASS DISTRIBUTION OF CURRENT COVER TYPES ON STILLWATER UNIT

CURRENT COVER TYPE	AGE CLASS					
	0 TO 39 YEARS	40 TO 99 YEARS	100 TO 149 YEARS	150 YEARS AND OLDER	NO AGE DATA	TOTAL ACRES
	NUMBER OF ACRES					
Douglas-fir	94	420	577	2,349	666	4,106
Hardwoods	100	122	68	64	0	354
Lodgepole pine	2,713	8,578	318	407	973	12,989
Mixed conifer	3,474	6,666	4,523	15,478	375	30,516
Ponderosa pine	170	0	531	192	0	893
Subalpine fir	3,992	6,514	4,112	16,735	376	31,729
Western larch/ Douglas-fir	522	4,247	6,198	16,105	2,076	29,147
Western white pine	360	198	325	2,019	0	2,902
Nonstocked	4,939	0	0	0	0	4,939
Total acres (total percent)	16,364 (13.6)	26,745 (22.8)	16,652 (13.8)	53,349 (45.8)	4,466 (3.9)	117,578

As was noted in *TABLE III-2 - DISTRIBUTION OF AGE CLASSES,* current age-class distributions are predominately in the oldest age class. The stand structure of the older age classes tend to be multistoried; this occurs when a stand has progressed through time and succession to the point that shade-tolerant species, such as grand fir, Engelmann spruce, and subalpine fir, are replacing a shade-intolerant overstory, such as western larch.

Environmental Effects to Cover Types and Age Classes

Direct and Indirect Effects of the No-Action Alternative to Cover Types and Age Classes

Neither cover types nor age-class distributions in the analysis area would be directly or indirectly affected. Over time, lacking substantial disturbances such as timber harvests or wildfires, the proportion of seedling/sapling-sized stands would gradually decrease.

Direct and Indirect Effects of the Action Alternative to Cover Types and Age Classes

Within the areas where treatment is proposed, the following results would be expected:

- Approximately 222 acres of mixed conifer and 19 acres of western white pine cover type would be converted to the western larch/Douglas-fir cover type.
- Approximately 90 acres of the western larch/Douglas-fir cover type and 45 acres of the subalpine fir cover type would remain the same.
- Most of these treatments would result in 2-storied stands following regeneration.

The overall trend with the action alternative would be to slowly move the stands towards the desired cover type of western white pine through the planting of rust-resistant seedlings within proposed harvest units, and towards a greater representation of western larch/Douglas-fir cover type.

Of the 376 acres being harvested, no notable change in age class would occur due to the amount of older-aged trees being retained, and DNRC's SLI methodologies used in determining age class. Based on SLI methodologies, when the sawtimber component of a stand has greater than 10-percent canopy coverage, the stand will be evaluated and classified with the age class of the sawtimber component; therefore, none of the areas of seedtree harvests would change to the 0-to-39 year age class.

Cumulative Effects of the No-Action and Action Alternatives to Cover Types and Age Classes

The cumulative effects of timber-stand management on Stillwater Unit trend toward increasing seral cover types in areas where recent forest-management activities have taken place.

In addition to the changes in cover type distributions from the no-action or action alternatives, the stands involved in the stand-replacement fires of the 2001 Moose Fire were inventoried in 2009-2010 but have not yet been compiled. The timber sale projects that have been implemented since the *STW 2006 SLI* increase the amount of the western larch/Douglas-fir cover type over the analysis area and, subsequently, reduce the amount of area in the mixed-conifer and subalpine fir cover types. Stillwater Unit also has a precommercial thinning program that often favors the retention of western larch and western white pine saplings; in some cases this changes a mixed-conifer cover type to a western larch or western white pine cover type.

As a result of implementing either alternative, as well as, from past projects implemented since 2006, the overall trend across the Stillwater Unit is a gradual transition of more stands being represented by western larch/Douglas-fir and western white pine cover types.

A minor increase in the amount of the 0-to-39 year age class has occurred; the minor amount is due to SLI methodologies for calculating age class as described in the *Direct and Indirect Effects to Cover types and Age Classes*.

Old-Growth

Existing Condition

DNRC uses the minimum criteria described by *Green et al*. (*Old-Growth Forest Types of the Northern Region, 1992*) to determine old-growth stands on state lands. *Green et al.* described characteristics of old-growth forests in Montana and provided minimum amounts of trees per acre of a given diameter at breast height (dbh) and age for each old-growth type. DNRC classifies stands that meet or exceed those minimums as old-growth. For this analysis, existing conditions and effects on old-growth are presented according to this definition.

Based on SLI data and field surveys across Stillwater Unit, approximately 10.8 percent (12,646 acres) of the Stillwater Unit analysis area can be classified as old-growth. *FIGURE III - 1 - OLD-GROWTH AND MATURE STAND CONNECTIVITY WITHIN THE PROPOSED SWEDISH CHICKEN PROJECT AREA* shows the old-growth stands in the project area.

*TABLE III-4 - OLD-GROWTH ACRES BY COVERTYPE ON STILLWATER UNIT** displays old-growth by forest cover type. Cover type is related to habitat type, habitat-type groups, and successional stages. Subalpine fir and mixed conifer are the dominant old-growth cover types on Stillwater Unit.

TABLE III-4 - OLD-GROWTH ACRES BY COVER TYPE ON STILLWATER UNIT*

PONDEROSA PINE	DOUGLAS-FIR	LODGEPOLE PINE	MIXED CONIFER	SUBALPINE FIR	WESTERN LARCH/ DOUGLAS-FIR	WESTERN WHITE PINE	TOTAL
12	531	408	3,918	4,242	2,720	815	12,646

**This information comes from 2009 SLI and field reconnaissance done during 2009 and 2010, and accounts for harvest treatments in all current timber sale projects on Stillwater Unit.*

Old-Growth Attributes

DNRC has developed a tool called the Full Old-Growth Index (FOGI) to describe the level of attributes commonly associated with old-growth for stands on state lands. The attributes considered are:

- number of large live trees,
- number of snags,
- amount of coarse woody debris,
- amount of decadence,
- multistoried structures,
- gross volume, and
- crown cover.

These attributes are assigned a value, or index rating that—when summed with the values or index ratings of the other attributes—indicate a total score or index rating for the stand. These scores can be grouped into *low*, *medium*, and *high attribute* categories. This provides an indication of the condition of the stand in reference to attributes that are often associated with old-growth timber stands. These attribute levels are not necessarily an indication of quality, but are tools to compare and classify a collection of older stands over the landscape.

There are 358 acres of old-growth within the project area. Currently, SLI and field reconnaissance shows approximately 75 percent (269 acres) of the old-growth stands are in the

medium attribute category, and 25 percent (89 acres) in the *low attribute* category.

Some old-growth characteristics in the project area:

- Western Larch and minor amounts of Douglas-fir are the dominant overstory species. Both species average 200+ in age. There are approximately 11 trees per acre (TPA) within the 21-inch or greater dbh class.
- Subalpine fir and grand fir are the dominant tree species within the intermediate stories or canopy level. Most of these two species are heavily infested with western spruce budworm. Subalpine fir range from 60 to 120 years old and 35 TPA, grand fir ranges between 120 and 200 years old and consist of about 25 TPA.
- The stand structures are all two-storied or multi-storied, with tree sizes from seedlings to large sawtimber.
- Vigor is average to poor in all stands.
- Older, large diameter trees have a clumpy distribution within most of the stands, characterized by pockets of whitewoods and pockets of older large diameter trees.

Environmental Effects to Old-Growth

Direct Effects of the No-Action Alternative to Old-Growth Distribution and Attributes

The distribution or attributes of old-growth stands would not be affected in the short-term.

Direct Effects of the Action Alternative to Old-Growth Distribution and Attributes

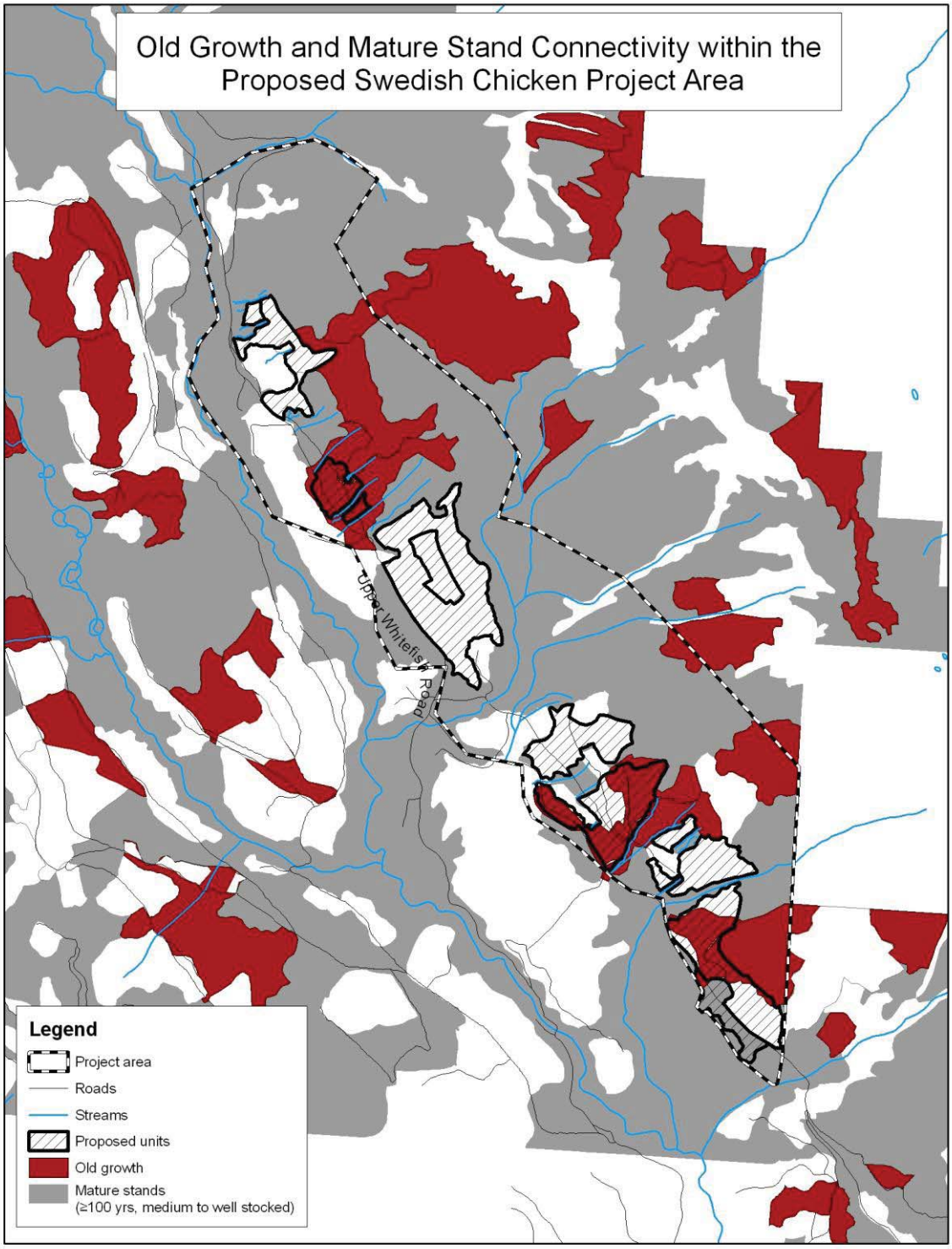
Approximately 89 acres of old-growth would be harvested under the Action Alternative; however, all 89 acres would receive an old-growth maintenance treatment that maintains the stand as old-growth as defined by DNRC. The primary purpose of treatment within these stands would be to:

- Remove encroaching shade-tolerant species (grand fir and subalpine fir) that natural disturbances, such as wildfire, would likely kill.
- Reduce the stocking levels of the stands which would free resources for the remaining residual trees, thus increasing their vigor and their ability to defend themselves from insect and disease attacks.
- Create small openings (generally one acre or less) which would allow for the planting of rust-resistant western white pine seedlings within these stands. This would eventually move the stand towards the desired western white pine cover type that has historically occurred in this area.

In summary, old-growth characteristics would be retained, leaving the old-growth stands moderately stocked with healthy trees, 16-plus inches dbh (including at least 10 TPA 21-inches dbh or greater), consisting primarily of western larch, Douglas-fir, and Engelmann spruce. Although old-growth characteristics would be retained, some attributes would change. Gross volume and crown cover would likely be reduced, this would move 89 acres (which currently has a medium FOGI) to a low FOGI.

FIGURE III-1 shows the distribution of old-growth within and adjacent to the project area. This figure also displays the amount and distribution of mature forest habitat should the Action Alternative be implemented. The connectivity analysis can be found within the *MATURE FORESTED HABITATS AND LANDSCAPE CONNECTIVITY* portion of the *WILDLIFE ANALYSIS.*

FIGURE III-1 – OLD-GROWTH AND MATURE STAND CONNECTIVITY WITHIN THE PROPOSED SWEDISH CHICKEN PROJECT AREA



Indirect Effects of No-Action Alternative to Old-Growth Distribution and Attributes

Stands that currently meet DNRC*s* old-growth definition, and are not proposed for harvesting, would become more decadent. Stocking levels and the loading of down woody debris would increase in some stands, increasing wildfire hazards. Shade-tolerant species would continue to replace shade-intolerant species. Various factors, such as insects, diseases, and decreasing vigor, would eventually cause more snags to occupy portions of the stands.

Indirect Effects of the Action Alternative to Old-Growth Distribution and Attributes

The risk of blowdown along the proposed unit boundaries would potentially increase and likely add to the down-fuel loading. Harvested areas next to the old-growth stands could possibly act as a fuel break, which could slow or stop wildfires before they could burn the old-growth.

Cumulative Effects of the No-Action Alternative to Old-Growth Distribution and Attributes

Stands that currently meet *Green et al*. old-growth definition and are not proposed for harvesting would become more decadent. Stocking levels and the loading of down woody debris would increase in some stands, increasing wildfire hazards. Shade-tolerant species would remain the major species component in stands. Various factors, such as insects, diseases, and decreasing vigor, would eventually cause more snags to occupy portions of the stands.

Cumulative Effects of the Action Alternative to Old-Growth Distribution and Attributes

114 acres of old-growth would be treated using old-growth maintenance treatments (89 acres in Swedish Chicken Timber sale and 25 acres in the proposed Coal Ridge Timber Sale). This would not affect the distribution of old-growth, since all 114 acres would retain old-growth status, but it would affect the attributes, such as stand volume and species composition, by removing much of the shade-tolerant components of the existing stands. Post-harvest planting of western white pine within portions of these stands would, over time, move these stands towards desired cover types in the future.

Timber-Stand Health

Planning for the long-term management of forest insects and diseases is an important part of designing project-level timber sales. Various forest species compositions and structures are more vulnerable than others to certain insects, diseases, windthrow, and wildfires. Annually, insect and disease activities are recorded and mapped using aerial-flight surveys. Information is collected on new occurrences, and the progression of existing pockets of insect infestations and disease infection, including the approximate acreages and locations. Field surveys identify areas with insect and disease activities for timber-harvesting opportunities.

Existing Condition

Damage and mortality from insects and diseases are relatively minor in forest types that exist in this area. A rise has occurred in the incidence of western spruce budworm, mountain pine beetle, white pine blister rust, and Douglas fir beetle. Indian paint fungus is not uncommon in grand fir throughout this area. Larch mistletoe is also found in several areas of the project area.

The following is a discussion of the major insects or diseases that have been influencing vegetation in the project area:

White Pine Blister Rust

White pine blister rust (*Cronartium ribicola)* is probably the most destructive disease of 5-needle (white) pines in North America. Around 1900, the disease was introduced into North America on white pine seedlings grown in European nurseries; by the 1950s, the disease had spread to most of the commercial white pine regions.

Western white pines not only die directly due to white pine blister rust, but also as a result of secondary causes, such as bark beetles. This is due to severely compromised health caused by the blister rust infection, leading to a reduction in the tree's natural ability to defend itself from environmental factors.

Much of the naturally occurring western white pine scattered throughout the project area is infected with blister rust, although there are a few mature individuals showing a high degree of natural resistance. A salvage effort in 1997 removed approximately 1.6 MMbf of dead and dying white pine. Several small pockets within the salvaged areas were planted with white pine blister rust resistant stock. In addition there is natural western white pine regeneration scattered throughout the understory across the project area. The natural white pine regeneration in the project area shows a moderate to high level of infection while the planted, rust resistant stock shows lower levels of infection.

Douglas-fir Beetle

Douglas-fir beetle (*Dendroctonus pseudotsugae)* is an aggressive and opportunistic organism that kills Douglas-fir trees by feeding on the living tissue (phloem) of the tree beneath the bark. They generally attack older, larger trees greater than 16-inches dbh, although younger trees as small as 7 inches dbh may be attacked when beetle populations are high. Warm, dry weather conditions, such as have occurred recently in western Montana, favor beetle survival and increase stress on trees, which can lead to a high level of tree mortality. The beetle normally kills small groups of trees, but during outbreaks it may kill groups of 100 or more. It prefers dense stands with a high percentage of mature or over-mature Douglas-fir.

A few pockets of tree mortality caused by Douglas-fir beetle are found within units 2, 4, 5, 6, 8, and 10, totaling approximately 8 acres.

Silvicultural treatments to reduce stand characteristics that are susceptible to the insect are effective when implemented before an outbreak. Thinning to reduce stand density will relieve competition between the remaining trees for water, light, and nutrients, thus increasing tree vigor and reducing tree susceptibility to Douglas-fir beetle attack.

Western Spruce Budworm

Western spruce budworm *(Choristoneura occidentalis)* in its larval form feeds on the needles, buds, staminate flowers and developing cones of host conifer trees. Budworm host tree species include: Engelmann spruce, and western larch but prefer the shade-tolerant Douglas-fir, subalpine fir, grand fir. Stands composed primarily of shade-tolerant species are far more susceptible to budworm damage than stands consisting of mostly shade-intolerant species. Other fundamental characteristics of suitable budworm habitat are dense, multi-storied stands in which there are greater opportunities for larvae to reach food and shelter as they disperse. Stands become more susceptible to budworm damage as they mature and trees become less vigorous. Sustained feeding by budworm larvae for 3 years or more often results in reduced growth, top kill and mortality. Young trees with relatively few needles and shoots can be especially at risk to mortality from budworm defoliation. Budworm damage to staminate flowers and cones can critically impede regeneration.

In 1989, U.S. Forest Service scientists N. William Wulf and Clint Carlson developed a rating

method for determining stand susceptibility to western spruce budworm where 0 to 20 is low, 21 to 50 is moderate, and 51 and greater is highly susceptible. The proposed project area rated in the mid to high twenties as moderately susceptible to western spruce budworm.

Fire exclusion in the project area has promoted dense, multi-storied stands dominated by climax tree species favored by western spruce budworm. Spruce budworm is a naturally-present insect in the Stillwater Unit, however during the summers of 2009 and 2010, populations reached epidemic levels within the project area. Silvicultural treatments that reduce the amount of preferred host species and increase the vigor of trees, tend to reduce susceptibility to budworm attack.

Indian Paint Fungus

Indian Paint Fungus (*Echinodontium tinctorium)*, also known as brown stringy trunk rot, is a common heartrot of mature and overmature grand fir and subalpine fir. Decay from this fungus within a tree can extend nearly 16 feet in either direction from a conk on the trunk. Multiple conks scattered on a trunk indicate rot is present throughout the entire tree. Trees are infected as saplings through tiny branch stubs. Once overgrown, the infection becomes dormant. Later injuries from fire scars and basal wounds reactivate the infection. Silvicultural treatments include managing susceptible species on short rotations, and thinning stands to increase vigor of the residual trees. Within the proposed units (particularly units 1, 3, 6, and 9), Indian Paint Fungus is found within pockets. These pockets are generally located in the more moist areas at lower elevations.

Larch Dwarf Mistletoe

Some portions of the project area have pockets of dwarf mistletoe *Arceuthobium laricis*. Infected stands typically have many dead trees, trees with stunted growth, 'witches brooms', and dying or dead tops. These stands eventually contain numerous dying and dead trees, usually bearing remnants of brooms. Dieback occurs as nutrients and water needed by growing tree tops are diverted to the brooms, which are usually concentrated in the lower or middle crowns. In addition, trees that are infected will likely infect incoming generations of western larch in the middle and understories.

Larch mistletoe is found within units 1, 2, 5, 6, 7, 8, and 11, totaling approximately 37 acres. The worst infections are found within units 6 and 8. Silvicultural treatments include removing infected individuals and thinning stands to improve the vigor of the remaining stand.

Environmental Effects

Direct and Indirect Effects of the No-Action Alternative to Timber Stand Health

In general, insect populations would continue to rise or fall based on natural disturbances or climatic conditions. As mortality and stem decay occurs in the project area, there would be loss of sawlog volume and value. Continued defoliation from western spruce budworm could increase tree mortality within the shade-tolerant species, thereby causing a loss of sawlog volume and value for the trusts, and increasing the potential of a wildfire within the stands. Diseases would continue to exist and may increase in susceptible species, resulting in mortality over time. Western white pine populations would continue to die from beetle damage and pine blister rust until possibly disappearing from the area all together, and Douglas-fir beetles may continue killing large diameter Douglas-fir.

Direct and Indirect Effects of the Action Alternative to Timber Stand Health

Mortality from some insects and diseases that are currently active in the project area would likely continue, but the amount would decrease as: a) susceptible trees within the timber stand and tree species susceptible to current insect and disease infestations are reduced, and b) the more-resistant tree species are regenerated. Harvest treatments would target those species or individuals affected by insects and diseases, as well as, salvage of recentlykilled trees.

This project would change stand conditions on 376 acres into habitat that is less favorable to western spruce budworm. The proposed harvest treatments would reduce the amounts of whitewoods, which are the preferred food source of spruce budworm. Harvest treatments would also reduce stand density thereby improving the vigor of the residual stands and providing trees with greater resources to support survival of cyclic defoliation.

This project would include the planting of approximately 21,000 rust-resistant western white pine seedlings on 300 acres, after harvesting has been completed; thereby providing the continued presence of western white pine in the project area.

Individual larch heavily infected with mistletoe would be removed, which would reduce the spread of mistletoe and, as with spruce budworm treatments, would also reduce stand density thereby improving the vigor of the residual stands and providing trees with greater resources to live with or even resist mistletoe infection.

Cumulative Effects of the No-Action Alternative to Timber Stand Health

No harvesting of live, dead, dying, or high-risk trees would occur. Some salvage harvesting of insect-infested and disease-infected trees would occur under a separate environmental review document if there were an outbreak. Western white pine populations would continue to die from beetles and pine blister rust until possibly disappearing from the area all together. Incidence of dwarf mistletoe would likely increase, infecting increasing numbers of western larch. Douglas-fir beetles may continue killing large diameter Douglas-fir. Continued defoliation from western spruce budworm could increase tree mortality within the shade-tolerant species, thereby causing a loss of sawlog volume and value for the trusts, and increasing the potential of a wildfire within the stands.

Cumulative Effects of the Action Alternative to Timber Stand Health

On the Stillwater Unit silvicultural prescriptions have generally been implemented that would reduce losses and recover mortality caused by insects and disease. This project would create forest stands that are more resilient to the impacts of insects and disease, and are more in-line with desired forest conditions. This would be achieved by reducing stocking density, increasing vigor, promoting the regeneration of western larch and Douglas-fir, and by the growth of rust-resistant western white pine.

Fire Regimes and Forest Fuels

Fire Regimes

The fire regimes across Stillwater Unit are variable. The forest, as a whole, has a mosaic pattern that developed from different fire frequencies and intensities. Areas of frequent fires have produced Douglas-fir and western larch cover types. As the intervals between fires become longer, cover types of more shade-tolerant species (Engelmann spruce, subalpine fir, grand fir, western hemlock, and western red cedar) begin to develop. The forest's higher elevations have longer fire intervals and the stands tend to be multistoried with a dominant shade-tolerant cover type. Where fire frequencies are short, the stands are open, single-storied, and, occasionally, two-storied. With the arrival of aggressive wildfire-suppression efforts, cover types and wildfire frequencies were altered. Stands of western larch and/or Douglas-fir have become multistoried with shade-tolerant species. Stands that were once open now have a thick understory of predominantly Douglas-fir, grand fir, Engelmann spruce, and subalpine fir. Due to fire-suppression efforts, forest fires are generally smaller, limiting natural fire effects. If a large-scale fire were to occur, many acres could be affected due to ladder fuels, heavy fuel accumulation, and other environmental factors.

Fisher and Bradley (1987), Fire Ecology of Western Montana Habitat Types, described the fire ecology of habitat-type groups in Montana.

The fire group present in the Swedish Chicken project area is summarized in *TABLE III-4– CHARACTERISTICS OF FIRE GROUP 9 OCCURRING WITHIN THE SWEDISH CHICKEN TIMBER SALE PROJECT.*

TABLE III-4 – CHARACTERISTICS OF FIRE GROUP 9 OCCURRING WITHIN THE SWEDISH CHICKEN TIMBER SALE PROJECT

Fire Group 9	
Habitat type group	Moist lower subalpine habitat types
Fire return interval/ Severity ***(Fisher and Bradley)***	Infrequent/Low or High
Average fuel loading (tons/acre) ***(Fisher and Bradley)***	25
Post-harvest fuel loading (tons/acre)	10 to 15

Timber Sale Project Fire Groups

The Swedish Chicken Timber Sale project is represented by the Fire Group 9 Fire Regime. Fire Group 9 represents moist, lower subalpine habitat types where fires are infrequent, and either very low intensity or severe, with the effects long lasting. Under typical conditions, high soil moisture and lush understory vegetation hamper most fires before they have a chance to grow. However, during unusually hot and dry conditions, a combination of a deep duff layer and high down wood fuel loads result in intense, stand replacement conflagrations when fires do occur. Moderately-severe fires, while less frequent than stand replacement events, do occasionally occur. While fire history information for subalpine fir habitat types is limited, research suggests fire-free intervals range from 117 years in valleys, to more than 146 years on lower alpine slopes *(Fischer and Bradley, 1987)*.

During field reconnaissance, 37 transects were used to estimate coarse woody debris in the project area, with emphasis on proposed unit locations. The method for quantifying the coarse woody debris is described in the Handbook for Inventorying Downed Woody Material *(Brown, 1974)*. The average tonnage per acre was 15.5 with a wide range of 0 to 45.4 tons per acre. The median—which is the point with half of the transects showing more, and half of the transects showing less—was 10.9 tons per acre.

These results are on the high end of recommendations described in Managing Coarse Woody Debris in Forests of the Rocky Mountains *(Graham et al, 1994)* on similar habitat types, post timber harvest. Subalpine fir habitat types are recommended to have a level of coarse woody debris in the range of 7.3 to 22.8 tons per acre to maintain forest productivity. Grand fir habitat types are recommended to have a range of 7-14 tons per acre to maintain forest productivity. Currently, 46% of the transects were in the recommended range and 73% of the transects were above the minimum recommendation.

Environmental Effects

Direct and Indirect Effects of the No-Action Alternative to Fire Regimes and Forest Fuels

In the short term, stands would retain current density, fuel load, and ladder fuels, until a prescribed or natural disturbance occurs. Risk of torching and crown fires would remain high. Over time, increased fuel loading would be expected to increase the risk and intensity of fires as described above.

Direct and Indirect Effects of the Action Alternative to Fire Regimes and Forest Fuels

Although the potential for ignition would continue to exist following treatment, ladder fuels to crowns would be removed in the proposed harvest units, and fuel treatments would limit the fire intensity under most circumstances. The success of aerial and ground attacks on wildfires would potentially be improved because fires would most likely burn through and remain in the understory, rather than climbing into the overstory and moving through the upper canopy.

Areas treated with an old-growth maintenance prescription would reduce the amount of trees, and consequently fuel loads, resulting in less-intense fires than would occur in non-harvested stands. However, the connectivity of fuel and ladder fuels may not be impacted. Additionally, thinning may result in increased air flow through the stand, which could promote the drying of fuels on the forest floor and increase the rates of spread for fires that do occur.

Areas treated with the regeneration treatments would emulate a stand-replacement fire without the risk of burning the seed trees of desired seral

species, or over heating the soil. Approximately 10 to 15 tons of large woody debris per acre would be retained following site-preparation treatments.

Cumulative Effects of the No-Action Alternative to Fire Regimes and Forest Fuels

Forest succession and fire suppression would continue; however, with the present levels of shade-tolerant species and down woody debris, as well as the difficult terrain and limited access, a wildfire would be difficult to suppress and a stand replacement fire would likely occur.

Cumulative Effects of the Action Alternative to Fire Regimes and Forest Fuels

Natural stand development, past timber sales, and wildfires have created the current vegetative mosaic in this area. These mosaics break up the continuity of fuels and behave as natural fire breaks. Maintaining an age-class mosaic, in conjunction with fuel-treatment projects, would reduce the potential of high-intensity wildfires.

Noxious Weeds

Existing Conditions

A noxious weed is defined as a nonnative plant competing with desirable plants for nutrients, water, and sunlight; and is harmful to agriculture, wildlife, forestry, and other beneficial uses, thus reducing the value and productivity of the land. Most noxious weeds are exotic species, originating in Eurasia (*Flathead County Weed Management Plan*). Montana has declared 15 weeds as noxious; Flathead County has added 10 to their Noxious Weed Management list.

The following noxious weeds have been located on the project area and along access routes to the project area:

- spotted knapweed (*Centraurea maculosa*)
- St. John's-wort (*Hypericum perforatum*)
- oxeye daisy (*Chrysanthemum leucanthemem*)
- common tansy *(Tanacetum vulgare)*
- hound's-tongue *(Cynoglossum officinale)*
- orange hawkweed (*Hieracium aurantiacum*)
- tansy ragwort (*Senecio jacobea*)

The first 5 species listed are Category 1 weeds, which are established weeds with high disbursement; orange hawkweed and tansy ragwort are Category 2 weeds, which are established, but have a moderate disbursement level. These invading weed species are not new to Flathead County; new invading weed species would be listed as Category 3 weeds.

Spotted knapweed and orange hawkweed—the most widely distributed noxious weeds in the project area and on Stillwater Unit are found in areas where ground disturbances such as landings, skid trails, powerlines, and roadsides occur.

Environmental Effects to Noxious Weeds

Direct and Indirect Effects of the No-Action Alternative to Noxious Weeds

Additional mineral soil would not be exposed and heavy tree canopies would continue to compete with weeds; therefore, the risk of additional establishment of weed populations would not increase. Currently, weed seed is introduced primarily via motor vehicle use. Established infestations of noxious weeds are being addressed with an ongoing program of site-specific herbicide spraying along roads and in small areas of infestation.

Direct and Indirect Effects of the Action Alternative to Noxious Weeds

The proposed activities would result in an increase in ground disturbance. Mechanized equipment and ground disturbance could increase or introduce noxious weeds along roads and throughout forested areas. Weed seeds are likely to be scattered throughout the forested areas, and the reduction of canopy and disturbance from the timber-harvesting activities are expected to provide the catalyst for spread. Mitigation measures would include:

- washing equipment before entering the site,
- sowing grass seed on roads after harvesting has been completed, and
- applying herbicide along roadsides and on spots of weed outbreaks.

Cumulative Effects of the Action and No-Action Alternatives to Noxious Weeds

The open roads in the project area receive traffic from dispersed recreation, timber-management activities, and other uses, on a regular basis. These disturbances, and illegal motorized use, increase exposure to weed establishment. The weed-management program at Stillwater Unit, including cooperation with the USFS and weed departments of Flathead and Lincoln counties, has improved over time and more weed control is taking place.

Water Resources Analysis

Introduction

This analysis is designed to disclose the existing condition of the hydrologic and fisheries resources and to display the anticipated effects that may result from each alternative presented in this proposal. During the initial scoping, issues were identified regarding water-quality, water-quantity, and fisheries resources. After reviewing the public and internal comments, DNRC developed the following issue statements regarding the potential effects of the proposed timber harvesting:

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

- Timber harvesting and road construction may increase sediment delivery into streams and affect water quality and aquatic resources and species.

- Timber harvesting activities may adversely impact the fisheries habitat parameters of large woody debris, stream shading and stream temperature. New roads may adversely affect fisheries habitat connectivity at road crossings.

- Past mitigation measures—specifically Forestry Best Management Practices (BMPs)—may not adequately protect soil, water and fisheries resources.

The *ENVIRONMENTAL EFFECTS* section discloses the anticipated direct, indirect, and cumulative effects of the proposed actions upon water resources in the analysis area. Past, current, and future planned activities on all ownerships in each analysis are taken into account for the cumulative-effects analysis.

The primary concerns relating to aquatic resources in the analysis area are potential impacts to water quality from sources outside the channel; however increases in annual water yield could result in increased in-stream erosion. In order to address these issues, the following parameters are analyzed by alternative:

- Miles of new road construction and road improvements, including fish passage.
- Potential for sediment delivery to streams.
- Increases in the Equivalent Clearcut Acre (ECA) and annual water yield.
- Increases or decreases in fish-habitat parameters (woody debris, stream shading and temperature.

Analysis Method

Sediment Delivery

The methods applied to the project area to evaluate potential direct, indirect, and cumulative effects include a field review of potential sediment sources from roads on the designated haul routes. Stream crossings and roads were evaluated to determine existing sources of introduced sediment. Potential sediment delivery from harvest units will be evaluated based upon a risk assessment. This risk assessment will use the soil information provided in the *SOILS ANALYSIS* and the results from soil monitoring on past DNRC timber sales. For Chicken Creek, in-channel sources of

sediment—as an indicator of channel stability—have been reviewed as an integral part of the R1/R4 Fish Habitat Inventory while un-named streams were reviewed for channel conditions and sediment sources during field reconnaissance.

Fish Habitat Parameters

Expected effects to fisheries habitat will be addressed qualitatively using the current condition as a baseline; disclosing the expected changes that would potentially occur with implementation of the proposed alternative. The analysis method for woody debris recruitment will evaluate the potential reduction in available woody debris and shading that may occur due to timber-harvesting activities. Stream temperature will be addressed by evaluating the risk of stream temperature increases that would potentially occur with reduced shading from existing vegetation. Fish passage restrictions will be disclosed from fish passage data collected by contractors over the last 8 years.

Water Yield

Annual water yield will be disclosed as a cumulative effect in the *EXISTING CONDITIONS* portion of this report because the existing condition is a result of all past harvesting and associated activities. Annual water yield refers to the gross volume of water in a watershed that is contributed to a stream or other surface water feature over an entire year. This does not address peak flows or seasonal fluctuations in stream flow. In the *ENVIRONMENTAL EFFECTS* portion of this report, modeled water yield increases as a result of this project will be disclosed as a direct effect. The cumulative water yield increase for each alternative will also be disclosed.

The annual water yield increase for watersheds in the project area was estimated using the Equivalent Clearcut Access (ECA) method, as outlined in *Forest Hydrology, Part II (Haupt et al, 1976)*.

ECA is a function of total area roaded, harvested, or burned; percent of crown removed during harvesting or wildfire; and amount of vegetative recovery that has occurred in the harvested or burned areas. As live trees are removed, the water that would have otherwise evaporated and transpired, either saturates the soil, or is translated to runoff. This method also estimates the recovery of these increases as new trees revegetate the site and move toward preharvest water use.

In order to evaluate the potential effects of water yield increases, a threshold of concern for each watershed was established per *ARM 36.11.423*. Thresholds were established based on evaluation of the acceptable risk level, resources value, and watershed sensitivity. Increased annual water yields above the threshold of concern may result in an increased risk of in-channel erosion and degradation of fisheries habitat, and may have detrimental impacts on other downstream beneficial uses.

BMP Effectiveness

BMP effectiveness will be evaluated by reviewing the effectiveness ratings from internal and state BMP audits/reviews since 1998. Several sites audited/reviewed have been located on the Stillwater State Forest. This will be discussed in the *EXISTING CONDITION* section of this document, however due to the programmatic scale of this topic; it will not be discussed in the *ENVIRONMENTAL EFFECTS* portion, except to acknowledge the requirement of implementing BMPs per *ARM 36.11.422*.

Analysis Area

Sediment Delivery

The analysis area for sediment delivery is limited to the harvest units and roads proposed for hauling. This includes upland sources of sediment that could result from this project. In-channel sources of sediment, such as mass-wasting locations or excessive scour/deposition, will be discussed for streams in the project area, with emphasis on streams adjacent to, or within, proposed harvest units.

Fisheries Habitat Parameters

The analysis area for fisheries habitat parameters are the proposed harvest units immediately adjacent to streams. While most of the streams in the project area are not fish-bearing, these streams generally contribute surface flow to downstream bodies of water that provide fish habitat. Fish-bearing streams in the project area include Chicken Creek and several unnamed tributaries to Swift Creek. Swede Creek is also a fish-bearing stream located just outside of the project area.

Water Yield and Cumulative Effects

The water yield analysis areas will be Swift Creek-Antice Creek and Swift Creek-Hemlock Creek 6th code HUC watersheds *(Hydrologic Unit Codes 17010200503 and 170102100505)*. The size of the analysis area should result in meaningful measurement of potential impacts, therefore this is selected as the appropriate scale of analysis due to the size of the project, versus the watershed size and the potential for impacts.

Water Uses and Regulatory Framework

Water Quality Standards

This portion of the Flathead River basin, including the Whitefish River and its tributaries, is classified as A-1 by the DEQ, as stated in the *ARM 17.30.608*. The water quality standards for protecting beneficial uses in A-1 classified watersheds are located in *ARM 17.30.622*. Water in A-1 classified waterways is suitable for the following purposes: drinking; culinary and food processing purposes (after conventional treatment); bathing; swimming and recreation; growth and propagation of salmonid fishes and associated aquatic life; waterfowl and furbearers; and agricultural and industrial water supply. State water quality regulations prohibit any increase in sediment above naturally occurring concentrations in water classified A-1. Naturally occurring means, condition or materials present from runoff or percolation over which man has no control, or from developed land where all reasonable land, soil and water conservation practices have been applied (*ARM 17.30.602 [17])*. Reasonable land, soil and water conservation practices include, "methods, measures or practices that protect present and reasonably anticipated beneficial uses…" (*ARM 17.30.602 [21]*). The State of Montana has adopted Best Management Practices (BMPs) through its non-point source management plan *(MDEQ, 2007)* as the principle means of meeting the Water Quality Standards.

Water Quality Limited Waterbodies

The project area drains into Swift Creek. Swift Creek is listed as a water quality limited water body in the 2008 303(d) list for not fully supporting aquatic life and cold water fisheries.

The listed probable causes in 2008 were habitat alteration, sedimentation and nutrients/total phosphorous. However, the 2010 assessment record for Swift Creek states that the "fishery data demonstrates the support of cold water fishery beneficial uses." The 2010 assessment record also notes that the macroinvertebrate composition and the "observed versus expected" model suggests no impairment. The 303(d) list is compiled by DEQ as required by Section 303(d) of the Federal Clean Water Act and the Environmental Protection Agency 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, and/or where beneficial uses are threatened or impaired.

Streamside Management Zone Law (SMZ)

All rules and regulations pertaining to the SMZ Law will be followed. An SMZ width of 100 feet is required on Class I and II streams when the slope is greater than 35 percent. An SMZ width of 50 feet is required when the slope is less than 35 percent.

Water Rights and Beneficial Uses

No water rights for surface water exist within three miles downstream of the project area on the Swift Creek, or its tributaries, except for an industrial-use water right granted to the State of Montana.

Fisheries—Threatened, Endangered and Sensitive Species

Westslope cutthroat trout are listed as a Montana Animal Species of Concern with an 'S2' ranking. An 'S2' designation is given to a species or subspecies that "…is at risk because of very limited and/or declining numbers, range, and /or habitat, making it vulnerable to global extinction or extirpation in the State."*(Montana Natural Heritage Program and Montana Fish Wildlife and Parks, 2009)*. The DNRC has also identified westslope cutthroat trout as a sensitive species (Forest Management Rule *ARM 36.11.436*). DNRC is a signatory to the 2007 (interagency) Memorandum of Understanding and Conservation Agreement for Westslope Cutthroat Trout and Yellowstone Cutthroat Trout.

Bull trout are also listed as a Montana Animal Species of Concern, with the same ranking as westslope cutthroat trout; however bull trout are also listed as 'threatened' by the US Fish and Wildlife Service under the Endangered Species Act. DNRC is a signatory to the 2000 (interagency) Restoration Plan for Bull Trout in the Clark Fork River Basin and Kootenai River Basin, Montana.

Bull trout are found in Swift Creek; westslope cutthroat trout are present in Swift and Chicken creeks and several unnamed streams adjacent to the project area.

Existing Condition

General Description

The Swift Creek-Antice Creek watershed is approximately 6,829 acres and includes numerous first and second-order tributaries that flow from the east aspect of Stryker Ridge into Antice Creek, and from the west aspect of the Whitefish Range toward Swift Creek. While most of the streams are unnamed, Antice Creek and Chicken Creek are named, and both flow into Swift Creek. Both of these streams are Class I fish-bearing streams. A description of Antice Creek and its tributaries can be found in the Southeast Stryker Ridge Timber Sale Project Environmental Assessment *(DNRC, 2009)*. A description of Chicken Creek can be found in

the Chicken-Antice Timber Sale Project Environmental Assessment *(DNRC, 2008).* Precipitation within the watershed ranges from 20 to 60 inches per year, mostly in the form of snow. Elevations range from approximately 4,000 feet at the Antice Creek-Swift Creek confluence to approximately 6,600 feet on Stryker Ridge.

Within the project area, there are approximately 4.2 miles of Class I streams, 3.9 miles of Class II streams and 1.1 miles of Class III streams. Of the Class I streams, 2.1 miles are known to support fisheries (primarily Chicken Creek); however, stream gradients found in other streams may be conducive to fish species survival, and therefore, these streams cannot be dismissed as non-fish-bearing.

Most of the Class II streams are spring-fed and flow for more than 6 months of the year; however, these streams typically do not connect to a downstream waterbody via surface flow. Class III streams all flow for less than 6 months of the year and do not contribute to a downstream waterbody.

Sediment Delivery

The majority of roads found within the project area are main system roads that are reviewed regularly for maintenance needs. Maintenance needs are prioritized by the potential for impacting water quality. During field reconnaissance, a sediment delivery inventory was completed on the roads in the project area. In order to inventory the existing sediment sources, DNRC personnel collected data to quantify sediment delivery from roads, using procedures adapted from the *Washington Forest Practices Board (Callahan 2000).* Information on this data collection procedure can be found in the project file.

During the field work, DNRC personnel noted undersized culverts or corrugated metal pipes (CMPs) and BMP issues. In some locations, water from drainage ditches was routed directly into streams. The total sediment delivery in the project area was estimated at 11.2 tons per year from road crossings. Approximately 86 percent of this comes from four crossing sites and predominately caused by inadequate road surface drainage. A detailed list of the sites inventoried, and the sediment delivery from each site, can be found in the project file.

In-channel sediment sources are very limited in the project area streams, which are most likely due to the relatively stable flow from spring-fed streams; however, some areas of bank instability do exist. An unnamed stream in Section 11 is headcutting above the Upper Whitefish Road. The headcut is approximately 40-50 feet above the road and is eroding at a moderate rate estimated at up to a foot per year. A small, short-term sediment source was identified on Chicken Creek where a culvert was removed during 2010. This site is expected to stabilize after a spring runoff helps the channel form. Other natural sources of in-channel sediment are limited to outcurves and constrictions of channels that can produce slightly higher velocity flows that are more erosive.

No unstable banks that are prone to mass-wasting were detected in the tributaries during R1/R4 Fisheries Habitat Standard Inventory *(Overton et al 1997)* conducted in 2005.

Fish Habitat Parameters

Large Woody Debris

Large woody debris (LWD) recruitment to streams is important for maintaining channel form and function, important components of fish habitat. DNRC Forest Management Rules require the establishment of Riparian Management Zones (RMZ) when forest activities are proposed adjacent to fish-bearing streams and lakes. The RMZ is the area

adjacent to streams where LWD is recruited into the stream. If trees are only 50 feet tall, we would not expect recruitment from areas further than 50 feet from the channel. According to *ARM 36.11.425(5-8*), harvest prescriptions in the SMZs and RMZ must retain adequate levels of shade and LWD in order to maintain stream form and function, and maintain natural water temperatures. To determine the RMZ width, the site potential index tree height was established after collecting tree heights and ages, and applying the appropriate site index curve. For Chicken Creek, the RMZ width is approximately 105 feet, as determined during the Chicken-Antice Timber Sale analysis. Unnamed tributaries within the project area that may be fish-bearing have an average site potential tree height of 85 feet.

One reason for the RMZ is the retention of adequate levels of LWD recruitment to the stream channel in order to maintain the complexity (variation) of fish habitat. The quantification of LWD in streams within the project area was not completed during field reconnaissance in 2010, although LWD was noted as common. In Chicken Creek, woody debris was inventoried as part of the *R1/R4 Fisheries Habitat Standard Inventory (Overton et al 1997).* The LWD counts in the reaches of Chicken Creek averaged 139 pieces per 1000 feet of stream. Reference reach data for LWD in western Montana was summarized by the DNRC Fisheries Program Specialist *(Bower 2008).* In similar stream types, the mean number of LWD per 1000 feet of stream channel was 61, with a range of 0 to 164 pieces per 1000 feet of stream channel. The existing conditions for Chicken Creek are within that range.

Evidence of past harvesting in riparian areas is found in the project area, however, the level of harvesting was low. Timber stands adjacent to streams are fully stocked with sawtimber size trees.

Stream Temperature

Stream temperature data for unnamed tributaries are not available and data for Chicken Creek is limited to 2001. During 2001, the maximum water temperature in Chicken Creek was 10.3 degrees Celsius. Although stream temperature can vary substantially between streams, seasonal data from other streams in the Stillwater State Forest indicates maximum water temperatures are typically less than 15 degrees Celsius since 2001. Montana DEQ noted that summer temperatures in Swift Creek were below thresholds that can adversely affect bull trout and westslope cutthroat trout *(DEQ, 2010)*.

Fish Passage

Fish passage and habitat connectivity in the project area and along the haul route was inventoried in 2003. Five CMP crossing structures were surveyed for fish passage criteria—all five CMPs had elements of habitat restriction for juvenile and/or adult salmonids. In 2010, one of the crossing structures was removed and another structure was replaced with a fish passage design CMP. The remaining three CMPs are considered barriers to juvenile fish; one of the three CMPs is considered a low-flow barrier to adult salmonids.

Water Yield and Cumulative Effects

A harvest history was developed for the Stillwater State Forest watersheds from aerial photos, timber sale contracts, and section record cards to estimate the annual water-yield increases for each watershed. Past harvesting operations in the project area include harvests in the 1950's through the 1990's, although the majority of harvesting occurred in the 1950s, 1960's and 1970's. A list of harvesting in the project area can be found in the project file. Other forest product removals include fence posts and rails, firewood, and individual and

commercial Christmas tree harvests throughout the last 70 years.

Using the ECA method described earlier, the existing annual water-yield increase for the Swift Creek-Antice Creek 6th code HUC watershed, is estimated at 4.9 percent, and the Swift Creek-Hemlock Creek watershed is estimated at a 5.5 percent annual water yield increase over fully forested conditions.

After reviewing the beneficial uses, existing channel conditions, and existing watershed condition per *ARM 36.11.423*, the threshold of concern for the Swift Creek-Antice Creek and Swift Creek-Hemlock Creek 6th code HUC watershed threshold was set at 11 percent. These threshold values expect a low to moderate degree of risk of adverse impacts to beneficial uses due to water-yield increases, as described in *ARM 36.11.423(f)(iv).*

Best Management Practices — Effectiveness

Best Management Practices (BMPs) are evaluated on even-numbered years by an interdisciplinary team comprised of a fisheries biologist, forester, hydrologist, a representative of a conservation organization, road engineer, soil scientist and an non-industrial private forest landowner or logging professional *(Ziesak, 2008).* In addition to these audits or reviews, DNRC conducts internal audits on an annual basis as part of the State Forest Land Management Plan Monitoring *(DNRC, 1996)*.

Up to 49 BMPs are audited at each site, depending upon the location and resource needs. For instance, a BMP for new road construction would not be evaluated on a site that did not include road construction. As inadequate application of some BMPs may not result in erosion or delivery of material to a stream, the application and effectiveness of eight "high risk" BMPs are evaluated separately due to their importance for protection soil and water resources.

Since 1998, the state BMP teams have conducted audits/reviews on 31 DNRC sites. Of these DNRC sites, 15 were located in the northwest part of the state; 6 specifically on the Stillwater Unit. During this same time period, DNRC hydrologists conducted 85 internal reviews on DNRC sites in the northwest portion of the state; 22 of the sites were located on the Stillwater Unit.

BMPs are rated for application and effectiveness. Table III-5 shows the percent of the ratings that met or exceeded the BMP for application, and also the percentage of BMPs that were effective in protecting soil and water resources.

Table III-5: BMP Application and Effectiveness ratings 1998-2009

	All BMPs		High Risk BMPS	
	Application	Effectiveness	Application	Effectiveness
State Audits/reviews on DNRC sales across state	97.3%	98.3%	91.3%	93.7%
Internal Audit/Reviews NWLO-ALL	97.6%	98.6%	95.1%	96.1%
Internal Audit/Reviews Stillwater Unit	97.0%	97.8%	92.7%	93.5%

Sites that did not have adequately implemented BMPs, or locations that did not exhibit adequate effectiveness, should not be assumed to have delivery of sediment into streams or other water bodies. Most departures for application are minor. Furthermore, the majority of BMP ineffectiveness ratings are minor and temporary, which indicates delivery to a dry draw for a short duration (less than one year). Over the period shown above, no major and/or prolonged impacts were noted for high risk BMPs.

Environmental Effects

Description of Alternatives

No-Action Alternative

No timber harvesting or associated activities would occur under this alternative. Existing activities such as recreational use, individual Christmas tree harvesting, and firewood gathering would continue.

Action Alternative

Thirteen units, totaling approximately 376 acres, would be commercially harvested under this alternative. Approximately 357 acres would be harvested using conventional ground-based equipment, while the remaining 19 acres would be treated using cable methods. All timber harvest may be completed under summer or winter conditions. In addition, approximately 2 miles of new road would be constructed (0.7 miles would be temporary), 1.3 miles of road would be reconstructed, and approximately 13.2 miles of road would be maintained or have minor drainage improvements installed as necessary to meet BMPs and protect water quality.

Existing activities such as recreational use, individual Christmas tree harvesting, and firewood gathering would continue.

Direct and Indirect Effects of the No-Action Alternative to Water Resources

Sediment Delivery

Under this alternative, no timber harvesting or related activities would occur. The existing direct sediment-delivery sources would continue until repaired by another project or funding source. In-channel sources of sediment would continue to exist and erode as natural events dictate.

Fish Habitat Parameters

Large Woody Debris Recruitment

No reduction in recruitable large woody debris would result from the implementation of this alternative.

Stream Temperature

No increases in stream temperature from a reduction in stream shading would be expected under this alternative.

Fish Passage

No changes in fish passage or habitat connectivity would be implemented under this alternative. Improvements for fish passage would be completed as funding sources are obtained.

Water Yield

No increase in water yield would be associated with this alternative. Annual water yields related to ECA would be expected to decrease over time as the project area trends toward a more fully forested condition.

Direct and Indirect Effects of the Action Alternative to Water Resources

Sediment Delivery

Past monitoring of statewide DNRC timber harvests has shown erosion on approximately 6 percent of the sites monitored, although no water-quality impacts from the erosion were found (*DNRC 2005*). These sites were harvested during the summer period and the erosion was attributed to inadequate skid trail drainage.

During a review of BMP effectiveness including stream buffer effectiveness, (*Raskin et al 2006)*, found that 95 percent of erosion features (disturbed soil) greater than 10 meters (approximately 33 feet) from the stream did not deliver sediment. His findings indicated that the main reasons stream buffers are effective include: 1) keeping active erosion sites away from the stream; and 2) stream buffers may intercept and filter runoff from upland sites as long as the runoff is not concentrated in gullies or similar features (*Raskin et al 2006*). No SMZ harvest would occur along fish-bearing streams. Equipment operation in the SMZ would not be permitted per the SMZ Law. Therefore, there would be no risk of displacing soil with harvesting equipment in the SMZ.

All construction would occur on soils that are suitable for road construction (*Martinson and Basko 1998*). Cut and fill slopes would be constructed at a stable slope to limit the potential risk of erosion. During the time required for vegetation to establish on cutslopes and fill slopes some erosion may occur, but required mitigation measures, such as slash filter windrows, sediment fences and rock armoring, would limit the risk of sediment entering the stream. Construction located further from streams would also have less risk of delivery into waterbodies.

Existing roads under this alternative would receive drainage improvements and upgrades or be reconstructed to minimize potential sediment delivery and meet BMPs. Minor drainage improvements include installing or reshaping drain dips, cleaning ditch-relief culvert catch basins, ditch reshaping and ditch-relief culvert extensions or replacements. Reconstruction would include major drainage improvements, such as stream-crossing upgrades to meet BMPs and the removal of undersized culverts. In addition, the proposed road construction would include two new stream crossings on non-fish-bearing streams. Current maintenance activities would continue to provide improved drainage to area roads. During stream crossing upgrades and installation, all requirements of the Stream Protection Act permit (124 permit) and short-term exemption from turbidity standards (318 authorization) would be followed to minimize

the sediment delivery into streams. In addition, short-term erosion control measures would be installed to minimize sediment transport until vegetation is established. Although all of these precautions would be implemented, minor amounts of sediment would likely enter the stream during and shortly after installation of new CMPs.

Approximately 21 sites that were included in the sediment inventory for the project area would be on the haul route. Although not all of the sites were identified as sediment sources, many of them would be improved or maintained to meet current forestry BMPs and protect water quality. The estimated current sediment delivery rate for these sites is 11.2 tons per year. After reconstruction, BMP upgrades, and installation of new CMPs, the estimated potential sediment delivery rate would be reduced to 4.8 tons per year. As the risk of sediment delivery at the new crossings would diminish after two years of vegetation growth, the estimated potential sediment delivery would be further reduced to 3.9 tons per year.

Because proposed harvest levels under this alternative would not increase water yield or stream flow above the recommended threshold, only a low risk of increased in-channel sediment would result from this alternative. In-channel sources of sediment would be expected to continue to contribute sediment at the current rate.

Since DNRC would incorporate BMPs into the project design as required by *ARM 36.11.422 (2)* and follow the SMZ Law and Rules, a low risk of sediment from timber harvest activities would result from the implementation of this alternative. The risk of long-term adverse direct or indirect effects to water quality or beneficial uses would also be low.

Fish Habitat Parameters

Large Woody Debris Recruitment

Most harvesting would occur at distances greater than 100 feet from fish-bearing streams; approximately 1,885 feet of potential fish-bearing streams would have some harvest within 100 feet, although no harvesting would occur within 50 feet of any potential fish-bearing stream. The level of harvest would vary from a seed tree prescription to an intermediate harvest that only removes approximately 50 percent of the trees. Furthermore, no harvesting would occur within 300 feet of Chicken Creek—a known fish-bearing stream.

Approximately 39.8 acres of forest are located within the average site potential tree height of potential fish-bearing streams. Under this alternative, approximately 1.5 of these acres (3.8 percent) would be harvested. This would leave more than 96 percent of the large woody debris available for natural recruitment into fish bearing streams. Some limited removal would occur in non-fish bearing SMZ, however, this would not be expected to have any direct or indirect effects to large woody debris recruitment for fish habitat.

Stream Temperature

Through implementation of the SMZ Law and Rules and Forest Management ARMs for fish-bearing RMZs and implementation of a 50-foot no-harvest buffer along Class 1 streams, timber harvest adjacent to known and potential fish-bearing streams in the project area would be limited to 4 percent of the total RMZ area. This prescription is expected to result in a minimal loss of stream shading. The consequent impact to stream temperatures in the project area is expected to be very low.

Fish Passage

No improvements to fish passage are associated with this alternative. Therefore, the three crossing structures that limit juvenile or adult connectivity would remain.

Water Yield

Approximately 376 acres would be harvested using conventional ground-based and cable yarding methods, and approximately 319 ECA would be generated from these activities. Most of the ECA (212) would be in the Swift Creek-Antice Creek watershed, which would result in an annual water yield increase of 1.0 percent. The remaining ECA (107) would be in the Swift Creek-Hemlock Creek watershed, which would result in an annual water yield increase of 0.2 percent. This level of increase would not be measurable and would not be expected to result in impacts that would be different from the current conditions.

Cumulative Effects of the No-Action Alternative to Water Resources

Sediment Delivery

The potential for sediment delivery from roads on the proposed haul routes would still exist, as would the in-channel sediment sources described in *EXISTING CONDITION*. The existing direct sediment-delivery sources would continue, until repaired by another project or funding source. In-channel sources of sediment would continue to exist and erode as natural events dictate.

Fish Habitat Parameters

Large Woody Debris Recruitment

No reduction in recruitable large woody debris would result from this alternative. Few stumps were found the SMZ which indicates limited past harvest in these areas. All of the riparian areas are currently fully stocked with sawtimber size trees. LWD would be retained at an adequate level to maintain stream form and function.

Stream Temperature

No increases in stream temperature from a reduction in stream shading would be expected under this alternative because no harvesting would occur and the current condition is fully stocked with sawtimber size trees.

Water Yield

No increase in water yield would be associated with this alternative. As vegetation continues toward a fully forested condition, annual water yields would also be expected to gradually decline.

Cumulative Effects Summary

As no timber harvesting, or associated activities, would occur under this alternative, cumulative effects would be limited to the existing condition. Sediment sources would continue, unless repaired under a separate project. Although some evidence of minor past harvesting in riparian zones is present, conditions would continue to provide adequate levels of large woody debris recruitment and shade retention in order to maintain channel form, function, and complexity and a natural range of water temperatures. Under this alternative, fisheries habitat quality would be maintained at its current level.

Cumulative Effects of the Action Alternative to Water Resources

Sediment Delivery

The proposed timber harvest and road construction activities would occur. A long-term reduction in direct sediment delivery would be expected due to culvert replacements and minor drainage improvements. A cumulative increase in sediment delivery as a result of upland timber harvest would have a low risk of occurring due to application of BMPs and by maintaining adequate stream buffers to filter potentially displaced soil. In-channel sources of sediment would continue to exist and erode, as natural events dictate, with a low risk of affecting beneficial uses. Therefore, the risk of cumulative sediment delivery would be reduced from pre-project conditions.

Fish Habitat Parameters

Large woody debris recruitment

Because a majority of the recruitable woody debris in the proposed harvest units would be retained, adverse affects would not likely result from the reduction.

Stream temperature

Due to the limited amount of shade-producing vegetation that would be removed, a low risk of cumulative temperature increases above naturally-occurring ranges would result from the implementation of this alternative.

Fish Passage

No reductions in fish passage limitations would be realized under this alternative—the three sites would remain partial barriers to habitat connectivity. No additional adverse impacts would occur to fish passage. The new crossing structures proposed would not be on fish-bearing streams and therefore would not cumulatively reduce the available habitat.

Water Yield

If this alternative were selected, the estimated cumulative water-yield increase in the Swift Creek-Antice Creek watershed would be 5.9 percent; the larger Swift Creek-Hemlock Creek watershed would experience an estimated cumulative annual water-yield increase of 5.7 percent. Because this level would remain below the threshold set in accordance with *ARM 36.11.425(g)*, a low degree of risk to water quality would result from the implementation of this alternative.

Cumulative Effects Summary

As all timber-harvesting activities would follow BMPs as required by *ARM 36.11.422*, and the direct and indirect effects would have a low risk of impacts, a low risk of additional adverse cumulative effects would be expected to occur under this alternative. This expectation includes the combined results of: 1) a reduction in direct sediment delivery from roads; 2) a slight reduction in potentially recruitable large woody debris in potentially fish-bearing stream corridors; and 3) a slight increase in modeled annual water-yield estimates for the Swift Creek-Antice Creek and the Swift Creek-Hemlock Creek 6th code HUC watersheds.

Soils Analysis

Introduction

This analysis is designed to disclose the existing condition of the soil resources and present the anticipated effects that may result from each alternative of this proposal. During the initial scoping, issues regarding soil impacts were identified by DNRC personnel and by the public. The following issue statements were compiled from comments regarding the effects of the proposed timber harvesting:

- *Ground based harvest techniques can displace and compact soils which can adversely affect the hydrologic function, soil structure and long-term productivity of the impacted area.*
- *Reduced infiltration capacity of an impacted soil can result in overland flow and off-site erosion, typically localized to main skid trails and log landing sites.*
- *Removal of both coarse and fine woody material off-site during timber harvest operations can reduce nutrient pools required for future forest stands and can affect the long-term productivity of the site.*

Analysis Area

The project area for this proposal includes approximately 1,805 acres. The project area contains 10 individual landtypes, however timber harvesting and road construction/ reconstruction are proposed on only six of these landtypes. The analysis area for soil impacts will be the area within harvest units and where proposed road activities would take place.

This analysis area will adequately allow for disclosure of existing conditions and direct, indirect, and cumulative impacts.

Analysis Methods

Methods for disclosing impacts include using general soil descriptions and the management limitations for each landtype. Landtype refers to a unit of land with similar designated soil, vegetation, geology, topography, climate, and drainage. This analysis will qualitatively assess the risk of negative effects to soils from erosion, compaction, and displacement from each alternative, using insight from previously collected soils-monitoring data from over 70 DNRC post-harvest monitoring projects. *(DNRC, 2005).*

Coarse woody material will be addressed by, first, disclosing existing levels from transect data collected during field reconnaissance. The transect data will be compared with scientific literature as required by *ARM 36.11.414 (2).* If the action alternative is selected, this assessment will assist in developing contract requirements and mitigation measures necessary to ensure post project levels of CWD adequately meet the recommendations of relevant literature, primarily Graham et al (1994). Fine woody material will be addressed solely through contract language that minimized removal *(ARM 36.11.410).*

While the anticipated impacts from each alternative will disclose the direct/indirect effects, the cumulative impacts will be the result of previous and proposed activities.

Existing Conditions

General Conditions

The *Soil Survey of Flathead National Forest Area, Montana* (*Martinson and Basko, 1998*) combines landform and soil information with habitat types to inventory and map soils in the project area. Thirteen landtypes were identified in the project area. *TABLE III-6 - PROJECT AREA LANDTYPE DESCRIPTIONS* provides a brief description of the landtypes within the project area while *FIGURE III-2 – LANDTYPES IN THE PROJECT AREA* provides a visual depiction of the landtype locations.

Stillwater State Forest, like much of northwest Montana, is dominated by bedrock consisting of metasedimentary rocks from the Proterozoic age. Rocks in this formation are generally comprised of argillites, quartzites, and siltites. Surface deposits of glacial till, outwash, and lacustrine sediments can be found throughout the area. Overlying these sediments is a layer of loess that has been influenced by volcanic ash deposited and redeposited from Mount Mazama approximately 6,700 years ago (*Martinson and Basko, 1998*).

Proposed harvest units are located on slopes up to 50 percent. The length of operating season would generally be shorter on more gentle slopes located at the base of mountain slopes. This is a result of soils holding water longer. *TABLE III-6 - PROJECT AREA LANDTYPE DESCRIPTIONS* displays the dominant slopes, soils and vegetation characteristics in the project and analysis area. Landtypes without proposed harvest units are noted.

Existing Conditions Due to Past Forest Management

Physical Soil Properties

DNRC strives to maintain soil productivity by limiting cumulative soil impacts to 15 percent or less of a harvest area, as noted in the SFLMP (*DNRC, 1996*). As a recommended goal, if existing detrimental soil effects exceed 15 percent of an area, proposed harvesting should minimize any additional impacts. Harvest proposals on areas with existing soil impacts in excess of 20 percent should avoid any additional impacts and include restoration treatments, as feasible, based on site-specific evaluation and plans.

Past monitoring on DNRC timber sales from 1988 to 2005 has shown an average of 13.9 percent soil impacts across all parent materials. Stratifying the results by soil texture that are similar to the majority of the proposed harvesting shows an average of approximately 15.5 percent of the harvest areas impacted from erosion, displacement or severe compaction (*DNRC 2005*).

The DNRC soil monitoring report *(DNRC 2005)* noted that ground-based sites harvested before 1990 had the largest areas of compaction attributed to dozer piling during the site preparation activities. Of the 19 sites with similar soils, 11 were dozer piled. The monitoring showed moderate or higher impacts from erosion, displacement or severe compaction covering 19.7 percent of these units, compared to 9.8 percent for the units that were not dozer piled. This practice has substantially been changed as a result of the monitoring.

Pre-1990 harvest sites averaged 16.0 percent of the area with moderate or higher impacts; post-1990 harvest sites averaged 13.7 percent of the area with moderate or higher impacts from erosion, displacement or severe compaction. Harvesting under winter conditions can result in lower impacts because the ground is frozen and

less susceptible to compaction and displacement. Post-1990 ground-based harvesting on similar soils under winter conditions resulted in average moderate-or-higher impacts from erosion, displacement or severe compaction of 11.7 percent, while summer (dry) activities exhibited 19.0 percent impacts.

Recent monitoring data on similar landforms near the project area was completed in 2003 on the Chicken-Werner Timber Sale. The unit monitored was harvested under dry fall and early winter conditions. Detrimental soil impacts from compaction, displacement and erosion were measured on six transects and averaged 9.7 percent.

DNRC has conducted soil monitoring on seven harvest units that were completed using cable yarding system and found that the average ground disturbance was 7.0 percent of the unit *(DNRC 2005)*.

Cumulative effects from past and current uses in the proposed harvest units are limited to a few skid trails and landings, generally dated from the early 1970's. Through the freeze-thaw cycles and root mass penetrating the soil, impacts from past entries are substantially reduced. Most impacts have been ameliorated over time, so that skid trails are very difficult to depict. Ocular estimate of impacts from past harvest is less than one percent of the proposed harvest areas.

Past harvesting operations in the project area and analysis area include harvests in the 1950's through the 1990's, although the majority of harvesting occurred in the 1950's, 1960's and 1970's. A list of harvesting in the project area can be found in the project file. Other forest product removals include fence posts and rails, firewood, and individual and commercial Christmas tree harvests throughout the last 70 years.

Nutrient Cycling

Coarse and fine woody debris provide a crucial component in forested environments through nutrient cycling, microbial habitat, moisture retention and protection from mineral soil erosion. *(Harmon et al 1986)*. While coarse woody debris decays at various rates due to local climatic conditions, the advanced stages of decay contains many nutrients and holds substantial amounts of moisture for vegetation during dry periods *(Larson et al. 1978, Wicklow et al. 1973)*. Forest management can affect the volumes of fine and coarse woody debris through timber harvesting and result in changes to the available nutrients for long term forest production.

During field reconnaissance, 37 transects were used to estimate coarse woody debris in the project area, with emphasis on proposed unit locations. The method for quantifying the coarse woody debris is described in the *Handbook for Inventorying Downed Woody Material (Brown, 1974)*. The average tonnage per acre was 15.5 with a wide range of 0 to 45.4 tons per acre. The median—which is the point with half of the transects showing more and half of the transects showing less—was 10.9 tons per acre.

These results are on the high end of recommendations in *Managing Coarse Woody Debris in Forests of the Rocky Mountains (Graham et al, 1994)* on similar habitat types post timber harvest. Subalpine fir habitat types are recommended to have a level of coarse woody debris in the range of 7.3 to 22.8 tons per acre to maintain forest productivity. Grand fir habitat types are recommended to have a range of 7-14 tons per acre to maintain forest productivity. Currently, 46% of the transects were in the recommended range and 73% of the transects were above the minimum recommendation.

FIGURE III-2 – LANDTYPES IN THE PROJECT AREA

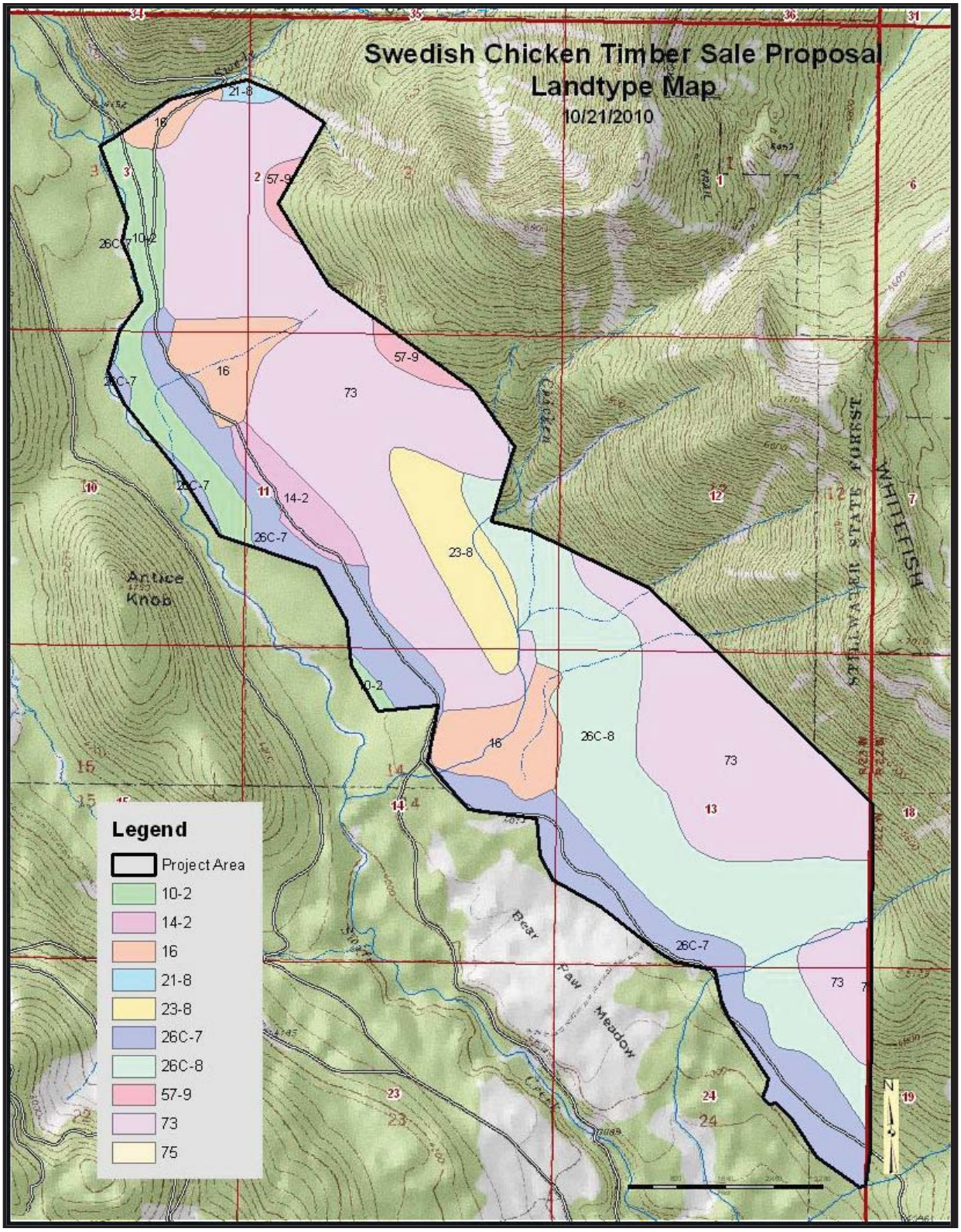


TABLE III-6 - PROJECT AREA LANDTYPE DESCRIPTIONS

Landtype	Name	Soil & Vegetation Descriptions	Management Considerations			
			K factor**/ erosion potential	Timber	Roads	Comments
10-2 (97 acres of Project Area)	Fluvent, Stream bottoms. 0-5 % slopes.	This landtype is built on alluvial deposits underlying a loamy sand surface layer. Vegetation is a mixed forest of subalpine fir, Engelmann spruce, Douglas-fir, western white pine, western larch and lodgepole pine. The understory is comprised of a wide variety of forbs in a community dominated by tall shrubs.	K=0.32 Erosion potential is moderate. Sediment delivery efficiency is low due to the gentle terrain; however disturbed soils on or adjacent to streambanks can result in substantial sedimentation.	Potential Prod: Moderate. Equipment: Tractor. Regen: Can be limited by wet soil, frost pockets and competition.	Low soil strength Wet soils may limit road locations. Flooding may damage culverts/bridges.	**No activities proposed on this landtype.**
14-2 (42 acres of Project Area)	Stream bottoms & depressions. 0-20 % slopes.	This landtype is found on stream bottoms and in depressions on moraines. The lower soil layers are formed in lacustrine. Vegetation is comprised of mixed conifers species that grow in the moist environments of the Northwest. The under story is dominated by forbs and low shrubs.	K=0.37 Erosion potential is moderate to severe. Sediment delivery efficiency is low. Fine sediment from these soils has a high potential for damaging spawning habitat.	Potential Prod: High. Equipment: Tractor. Regen: Can be limited by wet soil, frost pockets and competition.	Cutbanks on terraces tend to slough. Unsurfaced roads rut when wet.	Substantial riparian vegetation for wildlife habitat and water quality.
16 (138 acres of Project Area)	Fluvents, alluvial fans. 5-25% slopes.	Alluvial deposits at the point where steep mountain streams enter valley bottoms. Some areas may have surface layers formed in volcanic ash-influenced loess. Vegetation is a mixed forest of conifers over an understory dominated by forbs and low shrubs. Subalpine fire/queencup beadlily is the dominate habitat type on these lands.	K=0.17 Surface soil erosion potential is moderate. Sediment delivery efficiency is low.	Potential Prod: High. Equipment: Tractor, limited by wet soils. Regen: Can be limited by wet soil, frost pockets and competition.	Due to the circumstances in which this landtype was formed, numerous seeps and springs are present. Excavation can intercept considerable ground water. Steep cutslopes tend to ravel.	Soils may not dry out enough to harvest with conventional ground-based operations. Winter logging is a potential mitigation.
21-8 (6 acres of Project Area)	Cirque basins. 20 to 40 % slopes. 5,500 to 7,000 feet elevation.	These soils have been influenced by volcanic ash. Soils on concave lower slopes have deeper soils than areas on ridges and knolls. Soils on ridges may contain residuum. Vegetation is mixed forest of subalpine fir, Engelmann spruce, whitebark pine and lodgepole pine. Forest understory is dominated by forbs and large shrubs. Subalpine fir/wood-rush, Menziesia phase is a major habitat type.	K=0.17 to 0.37 Erosion potential is moderate on skid trails. Road construction material has a slight erosion hazard. Sediment delivery efficiency is considered low.	Potential Prod: Low. Equipment: Tractor (may be limited due to wet soil and broken slopes.) Cable systems are appropriate on slopes over 40%. Regen: Can be limited by wet soil, frost pockets and harsh subalpine climate.	Hard rock may limit excavation. Very rocky soil is difficult to revegetate due to low-moisture holding capacity. Driving surface is generally rough on unsurfaced roads.	Productivity limited by rock outcrops. Soils easily compactable due to inability to dry adequately (elevation). Seeps and springs are present in places. **No activities proposed on this landtype.**
23-8 (83 acres of Project Area)	Glaciated mountain slopes. 20-40% slopes.	Soils of this landtype are formed in glacial till. Vegetation found in ranges from a moist, mixed forest, to a dry, mixed forest.	K=0.32 Erosion potential is low to moderate. Sediment delivery efficiency is moderate.	Potential Prod: Moderate/high Equipment: Tractor Regen: Can be limited by wet soil, frost pockets and competition.	Roads perform well with standard location, construction and maintenance practices. Some cutslopes may be difficult to revegetate due to moisture stress.	

26C-7 (265 acres of Project Area)	Rolling glacial till deposits (Moraines). 10-20 % slopes.	These landtypes (26C-7, 26C-8 and 26C-9) are found on glacial moraines with soils comprised of a volcanic ash-influenced loess overlying silty glacial till. Vegetation is comprised of Douglas-fir, lodgepole pine and western white pine, although other species are included in places. The understory contains low shrubs and forbs.	K=0.32 Erosion potential is moderate to severe depending upon slope. Sediment delivery efficiency is moderate.	Potential Prod: High. Equipment: Tractor. Regen: Can be limited by frost pockets.	This landtype is well-suited to road construction for properly located and maintained roads. Tread erosion will result in a rough driving surface. Steep cutbanks tend to slump.	Soil compaction is a concern —operations should be confined to periods with acceptable risks.
26C-8 (368 acres of Project Area)	Glaciated Mountain slopes. 20-40 % slopes.					
57-9 (25 acres of Project Area)	Glaciated mountain ridges. 40 to 60 % slopes. 4,000 to 7,500 feet elevation.	Surface soils are medium-textured, gravelly, and very gravely silt loam, and consist of volcanic ash-influenced loess up to 22 inches thick. Subsoils contain 35 to 80 percent angular and rounded rock fragments. Vegetation is a mixed forest of subalpine fire, Douglas-fir, lodgepole pine, western larch and western white pine. The understory is mainly forbs and low shrubs. Subalpine fir/beargrass is the major habitat type on south slopes while subalpine fir/grouse whortleberry is the major habitat type on north aspects.	K=0.17 Erosion potential is moderate on firelines and skid trails. Sediment delivery efficiency is low.	Potential Prod: Moderate. Equipment: Tractor. Regen: Can be limited by droughtiness; especially on southern aspects.	This landtype is well suited to road construction for properly located and maintained roads.	Surface drainage is very limited in this landtype. Soil displacement can lower soil productivity. **No activities proposed on this landtype.**
73 (780 acres of Project Area)	Glacial trough walls. 60-90 % slopes.	Soils on lower slopes are formed in glacial till. All soils are derived from metasedimentary rock. Vegetation is characteristic of a mixed forest, including Douglas-fir, lodgepole pine and subalpine fir. The understory is dominated by forbs and shrubs.	K=0.17 Erosion potential varies from low to very severe. Sediment delivery efficiency is high on upper slopes and low on lower slopes.	Potential Prod: Moderate to high. Equipment: Cable. Regen: Can be limited by plant competition (northern aspects) or moisture stress (mainly southern aspects).	Hard rock frequently limits excavation. Due to steep slopes, cutslopes and fillslopes are large. Unsurfaced roads are very rough. Due to moisture stress, revegetation of cutslopes is difficult.	Avalanche paths are common in this landtype, although none were identified in the project area.

Table III-6 Notes:

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

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

Environmental Effects

Description of Alternatives

No-Action Alternative

No timber harvesting or associated activities would occur under this alternative.

Action Alternative

Thirteen units totaling approximately 376 acres would be commercially harvested under this alternative. Approximately 357 acres would be harvested using conventional ground-based equipment, while the remaining 19 acres would be treated using cable methods. All timber harvest may be completed under summer or winter conditions. In addition, approximately 2 miles of new road would be constructed (0.7 would be temporary), 1.3 miles of road would be reconstructed, and approximately 13.2 miles of road would be maintained or have minor drainage improvements installed as necessary to protect water quality.

Environmental Effects on Soils

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

No timber harvesting or associated activities would occur under this alternative. Skid trails from past harvesting would continue to recover from compaction as freeze-thaw cycles continue and vegetation root mass increases.

Direct and Indirect Effects of the Action Alternative on Soils

To provide an adequate analysis of potential impacts to soils, a brief description of implementation requirements is necessary. *ARM 36.11.422 (2)* and *(2)(a)* state that appropriate BMPs shall be determined during project design and incorporated into implementation. To ensure that the incorporated BMPs are implemented, the specific requirements would be incorporated into the DNRC Timber Sale Contract. As part of this alternative design, the following BMPs are considered appropriate and, would be implemented during harvesting operations:

1) Limit equipment operations to periods when soils are relatively dry, (less than 20 percent, except on landtypes 26C-7 and 26C-8 which would be less than 18 percent), frozen, or snow-covered in order to minimize soil compaction and rutting, and maintain drainage features. Check soil moisture conditions prior to equipment start-up.

2) On ground-based units, the logger and sale administrator would agree to a general skidding plan prior to equipment operations. Skid-trail planning would identify which main trails to use and how many additional trails are needed. Trails that do not comply with BMPs (i.e. trails in draw bottoms) would not be used unless impacts can be adequately mitigated. Regardless of use, these trails may be closed with additional drainage installed, where needed, or grass-seeded to stabilize the site and control erosion.

3) Tractor skidding should be limited to slopes of less than 40 percent unless the operation can be completed without causing excessive displacement or erosion. Based on site review, short, steep slopes above incised draws may require a combination of mitigation measures, such as adverse skidding to a ridge or winchline, and skidding from more moderate slopes of less than 40 percent.

4) Keep skid trails to 20 percent or less of the harvest unit acreage. Provide for drainage in skid trails and roads concurrently with operations.

5) Slash disposal: Limit the combination of disturbance and scarification to 30 to 40 percent of the harvest units. No dozer piling on slopes over 35 percent; no excavator piling on slopes over 40 percent, unless the operation can be completed without causing excessive erosion.

Consider lopping and scattering or jackpot burning on the steeper slopes. Consider disturbance incurred during skidding operations to, at least, partially provide scarification for regeneration.

6) Retain 10 to 20 tons of large woody debris and a feasible majority of all fine litter following harvesting operations. On units where whole tree harvesting is used, implement one of the following mitigations for nutrient cycling: 1) use in-woods processing equipment that leaves slash on site; 2) for whole-tree harvesting, return-skid slash and evenly distribute within the harvest area; or 3) cut tops from every third bundle of logs so that tops are dispersed as skidding progresses.

Physical Soil Properties

Considering data from the *DNRC SOIL MONITORING REPORT (DNRC, 2005)*, the implementation of Forestry BMPs has resulted in less risk of detrimental soil impacts from erosion, displacement, and severe compaction. While the report noted that the impacts were more likely on the fine-textured soils and steep slopes, reduced soil productivity due to compaction and displacement can occur on coarser parent materials. Also, the greatest impacts occurred where harvesting implementation departed from BMP's by ground-base skidding on slopes of greater than 40 percent.

Comparing the soil type map, field reconnaissance notes, and topographic map features with the proposed harvest unit map, indicates that ground-based skidding would occur on slopes of up to 45 percent under this alternative. The extent of expected impacts would likely be similar to those reported in the *DNRC SOIL MONITORING REPORT (DNRC, 2005)*, or approximately 13.7 percent of the harvest area for ground-based operations during summer conditions, while the cable-yarding units would have potential impacts on up to 7 percent of the area. Potential impacts to soils from cable yarding would generally be displacement, although some compaction could occur. In addition, cable corridors may pose a slight risk of routing water because the corridor is generally parallel to the fall-line of the hill slope. *TABLE III-7 EXPECTED ACRES OF IMPACT TO SOIL FROM COMPACTION AND DISPLACEMENT* summarizes the expected impacts to soils within harvest units.

TABLE III-7 - EXPECTED ACRES OF IMPACT TO SOIL FROM COMPACTION AND DISPLACEMENT

HARVEST METHOD AND SEASON	NO-ACTION ALTERNATIVE	ACTION ALTERNATIVE
Ground based - summer harvest (357 acres with impacts up to 13.7 percent of the harvest area)	0	48.9 acres
Cable (19 acres with impacts up to 7 percent of the harvest area)	0	1.3 acres
Total area of impacts	0	50.2 acres
Total harvest	0	376 acres
Percent of area impacted in harvest units	0	13.4 percent

In addition to the potential impacts from harvesting, approximately 11.2 acres would be impacted by new roads assuming a 50-foot clearing limit width. While the use of these roads would be temporary, the road prism would remain for future management opportunities; therefore, these 3.3 acres of road prism (14 feet wide by two miles in length) would effectively be removed from forest production. Road construction would likely result in more erosion than native topography; however, BMP implementation would minimize the risk of erosion by stabilizing soils quickly and protecting against sediment delivery to water bodies. Although erosion-mostly associated with road construction—would be likely under this alternative, the magnitude, area and duration of erosion and other adverse impacts such as compaction and displacement would remain less than acceptable threshold. Therefore the risk of unacceptable adverse direct and indirect impacts to physical soil properties would be low or low/moderate. A discussion of sediment delivery to stream and BMPs can be found in the *WATER RESOURCES ANALYSIS*.

As vegetation begins to establish on the impacted areas and freeze-thaw cycles occur, the area of reduced productivity would decrease.

Nutrient Cycling

As required in the DNRC Timber Sale Contract, both fine and coarse woody debris would be retained to reduce potential impacts to forest productivity. Although, fine woody debris would be left on-site for nutrient retention, a moderate reduction in annual fine material contribution would result from this alternative for up to 20 years. Coarse woody debris would be left on-site in a level recommended to help maintain soil moisture and forest productivity, generally in the 10 to 20 tons per acre range for habitat types found in the harvest locations *(Graham et al. 1994)*. As coarse woody debris would be left on site in amounts recommended by scientific literature, and fine debris removal would be maintain as much as practicable, the risk of measureable adverse direct or indirect impacts to nutrient cycling would be low.

Cumulative Effects of the No-Action Alternative to Soils

No additional adverse cumulative effects would be expected from the implementation of the No-Action Alternative. Harvesting would not be implemented, therefore, compaction, displacement and erosion rates above natural levels would not be expected. Coarse woody debris levels and nutrient cycling would continue without anthropogenic alteration.

Cumulative Effects of the Action Alternative to Soils

Cumulative effects would be controlled by limiting the area of adverse soil impacts to less than 15 percent of the harvest units (as recommended by the SFLMP) through implementation of BMPs, skid trail planning on tractor units, and limiting operations to dry or frozen conditions. Future harvesting opportunities would likely use the same road system, skid trails, and landing sites to reduce additional cumulative impacts. Due to these mitigation measures and the limited area of re-entry, the cumulative effects to soils from compaction, erosion and displacement would be low.

Both fine and large woody debris would be retained for nutrient cycling for long-term soil productivity. By following research recommendations on the levels of coarse and fine material left on site, the risk of cumulative impacts to forest productivity from nutrient pool loss would be low.

By designing the proposed harvesting operations with soil-moisture restrictions, season of use, and method of harvesting, the risk of unacceptable long-term impacts to soil productivity from compaction and displacement and nutrient pool losses would be low.

Economic Analysis

Introduction

This analysis describes the existing economic environment and identifies the potential direct, indirect, and cumulative economic effects associated with the proposed action.

Issues and Measurement Criteria

The following issue statement was crafted to guide the analysis of this section:

The proposed action may affect income generated for Common School Trust funds, funding for Forest Improvement (FI) projects, timber-related employment, and the regional economy.

The following measurement criteria were selected to describe the existing environment of the economic resource in the area and to 'measure' the extent of the potential direct, indirect, and cumulative economic effects under each alternative:

For revenue, the measurement criterion is dollars distributed to the aforementioned trusts, Forest Improvement (FI) program, and regional economy.

For employment, the measurement criterion is the number of timber-related jobs provided.

Analysis Area

The geographic scope of the economic analysis is located within Flathead and Lincoln counties and is economically relevant to the proposed action.

Analysis Methods

The economic analysis for the timber sale proposal includes estimates of project revenue, and income distributed to state trusts. Minimum bids for timber sales are determined through a transaction evidence appraisal, which is based on bid rates of past timber sales and current wood product price indexes. Characteristics that influence bid rates include market prices, sale location, logging and road development costs, as well as quality, species, size, and density of timber. Stumpage prices for this EA were determined using the current transaction equation modified by professional judgment to reflect current and local market conditions.

The Western Wood Products Association Inland Lumber Price Index for 2009 was used for estimating the delivered price of the logs.

FI fees are estimated using the current FI fee schedule set at $39.10 per Mbf.

DNRC does not have a formal accounting system to track costs for individual projects from start to finish. A cash-flow analysis of the DNRC forest product sales program is conducted annually. Revenue and costs are calculated by land office and at the statewide level. The revenue-to-cost ratios are a measure of economical efficiency.

Ratio values less that 1.0 means the costs are higher than the revenues (losing money). A ratio greater that 1.0 means the revenues are higher that the costs (making money).

Estimated forest-management revenues and expenditures for the Swedish Chicken Timber Sale Project were based on a 2006 through 2010 average operational revenue/cost ratio of $2.51. This ratio means that an average of $2.51 was earned in revenue for every $1.00 spent over the last 5 years in the forest-management program.

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 one full year due to this timber sale.

Existing Environment

The proposed action would take place on state lands managed by DNRC's Stillwater Unit. Timber sales in this area generally supply raw materials for lumber and pulp industries in Lincoln and Flathead counties. Flathead County includes the northern portion of Flathead Lake and the west side of Glacier Park. Lincoln County encompasses the northwestern corner of Montana.

Though the overall economy in each county is different, they share forestry and logging industries. Employment and wages for Forestry and logging *(NAICS)* in the 2-county area are described in detail below *(TABLE III-8 EMPLOYMENT AND WAGES)*. 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.

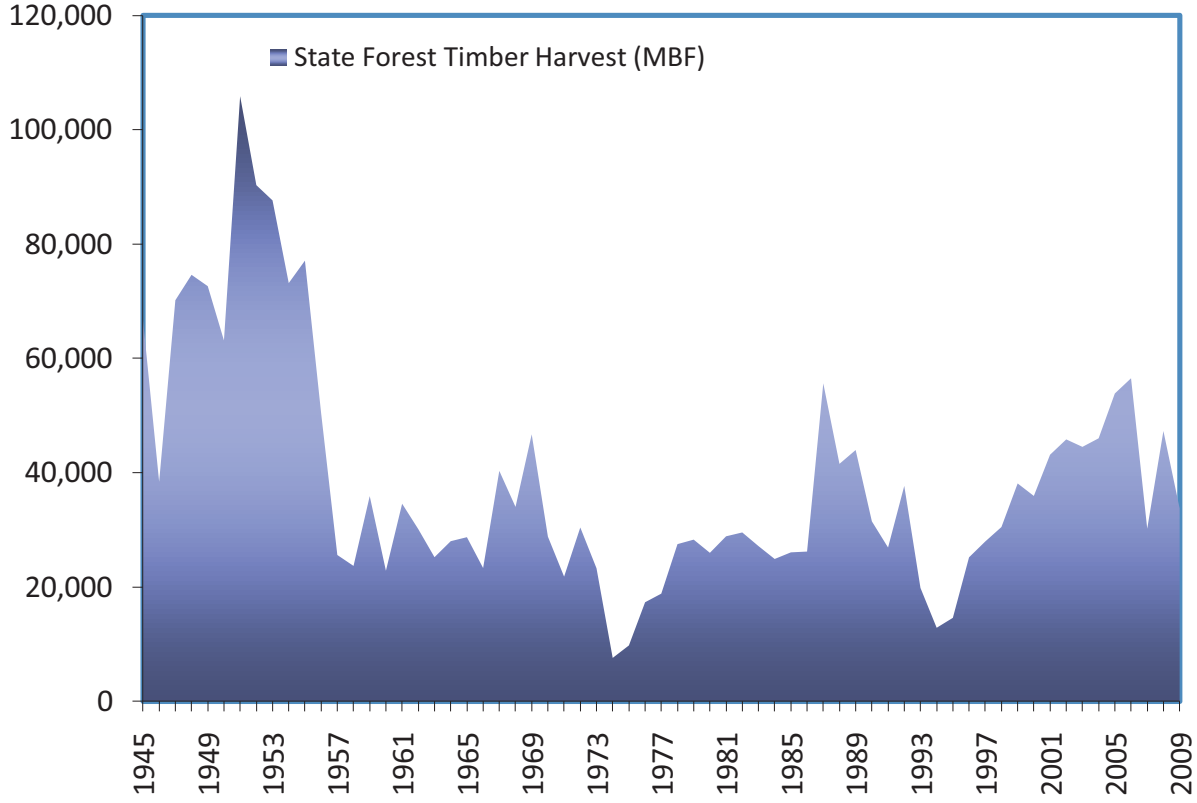
TABLE III-8 EMPLOYMENT AND WAGE. County Employment and Average Wages 2008

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

Historically, harvesting activity in Montana's timber-related industries has fluctuated. *FIGURE III-3 TIMBER HARVEST* shows the aggregate timber-harvesting activity in Montana. The more recent volume decline is, in part, a reflection of the diminishing contribution of USFS to statewide harvest levels. Currently, DNRC has an annual statewide sustained yield of 53.2 MMbf.

FIGURE III-3 TIMBER HARVEST.

Total Timber Harvesting in Montana Forests 1945 through 2009

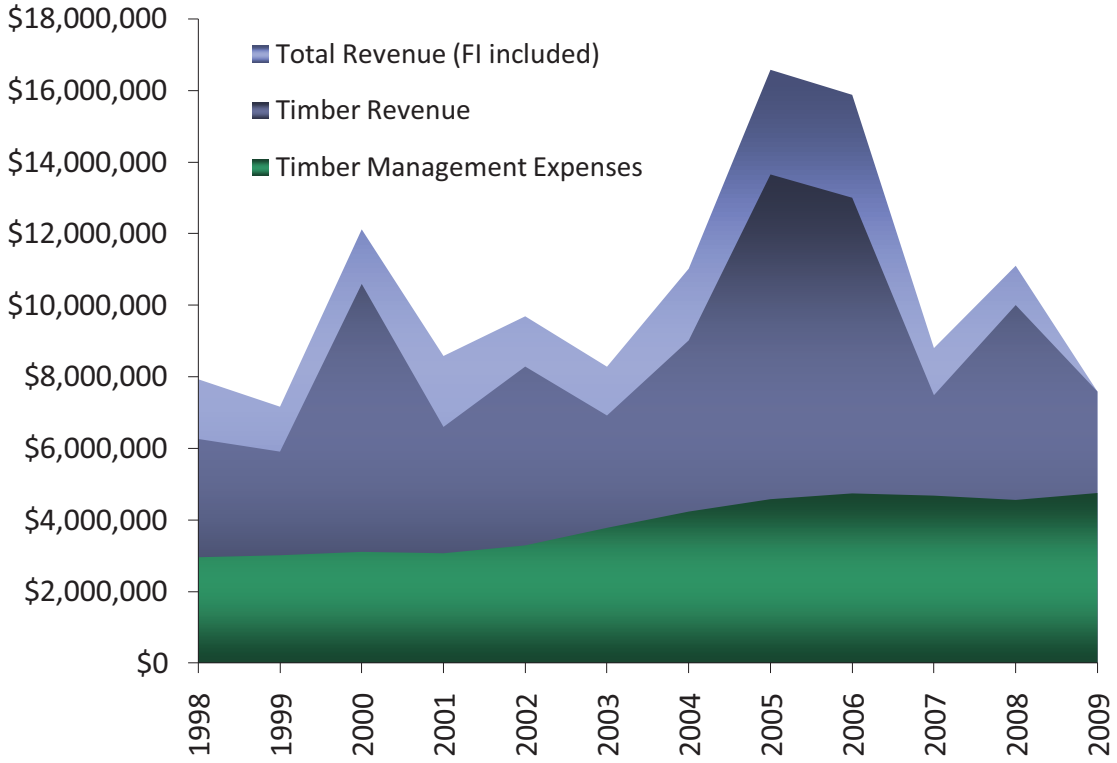


State-owned forests contribute revenues to trusts based on harvested volume and market prices. Timber sale revenues distributed to the trusts vary more widely than the respective volume sold. This additional variability in revenue comes from timber prices that fluctuate according to supply and demand events in national and international markets. *TABLE III-9 - TIMBER SALE REVENUE* shows gross revenue from harvests, net revenues distributed to the trusts, and FI fees collected over the last 5 years.

TABLE - III-9 TIMBER SALE REVENUE

YEAR	GROSS TIMBER REVENUE ($)	TIMBER REVENUE DISTRIBUTED TO TRUSTS ($)	FI FEES COLLECTED ($)
2010	8,044,850	3,231,746	1,196,307
2009	7,584,556	3,386,103	868,511
2008	10,000,724	5,858,579	1,098,577
2007	7,482,894	3,179,167	1,316,404
2006	13,000,338	8,963,990	2,875,277
2005	13,651,631	9,904,500	2,924,052

FIGURE III-4 TIMBER HARVEST. *Timber Revenues and Expenses on State Lands*



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 the piling and disposal of logging slash, reforestation, thinning, prescribed burning, site preparation, noxious weed control, seed collection, acquiring access and maintaining roads necessary for timber harvesting and monitoring. Plus, 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*).

Environmental Effects

Direct economic environmental effects are those that alter trust land revenues and timber-related industries in the 2-county area. Indirect economic environmental effects are those that alter other sectors in the economy. Cumulative economic environmental effects are typically seen as those that contribute to long-term changes in any part of the economy.

Direct and Indirect Effects of the No-Action Alternative to Economics

As displayed in *TABLE III-10 - COSTS AND BENEFITS ASSOCIATED WITH THE PROJECT BY ALTERNATIVE*, 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 for the potential loss of logs that would not be delivered to their mill from this alternative. Trust funding would not benefit from this alternative.

Direct Effects of the Action Alternative to Economics

As displayed in *TABLE III-10 - COSTS AND BENEFITS ASSOCIATED WITH THE PROJECT BY ALTERNATIVE*, an estimated $402,000 in revenue would be deposited into the involved trusts and an estimated $156,400 would be deposited into the FI account. Approximately $110,000 of road development and maintenance work would be accomplished. An estimated $69,700, or $185.37 per acre, would be spent from the FI budget to reduce fire hazards and prepare harvested areas for natural and planted regeneration.

TABLE III-10 – COSTS AND BENEFITS ASSOCIATED WITH THE PROJECT BY ALTERNATIVE

	ALTERNATIVES	
	NO-ACTION	ACTION
Estimated total harvest volume (MMbf)	0	4.0
Road development costs ($/Mbf)	0	27.50
Estimated stumpage value ($/Mbf)	0	100.50
FI fee ($/Mbf)	0	39.10
Estimated stumpage value, FI, and development cost ($/Mbf)	0	167.10
Total timber-dollar value based on estimated stumpage value, FI, and road-development value, multiplied by the estimated harvest volume ($)	0	668,400
Estimated stumpage value and FI ($/Mbf)		139.60
Total revenue ($) to the State (stumpage value and FI)	0	558,400
Total revenue ($) to the involved trusts (stumpage value)	0	402,000

Indirect Effects of the Action Alternative

Approximately 376 acres of timber would be treated, and 222 acres would be moved toward a more desirable future condition. Both Flathead and Lincoln counties have a substantial presence in the wood-processing industry. To the extent that sales provide employment, and using the employment multiplier as stated under *ANALYSIS METHODS*, this sale would provide work for approximately 40 positions. As a result, the short-term impact would be positive.

Cumulative effects of the No-Action Alternative on Economics

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; however, the timber may be from other areas and not benefit this region of the State. This forest area would again be available for harvesting considerations.

Cumulative Effects of the Action Alternative on Economics

The action alternative would contribute volume to the annual sustained yield of 53.2 MMbf. This 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 on 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. Therefore, one of the cumulative effects of the proposed action, in conjunction with other timber harvests, is the preservation of economic viability in Montana's timber resources.

The proposed action would also contribute proportionally to public school funding. Funds distributed by 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 proposed action would also contribute to the overall size of the 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.

Wildlife Analysis

Introduction

This analysis is designed to disclose the existing condition of the wildlife resources and display the anticipated direct, indirect, and cumulative effects that may result from each alternative of this proposal. The DNRC Forest Management Rules and comments received during initial scoping led to the following list of issues:

The proposed activities could alter mature forested habitats and landscape connectivity, which could affect species that rely on these mature forested habitats, and/or alter connectivity and the ability of wildlife requiring corridors to move through the landscape.

The proposed activities could reduce snags and coarse woody debris densities, leading to a decline in the quality of habitat for wildlife species that are dependent on these resources, which could alter their survival and/or reproductive ability.

The proposed activities could alter cover, increase human access, and reduce secure areas, which could adversely affect grizzly bears by displacing them from important habitats and/or increasing risk to bears of human-caused mortality.

The proposed activities could change stand conditions, which could reduce or modify lynx foraging habitats, denning habitats, and suitable habitats, rendering them unsuitable for supporting lynx.

The proposed activities could displace gray wolves from important habitats, particularly denning and rendezvous sites, and/or alter prey availability.

The proposed activities could reduce the amount and/or quality of fisher habitats, which could alter fisher use of the area.

The proposed activities could remove canopy cover and snags needed by pileated woodpeckers to forage and nest and/or displace pileated woodpeckers from active nests, resulting in increased mortality to pileated woodpecker chicks.

The proposed activities could remove elk security cover, which could affect hunter opportunity and local quality of recreational hunting.

Analysis Area

The discussions of existing conditions and environmental effects will focus on 2 different scales. The first will be the ‘project area’, which consists of approximately 1,805 acres of DNRC-managed lands in Sections 3, 10, 11, 13, 14, and 24, T33N, R23W. The second scale or the *cumulative effects analysis area (CEAA)* relates to the surrounding landscape for assessing cumulative effects to wildlife species and their habitats. The scales of these analysis areas vary according to the species being discussed, but generally approximate the size of the home range of the discussed species.

Analysis Methods

DNRC attempts to promote biodiversity by taking a 'coarse-filter approach', which favors an appropriate mix of stand structures and compositions on state lands (*ARM 36.11.404*). Appropriate stand structures are based on ecological characteristics (e.g., landtype, habitat type, disturbance regime, unique characteristics). A coarse-filter approach assumes that if landscape patterns and processes are maintained similar to those with which the species evolved, the full complement of species would persist and biodiversity would be maintained. This coarse-filter approach supports diverse wildlife populations by managing for a variety of forest structures and compositions that approximate historic conditions across the landscape. DNRC cannot assure that the coarse-filter approach will adequately address the full range of biodiversity; therefore, DNRC also employs a 'fine-filter' approach for threatened, endangered, and sensitive species (*ARM 36.11.406*). The fine-filter approach focuses on a single species' habitat requirements.

To assess the existing condition of the proposed project area and surrounding landscape, a variety of techniques were used. Field visits, scientific literature, SLI data, aerial photographs, Montana Natural Heritage Program (MNHP) data, and consultations with other professionals provided information for the following discussion and effects analysis. Specialized methodologies are discussed under the species in which they occur. Species were dismissed from further analysis if habitat did not exist in the project area or would not be modified by any alternative. Past and current activities on all ownerships in each analysis area, as well as planned future agency actions, have been taken into account for the cumulative-effects analysis.

Relevant Agreements, Laws, Plans, Rules, and Regulations

Various legal documents dictate management criteria for the management of wildlife and their habitats on state lands. The documents most pertinent to this project include: *DNRC Forest Management Rule*s, the *Endangered Species Act*, the *Migratory Bird Treaty Act*, and the *Bald and Golden Eagle Protection Act*.

Coarse Filter Wildlife Analysis

Of the 108 mammal species found in Montana, 66 are suspected or known to occur in Flathead County (*Foresman 2001*). The majority of terrestrial vertebrates that were present at the time of European settlement likely still occur in the vicinity of the proposed project area. Six amphibian and 7 reptile species have also been documented in Flathead County (*Maxell et al. 2003*) and at least 65 species of birds have been documented in the vicinity in the last 10 years (*Lenard et al. 2003*). Terrestrial species that rely on special habitat elements, such as white bark pine (*Pinus albicaulis*), western white pine (*Pinus monticola*), or burned areas, may not be present or may occur in lower abundance due to the decline of these elements across the landscape. Over time, due to fire suppression, tree densities have increased and shade-tolerant species, such as Douglas-fir and grand fir, have become more prevalent than they were historically. These departures probably benefit wildlife species that rely on shade-tolerant tree species and/or closed-canopy habitats, while negatively affecting species that rely on shade-intolerant tree species and/or open habitats. However, in the vicinity of the project area, the forests are a mosaic of mature stands and

regenerating forests, which benefit both the wildlife species that rely upon mature forests, and species that use early seral stages, either exclusively or seasonally. Past timber harvesting that led to the early seral stages has likely reduced the quality and quantity of snags and coarse woody debris compared to historical conditions, thereby reducing habitat for those wildlife species that require these components.

Mature forested habitats and landscape connectivity

Issue

The proposed activities could alter mature forested habitats and landscape connectivity, which could affect those species that rely on these mature forested habitats and/or alter connectivity and the ability of wildlife requiring corridors to move through the landscape.

Introduction

A variety of wildlife species rely on mature to old stands for some or all life requirements. A partial list of these species includes pileated woodpeckers *(Dryocopus pileatus),* American marten *(Martes americana)*, brown creepers *(Certhia americana)*, and winter wrens *(Troglodytes troglodytes)*. Wildlife species that require connectivity of forest habitat types between patches, or those species that are dependent upon interior forest conditions, can be sensitive to the amount and spatial configuration of appropriate habitats. Some species are adapted to thrive near patch edges, while others are adversely affected by the presence of edge, or the other animals that prosper in edge habitats. Connectivity of forested habitats facilitates movements of those species that avoid non-forested areas and other openings; connectivity under historical fire regimes likely remained relatively high as fire differentially burned various habitats across the landscape.

Analysis Area

Direct and indirect effects were analyzed on the project area. Cumulative effects were analyzed on the contiguous Stillwater State Forest. This scale of analysis would be large enough to support a diversity of species that use mature forested habitats and/or require connected forested habitats.

Analysis Methods

Mature forested habitats and landscape connectivity were assessed using field evaluations, aerial-photograph interpretation, and Geographical Information System (GIS) analysis. Factors considered in the analysis include the level of timber harvesting, amount of densely forested habitats, and connectivity.

Existing Environment

The project area currently contains approximately 1,598 acres of mature stands (100-plus years in age) of Douglas-fir/western larch and mixed-conifer stands that have a reasonably closed canopy. Of these older stands, at least 358 acres meet the definition of old-growth (*Green et al. 1992*). These stands are interspersed with a variety of Douglas-fir/western larch, subalpine fir, and mixed-conifer stands of varying ages and stocking densities. Currently, forested areas cover most of the project area, facilitating some use by those species requiring connected, forested conditions and/or forested-interior habitats. However, connectivity within the project area has been reduced with past timber harvesting and the network of open roads. In the project area, there are at least 5 potential corridors *(FIGURE III-5 - MATURE FORESTED HABITATS AND*

LANDSCAPE CONNECTIVITY CORRIDORS) that could facilitate travel between the Antice Creek bottom (and beyond to Stryker Ridge) and the Whitefish Divide, particularly along 5 riparian stream courses.

The network of open roads in the cumulative-effects analysis area, coupled with timber management on roughly 21,936 acres in the past 40 years, has reduced some of the landscape-level connectivity and fragmented existing habitats. Ongoing harvesting associated with the Duck-to-Dog, Chicken-Antice, Olney Urban Interface, Beaver/Swift/Skyles, Southeast Stryker Ridge, and Lupfer #3 timber sale projects would continue reducing forested habitats and/or altering connectivity. Across the cumulative-effects analysis area, landscape connectivity has largely been retained and considerable forested-interior habitats exist. Considerable amounts (at least 38,157 acres) of mature western larch/Douglas fir, subalpine fir, and mixed-conifer habitats that have a reasonably closed canopy exist across the cumulative-effects analysis area. A portion of these mature stands are included in the 12,646 acres (10.8 percent) across Stillwater Unit (see *VEGETATION ANALYSIS*) that meets the definition of old-growth (*Green et al. 1992*).

Environmental Effects

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

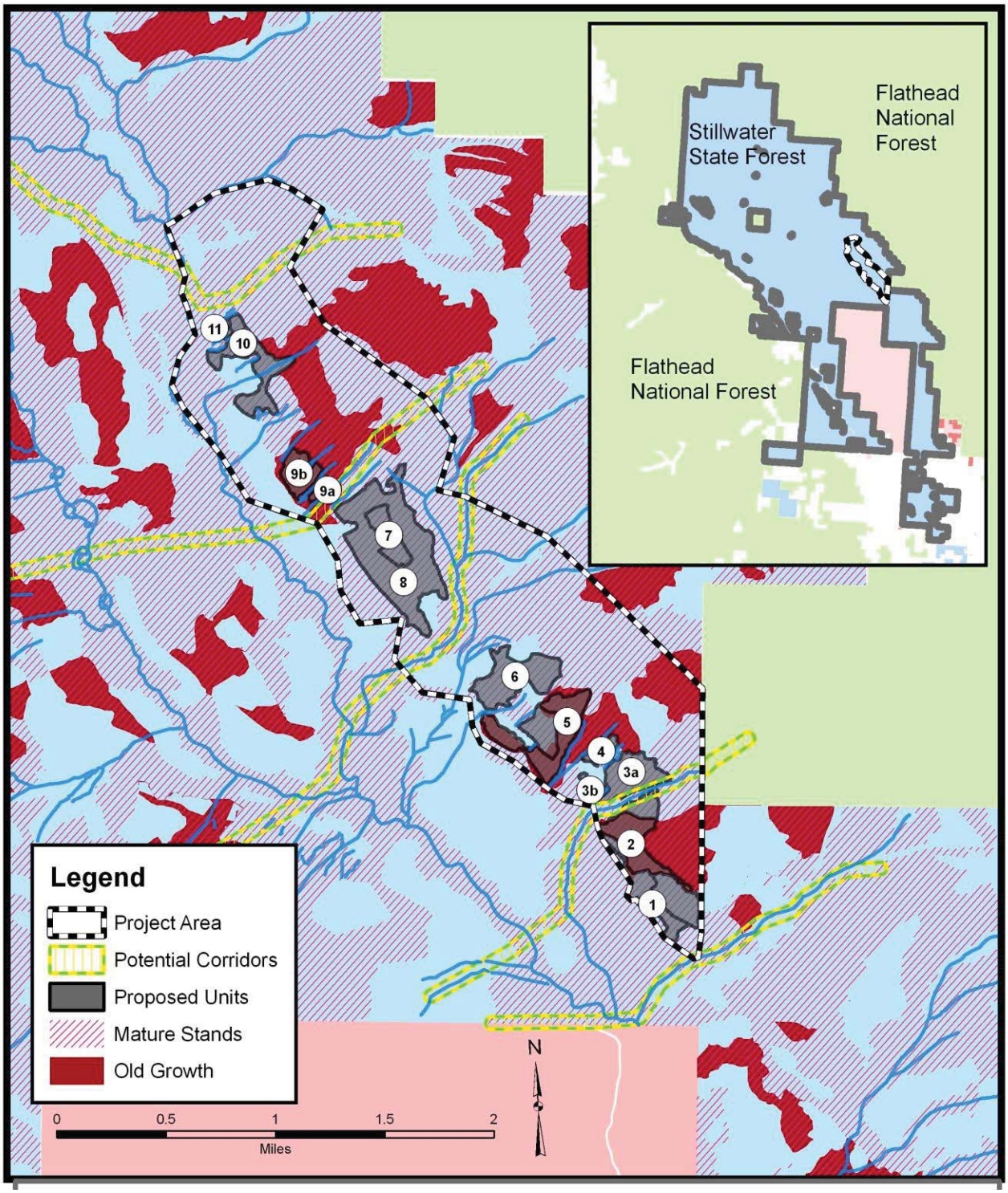
Forest conditions would continue to age, and denser stands of shade-tolerant tree species with high amounts of canopy cover would gradually develop. Largely, no appreciable changes to forest age, the distribution of dense forested cover, or landscape connectivity would be anticipated. No changes in wildlife use would be expected; wildlife favoring dense stands of shade-tolerant tree species would benefit, while those requiring conditions likely found under natural disturbance regimes would continue to be underrepresented. Habitat for forested interior species and old-stand-associated species, such as American marten, northern goshawk, and pileated woodpecker, would likely improve with this alternative; however, western larch and western white pine, the preferred snag species, could decline in abundance over time. Thus, no direct or indirect effects to mature forested habitats and connectivity would be expected that could affect wildlife in the project area since: 1) no changes to existing stands would occur; 2) no appreciable changes to forest age, the distribution of dense forested cover, or landscape connectivity would be anticipated; and 3) no changes to wildlife use would be expected.

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

Of the 376 acres of western larch/Douglas-fir and mixed-conifer stands to be harvested under the proposed action, roughly 375 acres occur within mature stands with a closed canopy. Roughly 269 of these acres of mature, forested habitats would receive a regeneration-type treatment, which would reduce habitat for those species relying on mature, closed-canopied forested habitats. The remaining 106 acres of mature, forested habitats would receive either an intermediate or an old-growth maintenance treatment, which again reduces habitat for species needing a mature, closed-canopied stand. However, these stands could provide lower-quality habitats for those species requiring mature, forested conditions more quickly than some stands receiving regeneration-type treatments due to the anticipated tree retention levels. Alterations to mature forested habitats would include an old-growth maintenance treatment on approximately 89 acres that meet

the old-growth definition (see *VEGETATION ANALYSIS*) and would continue meeting that definition following the proposed treatment. Overall, the resultant changes in existing stands would reduce habitats for species associated with older stands, such as the American marten and pileated woodpecker, which benefited from the increasing stand ages and densities caused, in part, by modern fire suppression. Animal movements through the area could be altered with the changing stand conditions. Four of the 5 riparian connectivity corridors identified in the project area would not be altered with the proposed harvesting; meanwhile, the corridor along the unnamed creek between units 2 and 3a would be restricted for roughly 1,000 feet where those harvest units occur on both sides of the stream, but the corridor width would still be roughly 160 feet wide in that area, which could facilitate some use by wildlife requiring those habitat attributes. Despite the modifications to one of the corridors, overall connectivity in the project area would only be slightly reduced and negligible changes in the ability of those corridors to move animals would be anticipated. In general, under this alternative, habitat conditions would improve for species adapted to more-open forest conditions, while reducing habitat quality for species that prefer dense, mature forest conditions. Collectively, minor-moderate adverse direct and indirect effects to mature forested habitats and connectivity would be expected that could affect wildlife in the project area since: 1) harvesting would revert succession on roughly 269 acres of mature forested stands and reduce stand complexity on an additional 107 acres; 2) minor changes to landscape connectivity would occur; and 3) some changes to wildlife use would be expected.

FIGURE III-5 - MATURE FORESTED HABITATS AND LANDSCAPE CONNECTIVITY CORRIDORS.
Relationship of the project area and proposed units to those mature forested stands and the identified potential connectivity corridors.



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

Habitats in the cumulative-effects analysis area are a mosaic of habitat types and age classes. Past harvesting has reduced the amount of mature, forested habitats; however, continued successional advances in the cumulative-effects analysis area is advancing stands toward mature forests. This alternative would continue to contribute to the mature forested stands in the cumulative-effects analysis area. Losses of individuals and pockets of trees would not likely alter the overall age or landscape connectivity. Ongoing activities would continue reducing forested habitats and/or altering connectivity. Under this alternative, continued use of the analysis area by species favoring dense stands of shade-tolerant tree species and those species requiring larger areas of mature forests would be expected. Habitat for forested-interior species and old-stand-associated species, such as the American marten, northern goshawk, and pileated woodpecker, would likely persist. Thus, no cumulative effects to mature forested habitats and connectivity would be expected that could affect wildlife in the cumulative-effects analysis area since: 1) no changes to existing stands would occur; 2) no further changes to forest age, the distribution of dense forested cover, or landscape connectivity would be anticipated; and 3) no changes to wildlife use would be expected.

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

Despite advancing succession leading to more mature forested habitats, past harvesting has fragmented larger blocks of habitat and reduced the amount of mature, forested habitats across the Stillwater State Forest. Reductions in mature, forested habitats associated with this alternative would be additive to losses associated with past harvesting activities. Across the cumulative-effects analysis area, forested habitats would still exist and landscape connectivity would largely persist. Habitats for forested interior species and old-stand-associated species, such as the American marten, northern goshawk, and pileated woodpecker, would be expected to be reduced; however, continued use of the analysis area by these species would be expected. Thus, minor adverse cumulative effects to mature forested habitats and connectivity would be expected since: 1) Although harvesting would remove mature stands, further reducing the amount of forested cover in the cumulative-effects analysis area, mature forested habitats would still exist and landscape connectivity would largely persist; 2) continued use of the analysis area by mature forest associated species would be expected.

Snags and coarse woody debris

Issue

Timber harvesting could reduce snags and coarse woody debris densities, leading to a decline in the quality of habitat for those wildlife species that are dependent upon these resources, which could alter their survival and/or reproductive ability.

Introduction

Snags and coarse woody debris are important components of forested ecosystems. The following are 5 primary functions of deadwood in the forested ecosystems: 1) increase structural diversity; 2) alter the canopy microenvironment; 3) promote biological diversity; 4) provide critical habitat for wildlife; and 5) act as a storehouse for nutrient and organic matter recycling agents *(Parks and Shaw 1996)*.

Snags and defective trees (e.g. partially dead, spiked top, broken top) are used by a wide

variety of wildlife species for nesting, denning, roosting, feeding, and cover. Snags and defective trees may be the most valuable individual component of Northern Rocky Mountain forests for wildlife species *(Hejl and Woods 1991)*. The quantity, quality, and distribution of snags affect the presence and population size of many of these wildlife species relying on these resources. Snags provide foraging sites for insectivorous species and offer opportunities for primary cavity-nesting species to excavate nests. The cavities created by primary excavators (i.e. woodpeckers) also provide habitat for secondary cavity users, including other birds and small and mid-sized mammals. Snags and defective trees can also provide nesting sites for secondary cavity users where cavities are formed by broken tops and fallen limbs. Larger, taller snags tend to provide nesting sites, while shorter snags and stumps tend to provide feeding sites *(Bull et al. 1997)*. Many species that use smaller-diameter snags will also use large snags; however, the opposite is not true. Typically, older-aged stands will have greater numbers of large snags. Finally, snag densities are another important aspect of habitat value for cavity-nesting birds, as many of these species tend to nest in areas where snag densities are high, using one snag for nesting, but having others nearby for foraging or roosting opportunities.

Meanwhile, coarse woody debris provides food sources, areas with stable temperatures and moisture, shelter from the environment, lookout areas, and food-storage sites for several wildlife species. Several mammals rely on deadwood for survival and reproduction. The size, length, decay, and distribution of woody debris affect their capacity to meet these life requisites. Single, scattered downed trees could provide lookout and travel sites for squirrels or access under the snow for small mammals and weasels, while log piles provide foraging sites for weasels and denning sites for lynx.

Analysis Area

Direct and indirect effects were analyzed on the project area. Cumulative effects were analyzed on the contiguous Stillwater State Forest. This scale of analysis would be large enough to support a diversity of species that use coarse woody debris resources, from birds to small mammals and meso-carnivores.

Analysis Methods

Snags and coarse woody debris were assessed during site visits and while reviewing past DNRC harvesting information. Factors considered in the analysis include the level of harvesting, number of snags and coarse woody debris, and the risk level of firewood harvesting.

Existing Environment

During field visits to the project area, an average of 1.07 large (greater than 21 inches dbh) snags per acre were observed (a range of 0 to 13.2 per acre), which were largely dominated by western larch, western white pine, and Douglas-fir. Large snags (greater than 21 inches dbh) were more abundant in the older stands and away from open roads where firewood cutting often occurs. Likewise, coarse woody debris is typically abundant in these older stands, with much of the volume coming from larger pieces of downed wood (greater than 10 inches dbh). Smaller-sized snags were also variable in the project area, with an average of 3.6 snags (15 to 21inches dbh) per acre (a range of 0 to 19.8 per acre), with a similar species mixture as the large snags. Generally, evidence of snag use for feeding and/or cavity building was observed across the project area. Coarse woody debris

levels were also variable across the project area, with a range of 0-45.4 tons per acre with an average of 15.5 tons per acre (median =11.0 tons/ac; n=37). Elsewhere in the project area, areas that have been harvested in the past decade or so typically have a couple of snags per acre and abundant coarse woody debris. The network of open roads in portions of the project area has facilitated some firewood gathering, which has affected snag and coarse woody debris levels in the vicinity of those open roads.

Past harvesting in the cumulative-effects analysis area has reduced the availability of snags and snag recruits while increasing coarse woody debris levels; however, minimum-retention thresholds for each of these resources have been retained in the recent past. Ongoing harvesting associated with the Duck-to-Dog, Chicken-Antice, Olney Urban Interface, Beaver/Swift/Skyles, Southeast Stryker Ridge, and Lupfer #3 timber sale projects would further alter snags, snag recruits, and coarse woody debris. Snags and coarse woody debris are frequently collected for firewood, especially near open roads, and considerable firewood gathering occurs in the cumulative-effects analysis area.

Environmental Effects

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

No direct changes in the deadwood resources would be expected. Existing snags would continue to provide wildlife habitats, and new snags would be recruited as trees die. However, in the long-term, densities of shade-intolerant trees and resulting snags could decline, as these species are replaced by increasing numbers of shade-tolerant species. Shade-intolerant species tend to provide important habitats, such as nesting structures and foraging habitats for cavity-nesting birds. Coarse woody debris would persist without other disturbances influencing its distribution and quality. Continued decay and decline in existing snags and trees would continue to contribute to the coarse woody debris in the project area. Thus, negligible direct and indirect effects would be anticipated to snags, coarse woody debris, and subsequently to those wildlife species requiring these habitat attributes since: 1) no harvesting would occur that would alter present or future snag or coarse woody debris concentrations; and 2) no changes to human access for firewood gathering would occur.

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

Present and future snags and coarse woody debris would be reduced due to timber harvesting on 376 acres in the project area. Portions of the project area adjacent to open roads or in stands that lack larger snags would not see appreciable changes in the availability of large snags and/or coarse woody debris since these attributes are currently somewhat limited in those areas. Prescriptions call for a minimum of 2 large snags per acre (greater than 21 inches dbh where they exist, otherwise the next largest size class), 2 large snag recruits per acre (greater than 21 inches dbh where they exist, otherwise the next largest size class; additional large-diameter recruitment trees may be left if sufficient large snags are not present), and 10 to 20 tons of coarse woody debris per acre would be planned for retention in the proposed harvest areas. However, some snags and/or recruit trees could be lost due to safety and operational concerns, but replacements would be identified in order to stay in compliance with *ARM 36.11.411*. Future snag

quality in the harvested areas would be enhanced with proposed silvicultural prescriptions that should lead to the reestablishment of shade-intolerant species that tend to provide important habitats, such as long-lasting nesting structures and foraging habitats for cavity nesting birds. Given the amounts, range of variability in sizes, and decay classes of snags and coarse woody debris present in the project area, prescriptions aiming to maintain a variety of these resources would benefit the suite of species that rely on these habitat components. No changes in human access would occur and no changes to the potential risk for snag and coarse woody debris loss due to firewood gathering would occur. Minor adverse direct and indirect effects to snags and coarse woody debris would be anticipated that would affect wildlife species requiring these habitat attributes since: 1) harvesting would reduce snags and snag-recruitment trees and increase coarse woody debris levels; and 2) no changes to human access for firewood gathering would occur.

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

Snags and coarse woody debris would not be altered in the project area. The species composition of future snags could be altered with changing species composition in the stands due to advances in succession. Snags have been retained during much of the past harvesting across the cumulative-effects analysis area, with greater numbers present in locations away from open roads, and reduced numbers near these open roads. Snags and snag recruits have been retained with recent harvesting across the cumulative-effects analysis area, and are being retained with the ongoing projects. Firewood and other forest product gathering activities have reduced deadwood resources in the vicinity of the open roads. Wildlife species in the cumulative-effects analysis area that rely on snags and coarse woody debris would be expected to persist. Thus, no cumulative effects to snags and coarse woody debris would be anticipated since: 1) no further harvesting would occur; 2) changes in the numbers of snags would be negligible; and 3) no change in the level of firewood gathering would be expected.

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

Some snags and coarse woody debris could be removed from the project area, while others may be recruited. Across the cumulative-effects analysis area, snags and coarse woody debris are common, and past harvesting activities have placed an emphasis on the retention of these landscape attributes. The losses of snags and coarse woody debris associated with this alternative would be additive to the losses associated with past harvesting, ongoing harvesting, as well as ongoing firewood gathering. However, the project requirements to retain a minimum of 2 large snags per acre (greater than 21 inches dbh where they exist, otherwise the next largest size class), 2 large snag recruits per acre (greater than 21 inches dbh where they exist, otherwise the next largest size class), and 10 to 20 tons of coarse woody debris per acre would mitigate additional cumulative effects associated with this project. Due to a lack of snags and/or the risk of firewood gathering, some areas would not meet these requirements. No change in human access would be anticipated; thus, no changes to the potential loss of snags and coarse woody debris due to firewood gathering would occur. Wildlife species that rely on snags and coarse woody debris in the cumulative-effects analysis area would be expected to persist at similar levels, albeit slightly lower numbers in proposed units

following treatment. Thus, minor adverse effects to wildlife species requiring snags and coarse woody debris would be anticipated in the cumulative-effects analysis area since: 1) a slight, but cumulative amount of the cumulative-effects analysis area would be harvested, reducing snags and snag-recruit trees while increasing coarse woody debris levels; 2) no changes in access for the general public and associated firewood gathering would be anticipated; and 3) the slightly increased representation of shade-intolerant species could become snags in the long-term.

Fine-Filter Analysis

In the fine-filter analysis, individual species of concern are evaluated. These species include wildlife species listed as threatened or endangered under the Endangered Species Act of 1973, species listed as sensitive by DNRC, and species managed as big game by DFWP. *TABLE III-11 – FINE FILTER* summarizes how each of the species considered was included in the following analysis, or was removed from further analysis because either suitable habitat does not occur within the project area or because proposed activities would not affect their required habitat components.

TABLE III-11 – FINE FILTER. Status of species considered in the fine-filter analysis for this proposed project.

SPECIES/HABITAT	DETERMINATION – BASIS
THREATENED AND ENDANGERED SPECIES	
Grizzly bear (*Ursus arctos*) Habitat: Recovery areas, security from human activity.	The project area occurs in the Upper Whitefish and Lazy Creek Subunits of the North Continental Divide Ecosystem (NCDE).
Canada lynx (*Felis lynx*) Habitat: Subalpine fir habitat types, dense sapling, old forest, deep snow zone.	Potential Canada lynx habitats occur in the project area.
Gray Wolf (*Canis lupus*) Habitat: Ample big game populations, security from human activities.	The project area is approximately 4 air miles from the annual home range of the Lazy Creek wolf pack.
SENSITIVE SPECIES	
Bald eagle (*Haliaeetus leucocephalus*) Habitat: Late-successional forest more than 1 mile from open water.	The proposed project area is more than 2.5 miles outside of the home range associated with the Upper Whitefish Bald Eagle territory. Thus, no direct, indirect, or cumulative effects to bald eagles would be expected to occur as a result of either alternative.
Black-backed woodpecker (*Picoides arcticus*) Habitat: Mature to old burned or beetle-infested forest.	No recently (less than 5 years) burned areas are 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 moist talus or streamside talus habitat occurs in the project area. Thus, no direct, indirect, or cumulative effects to Coeur d'Alene salamanders would be expected to occur as a result of either alternative.
Columbian sharp-tailed grouse (*Tympanuchus Phasianellus columbianus*) Habitat: Grassland, shrubland, riparian, agriculture.	No suitable grassland communities occur in the project area. Thus, no direct, indirect, or cumulative effects to Columbian sharp-tailed grouse would be expected to occur as a result of either alternative.

SPECIES/HABITAT	DETERMINATION – BASIS
Common loon (*Gavia immer*) Habitat: Cold mountain lakes, nests in emergent vegetation.	No suitable lake habitats occur in the project area. 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: Riparian, and dense mature to old forest less than 6,000 feet in elevation.	Potential fisher habitats occur in the project area.
Flammulated owl (*Otus flammeolus*) Habitat: Late-successional ponderosa pine and Douglas-fir forest.	No suitable dry ponderosa pine stands exist in the project area. Thus, no direct, indirect, or cumulative effects to flammulated owls would be expected to occur as a result of either alternative.
Harlequin duck (*Histrionicus histrionicus*) Habitat: White-water streams, boulder and cobble substrates.	Harlequin ducks have been documented on other portions of Swift Creek, which forms a portion of the boundary of the project area, but activities proposed under either alternative would be separated from potential habitats by considerable upland habitats and an open road. 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 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 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.	Mature western larch/Douglas-fir and mixed-conifer habitats exist in the project area.
Townsend's big-eared bat (*Plecotus townsendii*) Habitat: Caves, caverns, old mines.	No suitable caves or mine tunnels are known to occur in the project area. Thus, no direct, indirect, or cumulative effects to Townsend's big-eared bats are anticipated as a result of either alternative.
BIG GAME SPECIES	
Big game winter range.	No white-tailed deer, mule deer, or elk winter range exists in the project area. Thus, no direct, indirect, or cumulative effects to big game winter range would be anticipated as a result of either alternative.
Elk security habitat.	Although potential elk security habitat does not exist in the project area, portions of the project area contribute to larger blocks of elk security habitat in the vicinity.

Threatened and Endangered Species

Grizzly Bear

Issue

The proposed activities could alter cover, increase access, and reduce secure areas, which could adversely affect grizzly bears by displacing grizzly bears from important habitats and/or increasing risk to bears of human-caused mortality.

Introduction

Grizzly bears are native generalist omnivores that use a diversity of habitats found in western Montana. Preferred grizzly bear habitats are meadows, riparian zones, avalanche chutes, subalpine forests, and big game winter ranges, all of which provide seasonal food sources. Primary habitat components in the project area include meadows, riparian areas, and big game winter ranges. Primary threats to grizzly bears are related to human-bear conflicts, habituation to unnatural foods near high-risk areas, and long-

term habitat loss associated with human development (*Mace and Waller 1997*). Forest-management activities may affect grizzly bears by altering cover and/or by increasing access to humans into secure areas by creating roads (*Mace et al. 1997*). These actions could lead to the displacement of grizzly bears from their preferred areas and/or result in an increased risk of human-caused mortality by bringing humans and bears closer together and/or making bears more detectable, which can increase the risk of bears being illegally shot. Displacing bears from their preferred areas may increase their energetic costs, which may, in turn, lower their ability to survive and/or reproduce successfully.

Analysis Area

Direct and indirect effects were analyzed for activities conducted in the project area. The project area includes portions of 2 grizzly bear subunits of the Northern Continental Divide Ecosystem (NDCE); therefore cumulative effects were analyzed on both of these subunits *(FIGURE III-6- GRIZZLY BEAR MANAGEMENT ZONES).* The project is primarily in the 32,201-acre Upper Whitefish grizzly bear subunit; meanwhile, smaller portions of the project area exist in the 34,560-acre Lazy Creek subunit. Each of these subunits approximates the size of the home range of a female grizzly bear.

Analysis Methods

Field evaluations, aerial-photograph interpretation, and GIS analysis were the basis for this analysis. A moving-windows analysis (*Ake 1994*) was conducted to determine open-road densities and amount of security core within the Lazy Creek and Upper Whitefish grizzly bear subunits. Results of this analysis identified areas that exceeded an open-road density of 1 mile per square mile, and areas that are free of motorized human access that could contribute to security habitats. Security habitats are areas that are greater than 0.3 mile (500 meters) from any open, restricted, or high-use roads and trails, and meet a minimum size of 2,500 acres. Factors considered in the analysis include the amount of the area with open-road densities greater than 1 mile per square mile, the amount of available security habitat, and the availability of timbered stands for hiding cover.

Existing Environment

The project area largely exists in the Upper Whitefish grizzly bear subunit of the NCDE Recovery Area (*USFWS 1993*), with smaller amounts of area in the Lazy Creek grizzly bear subunit. Grizzly bears have been documented in the project area and continued use is anticipated. Grizzly bears generally use different habitats relative to season. The project area likely provides a combination of habitats for grizzly bears throughout the nondenning period. Areas of seasonally important habitats are spread-out throughout the project area, including the lower elevation riparian areas, areas with abundant berries, avalanche chutes, and mid-elevation areas with vegetation that are used during the summer period.

Managing human access is a major factor in management for grizzly bear habitat. The open-road density in the Upper Whitefish subunit is below the 1996 threshold; meanwhile the open road density is slightly above the 1996 threshold with the ongoing Southeast Stryker Ridge Timber Sale Project that included an Alternative Practice to exceed the 1996 threshold *(TABLE III-12 – GRIZZLY BEAR HABITATS).* DNRC is committed to designing projects that result in no net increase in the proportion of each subunit of a grizzly bear management unit that exceeds an open-road density of 1 mile per square mile in comparison to 1996 baseline conditions. No security core exists in the project area, but approximately 706 acres of the project area

contributes to a larger, 4,740-acre block of security habitat in the Upper Whitefish and Lazy Creek grizzly bear subunits. Currently, security habitats are at, or above, the 1996 baseline thresholds *(TABLE III-12 - GRIZZLY BEAR HABITATS)*. DNRC is committed to a no-net decrease in security core areas in comparison to the 1996 baseline conditions. Roughly 848 acres of hiding cover exists in the project area and considerable hiding cover exists in each of the larger grizzly bear subunits *(TABLE III-12 – GRIZZLY BEAR HABITATS)*. Within the Upper Whitefish grizzly bear subunit, ongoing harvesting associated with the Chicken-Antice and Southeast Stryker Ridge timber sale projects are altering grizzly bear habitats and elevating human-disturbance levels in that cumulative-effects analysis area. Similarly, the Duck-to-Dog, Beaver/Swift/Skyles, Olney Urban Interface, and Lupfer #3 timber sale projects are altering grizzly bear habitats and human disturbance levels in the Lazy Creek subunit.

TABLE III-12 – GRIZZLY BEAR HABITATS. Baseline 1996, current, and anticipated open-road densities, security habitats, and hiding cover under each alternative in the Upper Whitefish and Lazy Creek subunits.

	UPPER WHITEFISH SUBUNIT	LAZY CREEK SUBUNIT
Baseline open-road densities (1996)	37.2 percent	64.5 percent
Current open-road densities (2010)	36.5 percent	64.6 percent
Open-road densities – No-Action Alternative	36.5 percent	64.6 percent
Open-road densities – Action Alternative	36.8 percent	64.6 percent
Baseline security habitats (1996)	37.6 percent	19.0 percent
Current security habitats (2010)	42.6 percent	19.0 percent
Security Habitats – No-Action Alternative	42.6 percent	19.0 percent
Security Habitats – Action Alternative	42.4 percent	19.0 percent
Hiding Cover (2010)	64.2 percent	54.7 percent
Hiding Cover – No-Action Alternative	64.2 percent	54.7 percent
Hiding Cover – Action Alternative	63.5 percent	54.1 percent

Environmental Effects

Direct and Indirect Effects of the No-Action Alternative on Grizzly Bears

No direct effects to grizzly bears would be expected. No changes to the level of disturbance to grizzly bears would be anticipated. Foraging opportunities might decline due to the lack of diversity in habitat such as forest edge and younger age-class stands. No changes in security core, open-road densities, or hiding cover would be anticipated. Thus, no direct or indirect effects to grizzly bears would be anticipated since: 1) no disturbance or displacement would be expected; 2) no changes in hiding cover would occur; 3) security habitat would not be altered; and 4) no changes in long-term open-road densities would be anticipated.

Direct and Indirect Effects of the Action Alternative on Grizzly Bears

This alternative might affect grizzly bears directly through increased road traffic, noise, and human activity, and indirectly by altering the amount of hiding cover and forage resources. Activities in grizzly bear habitats reduce grizzly bear security, possibly resulting in increased stress and/or energy expenditure to endure the disturbance, or to move from the area. These disturbances would only be present during harvesting operations; therefore, the season of disturbance is important in addressing impacts to

grizzly bears. Approximately 35 acres in 3 harvest areas (units 3A, 3B, and 4) would be harvested during the denning period (November 16 – March 31), which would result in no direct effects to grizzly bears. The remaining 341 acres in 10 harvest areas could either be harvested during the denning period or during the nondenning period; harvesting would likely have minor direct effects if conducted during the nondenning period, and no direct effects to grizzly bears would be anticipated if harvesting occurred during the denning period. Several units, or portions thereof, are near open roads where disturbance from the open road has already reduced habitat quality. The disturbance associated with the proposed harvesting of areas away from existing disturbance sources and open roads has the highest chance of affecting grizzly bears in the area. Overall, grizzly bears likely use the project area for much of the nondenning period. Disturbance and displacement potentially caused by this alternative would likely disturb grizzly bears, should the proposed harvesting activities occur during the nondenning period. Activities conducted during the denning period, or during the summer period while avoiding the spring and fall periods, would have the lowest potential for grizzly bear disturbance or displacement.

Hiding cover, defined as vegetation that will hide 90 percent of a grizzly bear at a distance of 200 feet, would be reduced on much of the 376 acres in the proposed harvest areas in the short-term; however, cover would improve with time as shrub and tree regeneration proceeds. Hiding cover is especially important along open roads and in areas that receive human disturbance.

Hiding cover and visual screening in the form of brush, shrubs, and submerchantable trees would be retained along open roads where feasible, and hiding cover throughout the harvested areas would be expected to regenerate 5 to 15 years after proposed treatment.

No changes to motorized access for the general public would occur. Approximately 2.0 mile of new road would be constructed, which could reduce habitat quality for grizzly bears. Additionally, roughly 1.9 miles of closed roads would be opened and used under this alternative. Restricted roads that are opened with this alternative would be closed to the public during proposed activities, and again closed with either a gate or a berm to prevent public motorized access following the proposed activities. The newly constructed roads would either be behind an existing closure device that prevents motorized public access, or would be closed with a gate or a berm to discourage public motorized access after the proposed activities. Furthermore, to mitigate open road density concerns, units 5, 6, 7, 8, 9a, and 9b that partially or wholly rely upon these closed roads for access, would be harvested either during the denning period, or within intense periods of 30-days or less during the non-denning period so that minimal changes to open road density would occur. Overall a short-term increase in open-road density would be anticipated with this alternative, which could decrease habitat quality for grizzly bears in the area. Open road densities would revert to existing levels following proposed activities.

Portions of several proposed units are far enough from open roads that they meet the definition of security habitats and the proposed alteration of vegetation would alter sight-distances, but would not reduce potential for use as security habitats by grizzly bears. Proposed road construction and use of the North Chicken, Spur B, and Temp Spur 10 would temporarily reduce security habitats by an additional 170 acres while the roads exist in a drivable state. Following proposed activities, 38 acres of security habitats would be regained when the Temp Spur 10 and Spur B roads would be bermed to prevent motorized usage. Overall, 132 acres of grizzly bear security habitats would be eliminated with the retention of the gated North Chicken Road. To prevent any decreases in

security habitats in the Lazy Creek subunit, the use of the Spur A Road, along with the removal of the existing berm, and the replacement of the berm on that road following proposed activities, would occur during one denning period to maintain the existing security habitats. Or, at a minimum, a non-movable barrier would need to be in place at all times during the non-denning period for the purpose of maintaining the existing security habitats. Thus, minor to moderate adverse direct or indirect effects to grizzly bears in the local area would be expected since: 1) minor to moderate levels of disturbance and displacement would be anticipated; 2) hiding cover on 376 acres would be lost in the short-term, but would be expected to recover fairly rapidly; 3) 132 acres of security habitats would be removed; and 4) short-term increases in open-road densities would be anticipated, but no changes to long-term open-road densities would occur, coupled with slight increases in total road densities.

Cumulative Effects of the No-Action Alternative on Grizzly Bears

Within both of the cumulative-effects analysis areas, motorized access, security habitats, hiding cover—as well as spring and fall habitats—would all remain unchanged. Existing forested stands throughout both of the cumulative-effects analysis areas would be expected to persist into the future. In the long-term, forest succession would continue and may reduce food sources, but the amount of hiding cover in each of the cumulative-effects analysis areas may increase. Existing human disturbance levels would be expected to continue into the future. Grizzly bear disturbance and modifications of grizzly bear habitats associated with ongoing harvesting would continue. Thus, no further adverse cumulative effects would be expected to affect grizzly bears in either of the cumulative-effects analysis areas since: 1) no changes in human disturbance levels would be expected; 2) no further losses of hiding cover would occur; 3) no changes to security habitats would be anticipated; and 4) no changes to open-road densities would occur.

Cumulative Effects of the Action Alternative on Grizzly Bears

The increased use of road systems during implementation of the proposed project would temporarily increase human disturbance to grizzly bears in a portion of each of the cumulative-effects analysis areas. Most of the proposed activities would occur in the Upper Whitefish subunit, with fewer activities occurring along the edge of the Lazy Creek subunit. Much of the activities associated with this alternative would occur in those portions of the cumulative-effects analysis areas that are already experiencing relatively high levels of human disturbance, largely associated with open roads. Continued use of each of the cumulative-effects analysis areas by grizzly bears would be anticipated. Reductions in hiding cover would be additive to reductions from past timber harvesting; however, appreciable amounts of each of the cumulative-effects analysis areas are currently providing hiding cover. Early successional stages of vegetation occurring in harvest areas could provide foraging opportunities that do not exist in some mature stands. Open-road density in the Upper Whitefish subunit would increase from the current condition *(TABLE III-12 - GRIZZLY BEAR HABITATS),* but would be below the 1996 baseline conditions. Open-road density in the Lazy Creek subunit would not change from the current condition *(TABLE III-2 - GRIZZLY BEAR HABITATS)*; however, short-term open road density in this subunit would still exceed the 1996 baseline by less than 0.1 percent as was granted in the Alternative Practice associated with the Southeast Stryker Ridge Timber Sale Project. No appreciable changes in long-term open-road densities would be expected in either of the cumulative-effects analysis areas, since all roads would revert to their present status and newly constructed roads would be closed to

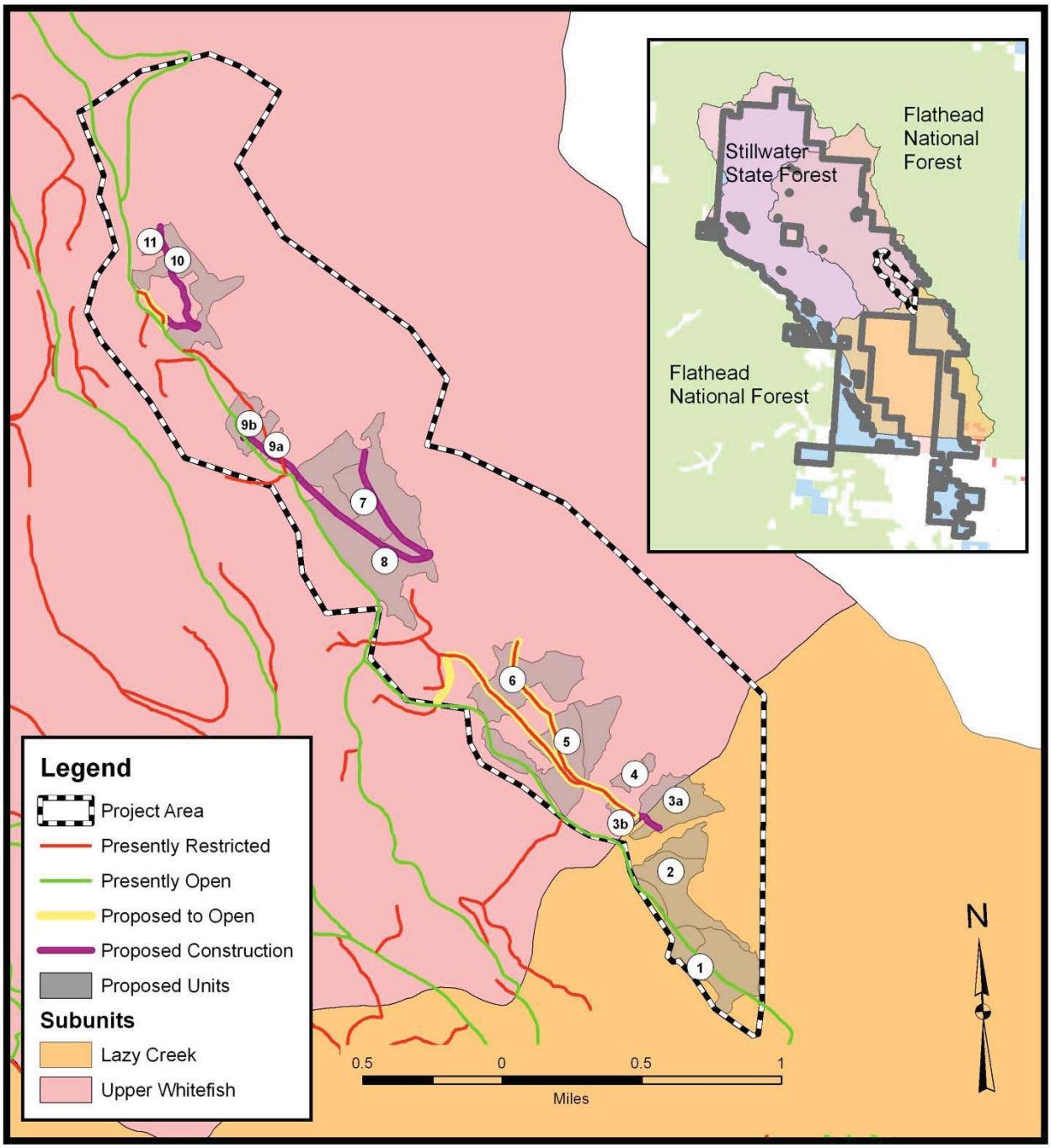
motorized public access with either a gate or a berm following proposed activities. A fairly extensive road system would persist that would facilitate considerable human access in each of the cumulative-effects analysis areas. In both the short-term and long-term, decreases in security habitats in the Upper Whitefish subunit would be anticipated under this alternative; however, both cumulative effects analysis areas would continue to be at or above the 1996 baseline amount of security habitats *(TABLE III-12 - GRIZZLY BEAR HABITATS)*. The re-enforcement of an existing closure on the Stryker Basin Road in Section 19, T34N, R23W would slightly improve grizzly bear security habitats in the Upper Whitefish grizzly bear subunit; this berm re-installation could end up moving closer to the West Fork Road, which would generate even more security habitats for grizzly bears in the subunit. Grizzly bear disturbance and modifications of grizzly bear habitats associated with ongoing harvesting would continue. Thus, minor adverse cumulative effects to grizzly bears would be expected in the short-term since: 1) only minor increases in human-disturbance levels would be expected in each of the cumulative-effects analysis areas; 2) hiding cover would be reduced in the short-term on a relatively small portion of each of the cumulative-effects analysis areas, but would be expected to recover fairly rapidly; 3) only minor reductions in security habitats would be expected; and 4) no changes in long-term open-road densities would be anticipated.

Canada Lynx

Issue

The proposed activities could change stand conditions, which could reduce or modify lynx foraging habitats, denning habitats, and suitable habitats, rendering them unsuitable for supporting lynx.

FIGURE III-6 - GRIZZLY BEAR MANAGEMENT ZONES. **Relationship of the project area and proposed units to the 2 grizzly bear subunits used in the cumulative-effects analysis. The existing class of roads is mapped, which would be the same for the no-action alternative; proposed changes to road classes under the action alternative are highlighted.**



Introduction

Canada lynx are associated with subalpine fir forests, generally between 4,000 and 7,000 feet in elevation in western Montana (*Ruediger et al. 2000*). The proposed project area ranges from approximately 4,000 to 6,400 feet in elevation; on DNRC ownership, the project area is dominated by mixed conifer with appreciable acreage in subalpine fir and Douglas-fir/western larch. Lynx habitats in western Montana consist primarily of stands that provide habitat for snowshoe hares—either dense young coniferous stands or dense mature forested stands—as well as mature subalpine fir types with abundant coarse woody debris for denning and cover for kittens, and densely forested cover for travel and security. These conditions are found in a variety of habitat types, particularly within the subalpine fir series (*Pfister et al. 1977*). Historically, high intensity, stand-replacing fires of long fire intervals (150 to 300 years) within continuous dense forests of lodgepole pine, subalpine fir, and Engelmann spruce created extensive even-aged patches of regenerating forest intermixed with quite old stands that maintained a mosaic of snowshoe hare and lynx habitat.

Analysis Area

Direct and indirect effects were analyzed for activities conducted in the project area. Cumulative effects were analyzed on both of the grizzly bear subunits used for the grizzly bear cumulative-effects analysis (per *ARM 36.11.435 [7] [a]* and *[b]*). More information regarding these subunits can be found in the *GRIZZLY BEAR* section. The scale of each of these analysis areas approximates the home range size of an individual lynx (*Ruediger et al. 2000*).

Analysis Methods

To assess lynx habitat, DNRC SLI data were used to map specific habitat classes used by lynx. Lynx habitat (*ARM 36.11.403[40]*) was assigned to a stand if the SLI data indicated habitat types (*Pfister et al. 1977*) that are consistent with those reportedly used by lynx (*Ruediger et al. 2000*). Other parameters (stand age, canopy cover, and amount of coarse woody debris) were used in modeling the availability of the following 5 specific lynx habitat elements:

1) denning,

2) young foraging,

3) mature foraging,

4) forested travel/other habitat, and

5) temporary non-lynx habitats.

Denning habitat provides important vegetative and woody structure needed to provide denning sites and security for juvenile lynx, while foraging habitat is critical for the survival of both adult and juvenile lynx. 'Forested travel/other habitat' is a general habitat category that provides for secondary prey items and contains modest levels of forest structure usable by lynx. Temporary non-lynx habitat consists of non-forest and open forested stands that are not expected to be used by lynx until adequate horizontal cover re-establishes. Factors considered in the analysis include landscape connectivity and the amount of the cumulative-effects analysis area in denning, foraging, and temporary non-lynx habitats.

Existing Environment

The entire 1,805-acre project area was identified as lynx habitats (*TABLE III-13 –EXISTING LYNX HABITATS).* Much of this habitat was identified as forested travel/other and mature-foraging habitats. Connectivity of forested habitats within the project area is relatively intact (see *WILDLIFE ANALYSIS—MATURE*

FORESTED HABITATS AND LANDSCAPE CONNECTIVITY).

At the cumulative-effects analysis area scale, forested travel/other suitable habitats dominate the Upper Whitefish grizzly bear subunit, while mature foraging and forested travel/other habitats dominate the Lazy Creek grizzly bear subunit *(TABLE III-13 –EXISTING LYNX HABITATS)*. The distribution of the various lynx habitat elements on DNRC-managed lands is the result, primarily, of past timber harvesting and the lack of recent wildfire. Forest-management practices over the past 40 to 60 years produced the current levels of young foraging and temporary non-lynx habitats. Areas in which timber harvesting was conducted over 15 years ago have likely recovered to the point of at least providing forested travel/other habitat. In addition, the lack of fire, including the effects of fire suppression, led to the development and maintenance of mature foraging, forested travel/other, and denning habitats. *ARM 36.11.435* requires a minimum of 5 percent and 10 percent of the lynx habitats in a bear management subunit to be in denning and foraging habitats, respectively. Currently, both of the cumulative-effects analysis areas exceed the minimum thresholds for both foraging and denning habitat requirements *(TABLE III-13 –EXISTING LYNX HABITATS)*. Within the Upper Whitefish grizzly bear subunit, ongoing harvesting associated with the Chicken-Antice and Southeast Stryker Ridge timber sale projects are altering denning (183 acres), foraging (149 acres), and forested travel/other habitats (68 acres). Similarly, in the Lazy Creek grizzly bear subunit, the Olney Urban Interface, Southeast Stryker Ridge, and Lupfer #3 timber sale projects are altering foraging (151 acres), denning (326 acres), and forested travel/other habitats (99 acres), and the Beaver/Swift/Skyles Timber Sale Project is not altering any Canada lynx habitats. Connectivity in each of the cumulative-effects analysis areas is fairly intact, but has been diminished in places by past harvesting and road construction. Canada lynx have been documented in both of the cumulative-effects analysis areas in the past.

Environmental Effects

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

In the short-term, no changes in lynx habitat elements would be expected in the project area. In the longer-term, —barring a major natural disturbance—natural succession would advance several classes forward, generally improving several classes of lynx habitats; however, a net reduction in young foraging habitats would be expected over time, in the absence of any stand disturbance. When this occurs, habitat quality for snowshoe hares could decline, thereby reducing the availability of prey for lynx in the future. Mature foraging and denning habitats would be expected to remain at similar levels, or increase in the future, as shade-tolerant trees develop in the understory and coarse woody debris accumulates through time due to natural events. Forested travel/other habitats would be expected to increase in the future as temporary non-lynx habitats and young foraging habitats mature into this habitat element. Therefore, in the short-term, no effects to lynx would be expected. In the longer-term, without human or natural disturbance, young foraging opportunities in the project area would potentially decrease. Landscape connectivity would not be altered in the near-term and may improve in the long-term. The existing stands of continuous forested habitats could facilitate lynx movement. Existing closed roads and skid trails would remain closed; no changes in human-disturbance levels would be expected. Thus, minor beneficial direct and indirect effects to lynx habitats would be expected to occur in the project area since: 1) adequate denning habitats would persist; 2) sufficient mature foraging habitat would exist; 3) longer-

term availability of young foraging habitats would likely decline without disturbance; 4) limited amounts of lynx habitats would be in the temporary non-lynx habitat category, meaning most of the lynx habitats would be in a usable state for lynx; and 5) landscape connectivity would not be altered.

Direct and Indirect Effects of the Action Alternative on Canada Lynx

Approximately 376 acres of lynx habitats would be harvested with this alternative (*TABLE III-14 - CHANGES TO LYNX HABITATS*). In units proposed to receive seed tree prescriptions, canopy cover and horizontal cover would be removed to prepare for regenerating trees. These prescriptions would convert available lynx habitat elements into temporary non-lynx habitats, until tree seedlings and shrubs recover and begin providing habitats for snowshoe hares. Conversely, units proposed to receive intermediate or old-growth maintenance treatments would be converted into the forested travel/other category (*TABLE III-14 – CHANGES TO LYNX HABITATS)*. Continued maturation of younger-aged stands in the project area would gradually move these stands away from the young foraging habitat class and into other classes of lynx habitats. However, the younger-aged stands created by even-aged harvest treatments that are a component of this alternative would provide young foraging habitats further into the future, as tree seedlings and shrubs recover and begin providing habitats for snowshoe hares. It could take up to 10 years for seedlings to provide snowshoe hare habitats, and then these ephemeral habitats would gradually outgrow usefulness to snowshoe hares in 10 to 20 years. In all proposed units, 10 to 20 tons of coarse woody debris would be retained to provide some horizontal cover and security structure for lynx. In the short-term, lynx would likely avoid proposed harvest units that would be converted to temporary non-lynx habitat, resulting in habitat usage shifts away from the regeneration units. Use of the units receiving intermediate or old-growth maintenance treatments would be expected to continue at some level. Forest connectivity around the openings created with this alternative would be largely maintained through riparian buffers and other unaltered forested habitats in the project area, but overall connectivity would be slightly reduced (see *WILDLIFE ANALYSIS – MATURE FORESTED HABITATS AND LANDSCPE CONNECTIVITY*). Collectively, minor adverse direct and indirect effects to lynx habitats would be expected to affect Canada lynx in the project area since: 1) adequate denning habitats would persist; 2) sufficient mature foraging would exist; 3) young foraging habitats would continue developing in the next 20 to 50 years in the project area; 4) limited amounts of lynx habitats would be in the temporary non-lynx habitat category, meaning most of the lynx habitats would be in a usable state for lynx; and 5) moderate levels of landscape connectivity would persist despite an overall slight reduction in landscape connectivity.

Cumulative Effects of the No-Action Alternative on Canada Lynx

Within each of the cumulative effects analysis areas (CEAA), the mosaic of habitats would be expected to continue providing snowshoe hare habitats intermixed with mature forested stands that facilitate travel and foraging. No appreciable change in lynx habitats would occur under this alternative, except the continued maturation of stands (*TABLE III-15 - CEAA LYNX HABITATS)*. Lynx habitats in each of the cumulative-effects analysis areas would be altered with ongoing harvesting in the cumulative effects analysis area. A slight increase in young foraging habitats in the cumulative-effects analysis area would be possible in the near-term, as stands that were

harvested in the last 10 to 15 years regenerate tall, dense saplings. Gradually, however, as these young foraging stands continue maturing out of the young foraging category and into forested travel/other habitats, habitat quality for snowshoe hares could decline, thereby reducing the availability of prey for lynx in the long-term. Mature foraging and denning habitats would be expected to increase in the future, as shade-tolerant trees develop in the understory, and coarse woody debris accumulates through time due to natural events, and, in-general, stands continue maturing out of young foraging and forested travel/other habitats. Therefore, in the short-term, negligible negative effects to lynx would be expected. In the longer-term, without human or natural disturbance, young foraging opportunities could potentially decrease over time as stands mature toward mature foraging, denning, and forested travel/other habitats. No appreciable changes to landscape connectivity would be anticipated. Thus, negligible adverse cumulative effects to lynx habitats would be expected to affect Canada lynx in the cumulative-effects analysis area since: 1) adequate denning habitats would persist; 2) sufficient mature foraging habitats would exist; 3) young foraging habitats would continue developing in the near-term across the cumulative-effects analysis area; 4) longer-term availability of young foraging habitats would likely decline without disturbance; 5) limited amounts of lynx habitats would exist in the temporary non-lynx habitat category, meaning most of the lynx habitats would be in a usable state for lynx; and 6) landscape connectivity would persist.

Cumulative Effects of the Action Alternative on Canada Lynx

Within each of the cumulative-effects analysis areas, considerable lynx habitats would continue to persist. Minor reductions in mature foraging, denning, and forested travel/other habitats in the proposed units would not be expected to appreciably alter the use by lynx of either of the cumulative-effects analysis areas. Following harvesting, sufficient denning and foraging habitats would be retained on DNRC-managed lands *(TABLE III-15 - CEAA LYNX HABITATS)* to satisfy DNRC's commitment for these habitat attributes *(ARM 36.11.435)* in each of the cumulative-effects analysis areas. Anticipated reductions in denning, foraging, and forested travel/other habitats would be additive to past losses from timber harvesting and ongoing modifications in the cumulative-effects analysis areas; likewise, increases in temporary non-lynx habitats would be additive to past losses of lynx habitats due to timber harvesting as well as any ongoing modifications in the cumulative-effects analysis areas. Gradually, young foraging stands would develop on these temporary non-lynx habitats. Within the next 2 decades, some of the forested travel and temporary non-lynx habitats would be expected to develop into some of the other suitable lynx habitat categories. Denning and foraging habitats would be expected to persist in the absence of timber harvesting or catastrophic event reducing habitat quality. Ongoing harvesting would continue altering lynx habitats across the cumulative-effects analysis areas. However, sufficient foraging and denning habitats would persist in each of the cumulative-effects analysis areas; relatively small amounts of each of the cumulative-effects analysis areas would be in the temporary non-lynx habitats, meaning most of the lynx habitats would be in a usable state for lynx. Thus, minor adverse cumulative effects to lynx habitats would be expected to affect Canada lynx in each of the cumulative-

effects analysis areas since: 1) adequate denning habitats would persist in each of the cumulative-effects analysis areas; 2) sufficient mature foraging habitats would exist in each of the cumulative-effects analysis areas; 3) young foraging habitats would continue developing for the next 20 to 50 years across the cumulative-effects analysis areas; 4) limited amounts of lynx habitats would be in the temporary non-lynx habitat category (less than 30 percent), meaning most of the lynx habitats would be in a usable state for lynx; and 5) reductions in landscape connectivity would not prevent lynx movements through the cumulative-effects analysis areas.

TABLE III-13 – EXISTING LYNX HABITATS. Acres of lynx habitats in the project area, Lazy Creek subunit, and Upper Whitefish subunit with the proportion each suitable class represents out of all suitable lynx habitats in each of these areas.

LYNX HABITAT	PROJECT AREA	LAZY CREEK SUBUNIT	UPPER WHITEFISH SUBUNIT
Denning	313 (17 percent)	1,961 (16 percent)	4,426 (17 percent)
Foraging	589 (33 percent)	3,665 (30 percent)	5,939 (23 percent)
Forested travel	766 (42 percent)	3,584 (29 percent)	11,169 (43 percent)
Temporary non-lynx habitats	135 (8 percent)	3,199 (26 percent)	4,391 (17 percent)
Total lynx habitats	1,805	12,409	25,925
Permanently unsuitable	0	1,816	1,014
Total analysis area	1,805	14,225	26,939

TABLE III-14– CHANGES TO LYNX HABITATS. Acreage changes in lynx habitat elements following implementation of each alternative.

CHANGES TO LYNX HABITATS	ALTERNATIVES	
	No Action	Action
Denning habitat converted to temporary non-lynx habitat	0	20
Mature foraging habitat converted to temporary non-lynx habitat	0	180
Forested travel/other habitat converted to temporary non-lynx habitat	0	70
Temporary non-lynx habitat treated but remaining as temporary non-lynx habitat	0	1
Total increase in temporary non-lynx habitat	*0*	*274*
Denning habitat converted to other habitat	0	30
Mature foraging habitat converted to other habitat	0	19
Forested travel/other habitat treated but remaining as forested travel/other habitat	0	56
Total increase in forested travel/other habitat	*0*	*49*
Total lynx habitat affected	*0*	*376*

TABLE III-15 - CEAA LYNX HABITATS. **Acres of lynx habitats affected, resulting acres of lynx habitats after each alternative, and the proportion that each suitable habitat represents out of all suitable lynx habitats, by alternative, in the Upper Whitefish and Lazy Creek subunits.**

		NO-ACTION ALTERNATIVE		ACTION ALTERNATIVE	
LYNX HABITAT		LAZY CREEK SUBUNIT	UPPER WHITEFISH SUBUNIT	LAZY CREEK SUBUNIT	UPPER WHITEFISH SUBUNIT
Denning	Project level change Acres post-treatment Percent of lynx habitats	0 1,961 16 percent	0 4,426 17 percent	-9 1,952 16 percent	-41 4,385 17 percent
Foraging	Project level change Acres post-treatment Percent of lynx habitats	0 3,665 30 percent	0 5,939 23 percent	-26 3,639 29 percent	-173 5,766 22 percent
Forested travel	Project level change Acres post-treatment Percent of lynx habitats	0 3,584 29 percent	0 11,169 43 percent	-17 3,567 29 percent	-4 11,165 43 percent
Temporary non-lynx habitats	Project level change Acres post-treatment Percent of lynx habitats	0 3,199 26 percent	0 4,391 17 percent	+52 3,251 26 percent	+218 4,609 18 percent
Total lynx habitats	Project level change Acres post-treatment	0 12,409	0 25,935	0 12,409	0 25,925
Permanently unsuitable		1,816	1,014	1,816	1,014
Total analysis area		14,225	26,939	14,225	26,939

Gray Wolf

Issue

The proposed activities could displace gray wolves from important habitats, particularly denning and rendezvous sites and/or alter prey availability.

Introduction

The gray wolf was listed as 'endangered' under the Endangered Species Act in the northern portion of Montana, which includes the project area. The gray wolf was de-listed on March 28, 2008; however, a preliminary injunction (July 18, 2008) led to the re-listing of wolves in this area as "endangered." Following the injunction, the USFWS requested the Court allow them to voluntarily withdraw its decision to delist wolves and re-evaluate information and make a new decision, which was granted (October 14, 2008). The USFWS then de-listed the gray wolf (May 4, 2009), and a recent federal ruling (August 8, 2010) re-instated the Endangered classification for gray wolves under the Endangered Species Act. To meet the delisting criteria, the 3 recovery areas need to support a minimum of 30 breeding pairs for 3 consecutive years. The 3 recovery areas have met the recovery objectives for breeding pairs since 2000. In 2009, 115 of the 242 documented packs in the tri-state region met the definition of a 'breeding pair' *(USFWS et al. 2010).* Of those 115 packs, 37 occurred in Montana, with 23 of those found in the northern Montana portion of the recovery area, along with 41 additional

packs that didn't meet the requirements to be considered a 'breeding pair' (Sime et al. 2010).

Wolves are a wide-ranging, mobile species that occupy a wide range of habitats that possess adequate prey and minimal human disturbance, especially at den and/or rendezvous sites. The Lazy Creek wolf pack has been in the vicinity for at least the last 9 years, and has contained a breeding pair counted toward the recovery goals for 3 of the last 5 years. The home range for this pack is variable and has been adjacent to the project area in numerous years *(USFWS et al. 2010)*.

Wolves are opportunistic carnivores that frequently take vulnerable prey (including young individuals, older individuals, and individuals in poor condition). In general, wolf densities are positively correlated to prey densities *(Oakleaf et al. 2006, Fuller et al. 1992)*. In northwest Montana, wolves prey primarily upon white-tailed deer and, to a lesser extent, elk and moose *(Kunkel et al. 1999)*. However, some studies show that wolves may prey on 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 indirectly be detrimental to wolf populations.

Wolves typically den during late April in areas with gentle terrain near a water source (valley bottoms), close to meadows or other openings, and near big game wintering areas. When the pups are 8 to 10 weeks old, wolves leave the den site and start leaving their pups at rendezvous sites while hunting. These sites are used throughout the summer and into the fall. Disturbance at den or rendezvous sites could result in avoidance of these areas by the adults or force the adults to move the pups to a less adequate site. In both situations, the risk of pup mortality increases. No known wolf den or rendezvous sites are known in the project area; however, landscape features frequently associated with these sites occur in the project area. Wolves may be using the vicinity of the project area for hunting, breeding, and other life requirements.

Analysis Area

Direct and indirect effects were analyzed for activities conducted in the project area. Cumulative effects were analyzed on the Lazy Creek portion of the cumulative-effects analysis area defined under *GRIZZLY BEAR* in this analysis. This area includes most of the annual home ranges for the Lazy Creek wolf pack and would be large enough to support this wolf pack.

Analysis Methods

Portions of the analysis are tied to the big game winter range section since changes in winter range could have a sizable effect on the availability of prey for wolves. Meanwhile, disturbance at den and rendezvous sites are important during certain portions of the year, and the timing of proposed activities in relation to these sites is also important. Direct and indirect, as well as cumulative effects, were analyzed using field evaluations, aerial-photograph interpretation, and a GIS analysis of habitat components. Factors considered in the analysis include the amount of winter range modified, and the level of human disturbance in relation to any known wolf dens or rendezvous sites.

Existing Environment

Big game species are fairly abundant in the project area. No deer or elk winter ranges exists in the project area. Several landscape features commonly associated with denning and rendezvous sites occur in the project area—including meadows and openings, several water sources, and some areas of gentle terrain.

Wolves from the Lazy Creek wolf pack have been documented in the project area in the past, and could continue using the area into the future. No known den or rendezvous sites occur in the project area. Wolves may be using the vicinity of the project area for hunting, breeding, and other life requirements.

Within the larger, cumulative-effects analysis area, big game species are abundant, but winter ranges are limited in the central portions and are generally concentrated along the southern and western portions of the cumulative-effects analysis area. Numerous landscape features commonly associated with denning and rendezvous sites, including meadows and other openings near water and in gentle terrain, occur in the cumulative-effects analysis area. The known den site, along with the suspected rendezvous sites for this wolf pack, occurs on private ownership in the vicinity and not in the project area (*K. Laudon, DFWP, personal communication, September 18, 2008).* In the past, wolves from the Lazy Creek wolf pack have utilized a fairly large portion of the cumulative-effects analysis area and would be expected to continue using this area into the future. Past harvesting on all ownerships in the subunit altered big game and wolf habitats. Similarly, harvesting associated with the Duck to Dog, Chicken-Antice, Olney Urban Interface, Beaver/Swift/Skyles, Southeast Stryker Ridge, and Lupfer #3 timber sale projects are altering big game habitats; however, all of these activities would be expected to have minor effects to wolves and/or their prey.

Environmental Effects

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

Disturbance to wolves would not increase. No changes in big game habitat, including no changes to big game winter ranges, would be expected during the short-term; therefore, no changes in wolf prey availability would be anticipated. Wolf use of the project area would be expected to continue at current levels. Thus, no direct and indirect effects would be expected to affect gray wolves in the project area since: 1) no changes in human disturbance levels would occur; and 2) no changes to big game winter range would occur.

Direct and Indirect Effects of the Action Alternative on Gray Wolves

Wolves using the area could be disturbed by harvesting activities and are most sensitive at den and rendezvous sites, which are not known to occur in the project area. After harvesting activities, human disturbance levels would likely revert to pre-harvest levels and no changes in human access or open-road densities would be anticipated. Likewise, wolf use of the project area for denning and rendezvous sites would likely revert to pre-harvest levels. In the short-term, the proposed harvesting could lead to shifts in big game use, which could lead to a shift in wolf use of the project area. Thus, negligible direct and indirect effects would be expected to affect gray wolves in the project area since: 1) minor short-term increases and negligible long-term changes in human disturbance levels would occur, with no increases near known wolf den and/or rendezvous sites anticipated; and 2) no changes to white-tailed deer, mule deer, or elk winter ranges would occur.

Cumulative Effects of the No-Action Alternative on Gray Wolves

White-tailed deer, mule deer, and elk winter ranges would not be affected and substantive changes in big game populations, distribution, or habitat use would be not anticipated. Levels of human disturbance would be expected to remain similar to present levels. Ongoing harvesting associated with the Olney Urban Interface, Lupfer #3, Southeast

Stryker Ridge, and Beaver/Swift/Skyles timber sale projects may cause shifts in white-tailed deer use and, subsequently, gray wolf use, of the cumulative-effects analysis area; however, no changes would be anticipated that would alter levels of gray wolf use of the cumulative-effects analysis area. No changes in human access would be anticipated. Thus, no further cumulative effects would be expected to affect gray wolves since: 1) no changes in human disturbance levels would occur, particularly near known wolf den and/or rendezvous sites; and 2) no changes to big game winter ranges would occur.

Cumulative Effects of the Action Alternative on Gray Wolves

No changes to white-tailed deer, mule deer, or elk winter range would be anticipated. Some slight shifts of big game use may occur. Reductions in cover may cause slight decreases in use by deer and elk; however, no appreciable changes would be expected within the cumulative-effects analysis area. These reductions in cover would be additive to losses from past timber-harvesting activities and ongoing harvesting in the cumulative-effects analysis area. Human-disturbance levels would be elevated during proposed activities and would be expected to revert to levels similar to current levels after the proposed harvesting has been completed and roads would again be closed. No changes in motorized human access would be anticipated. No substantive change in wolf use of the cumulative-effects analysis area would be expected; wolves would continue to use the area in the long-term. Thus, negligible further cumulative effects would be expected to affect gray wolves since: 1) negligible short-term and long-term changes in human disturbance levels would occur with no increases near known wolf den and/or rendezvous sites anticipated; and 2) no changes to white-tailed deer, mule deer, or elk winter range would occur.

Sensitive Species

When conducting forest-management activities, the *SFLMP* directs DNRC to give special consideration to sensitive species. These species may be sensitive to human activities, have special habitat requirements, are associated with habitats that may be altered by timber management, and/or may, if management activities result in continued adverse impacts, become listed under the *Federal Endangered Species Act*. Due to the fact that sensitive species usually have specific habitat requirements, consideration of their needs serves as a useful 'fine filter' for ensuring that the primary goal of maintaining healthy and diverse forests is met. A search of the *Montana Natural Heritage Database* documented bald eagles, fisher, and harlequin ducks in the vicinity of the project area. As shown in *TABLE III-11 - STATUS OF SPECIES CONSIDERED IN THE FINE-FILTER ANALYSIS FOR THIS PROPOSED PROJECT,* the sensitive-species portion of this analysis will focus on fishers and pileated woodpeckers.

Fisher

Issue

Timber harvesting and associated activities could reduce fisher habitat availability and quality by reducing canopy cover, snag density, and the amount of coarse woody debris.

Introduction

Fishers are a mid-sized forest carnivore whose prey includes small mammals such as voles, squirrels, snowshoe hares, and porcupines, as well as birds (*Powell and Zielinski 1994*). They also take advantage of carrion and seasonally available fruits and berries (*Foresman 2001*). Fishers use a variety of successional stages, but are disproportionately

found in stands with dense canopies (*Powell 1982, Johnson 1984, Jones 1991, Heinemeyer and Jones 1994*) and avoid openings or young forested stands (*Buskirk and Powell 1994*). However, some use of openings may occur for short hunting forays or if sufficient overhead cover (shrubs, saplings) is present. Fishers appear to be highly selective of stands that contain resting and denning sites and tend to use areas within 150 feet of water (*Jones 1991*). Resting and denning sites are found in cavities of live trees and snags, downed logs, brush piles, mistletoe brooms, squirrel and raptor nests, and holes in the ground. Forest-management considerations for fisher involve providing for resting and denning habitats near riparian areas while maintaining travel corridors.

Analysis Area

Direct and indirect effects were analyzed for activities conducted in the project area. Cumulative effects were analyzed on the 2 cumulative-effects analysis areas described under *GRIZZLY BEAR* in this analysis. Each subunit includes enough area to approximate overlapping home ranges of male and female fishers (*Heinemeyer and Jones 1994*).

Analysis Methods

To assess potential fisher habitat and travel cover on DNRC-managed lands in the cumulative-effects analysis area, sawtimber stands within preferred fisher cover types (*ARM 36.11.403[60]*) below 6,000 feet in elevation with 40 percent or greater canopy closure were considered to be potential fisher habitat. Fisher habitat was further divided into upland and riparian-associated areas, depending on the proximity to streams and based on stream class. Effects were analyzed using field evaluations, GIS analysis of potential habitat, and aerial-photograph interpretation. Factors considered include the amount of suitable fisher habitats, landscape connectivity, and human access.

Existing Environment

The project area ranges from 4,040 to 5,720 feet in elevation, with approximately 4.2 miles of perennial streams and at least another 3.9 miles of intermittent streams. DNRC manages preferred fisher cover types within 100 feet of Class 1 and within 50 feet of Class 2 streams (as defined in SMZ law *[ARM 36.11.311 and 31.11.312])*, so that 75 percent of the acreage (trust lands only) would be in the sawtimber size class in moderate to well-stocked density (*ARM 36.11.440[1][b][i]*). Approximately 168 acres are in these riparian areas in the project area along the 8.1 miles of Class 1 and 2 streams. Modeling fisher habitats using SLI data generated an estimate of 1,294 acres of fisher foraging, resting, denning, and travel habitats (1,177 upland acres and 116 riparian acres) in the project area (*Heinemeyer and Jones 1994*). Within the riparian areas, the majority of the preferred fisher cover types (116 of 125 acres, or 93%) are moderately or well-stocked and likely support the structural features necessary for use as fisher resting and denning habitats in addition to serving as travel habitats and maintaining landscape connectivity.

In each of the cumulative-effects analysis areas are numerous streams, with 36 to 61 miles of Class 1 streams and another 7 to 36 miles of Class 2 streams (*TABLE III-16 – STREAMS AND RIPARIAN HABITATS*). A range of 894 to 1,798 acres of riparian habitats are associated with these streams (*TABLE III-16 – STREAMS AND RIPARIAN HABITATS*). Within the riparian habitats below 6,000 feet in elevation and on DNRC-managed lands, between 85.5 and 94.8 percent is in preferred fisher cover types and presently provide structural features necessary for use as fisher resting and denning habitats (*TABLE III-17 – CEAA FISHER HABITATS*). Additionally, between 5,880 and 8,168 acres of upland fisher habitats exist on DNRC-managed lands in the cumulative-effects analysis areas. Ongoing timber management in each of the

cumulative-effects analysis areas are altering fisher habitats, including those activities associated with the Olney Urban Interface (Lazy Creek CEAA), Chicken-Antice (Upper Whitefish CEAA), Beaver/Swift/Skyles (Lazy Creek CEAA), Lupfer #3 (Lazy Creek CEAA), and Southeast Stryker Ridge (Lazy Creek and Upper Whitefish CEAAs) timber sale projects.

Environmental Effects

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

No effects to fishers would be expected under this alternative. Minimal changes to the stands providing fisher habitats would be expected. Habitats that are conducive to fisher denning and travel may improve in time due to increases in tree growth and canopy closure; however, foraging opportunities may decline in future decades if disturbance is minimized, since habitats such as edges and younger age-class stands that support a variety of prey species would decline in abundance on the landscape. Human disturbance and potential trapping mortality would expect to remain similar to current levels. No changes in landscape connectivity would occur. Thus, no direct and indirect effects would affect fishers in the project area since: 1) no changes to existing habitats would be anticipated; 2) landscape connectivity would not be altered; 3) no appreciable changes to snags, snag recruits, and coarse woody debris levels would be anticipated; and 4) no changes to human access or the potential for trapping mortality would be anticipated.

Direct and Indirect Effects of the Action Alternative on Fishers

Approximately 7 acres of the 168 acres in the riparian areas in the project area would be included in proposed harvest areas. Roughly 5 of those acres are presently meeting the structural requirements of fisher, and much of this habitat (approximately 3 acres) would be unsuitable following proposed treatments. Additionally, approximately 338 of the 1,177 acres (28.7 percent) of upland fisher habitats in the project area would receive treatments; roughly 238 acres would receive a seed tree treatment which would result in stands that are too open for appreciable fisher use following proposed treatments, and the remaining 107 acres would receive either an intermediate or old-growth maintenance treatment which would retain at least 40% canopy closure and would continue to be available as potential fisher habitat, although at a reduced quality. No changes in open roads would be anticipated, which would not likely alter trapping pressure and the potential for fisher mortality. Minor reductions in connectivity would be expected in a landscape where connectivity is relatively intact (see *WILDLIFE ANALYSIS-MATURE FORESTED HABITATS AND LANDSCAPE CONNECTIVITY*), but activities would largely avoid riparian areas where connectivity has been retained in the past. Thus, minor adverse direct and indirect effects would be anticipated that would affect fisher in the project area since: 1) harvesting would largely avoid riparian areas; 2) harvesting would reduce or remove upland fisher habitats and mature upland stands in preferred cover types; 3) minor reductions in landscape connectivity would occur, but those areas associated with riparian areas would largely remain unaffected; 4) harvesting would reduce snags and snag-recruitment trees while increasing coarse woody debris levels; however, some of these resources would be retained; and 5) no appreciable changes in motorized human-access levels would be anticipated.

Cumulative Effects of the No-Action Alternative on Fishers

Fisher denning and resting habitats would be retained. Suitable fisher foraging, denning, and resting habitats occur across each of the

cumulative-effects analysis areas. Landscape connectivity in each of the cumulative-effects analysis areas is largely intact, particularly along the numerous streams. Road access in the cumulative-effects analysis areas would not appreciably change; therefore, fisher vulnerability to trapping would remain unchanged. Fisher habitats could be altered with the ongoing harvesting. Thus, no further cumulative effects to fishers would be anticipated in the cumulative-effects analysis area since: 1) no changes to existing habitats on DNRC-managed land would occur, 2) landscape connectivity afforded by the stands on DNRC-managed land would not appreciably change, 3) no changes to snags, snag recruits, or coarse woody debris levels would be expected, and 4) no changes to human access or the potential for trapping mortality would be anticipated.

Cumulative Effects of the Action Alternative on Fishers

Approximately 2.8 acres of potential riparian fisher habitats would be harvested, which is fairly evenly-split between the Upper Whitefish and Lazy Creek cumulative-effects analysis areas. An additional 1.9 acres of potential riparian fisher habitats would be modified in the Upper Whitefish cumulative-effects analysis area. Overall, these negligible reductions in riparian fisher habitats would not appreciably change the amount of the preferred fisher cover types meeting structural requirements for fishers in either of the cumulative-effects analysis areas. Following the proposed treatments, the Lazy Creek (94.5 percent) and Upper Whitefish (85.4 percent) cumulative-effects analysis areas *(TABLE III-17 - CHANGES IN FISHER HABITATS)* would each exceed the 75-percent threshold established in *ARM 36.11.440(1)(b)(i)*. Roughly 339 acres of potential upland fisher foraging and travel (*TABLE III-17 - CHANGES IN FISHER HABITATS*) habitats would be harvested, with the majority proposed for the Upper Whitefish (243 acres) cumulative-effects analysis area; upland foraging and travel habitats would continue to be present on a sizeable portion of each of the cumulative-effects analysis areas. These reductions would be additive to the losses associated with past timber harvesting in each of the cumulative-effects analysis areas. Landscape connectivity in each of the cumulative-effects analysis areas would remain largely intact. No appreciable changes in human disturbance and potential trapping mortality would be anticipated. Thus, minor adverse cumulative effects would be anticipated that would affect fisher in each of the cumulative-effects analysis areas since: 1) harvesting would remove upland fisher habitats and mature upland stands in preferred fisher cover types, but considerable upland habitats would persist; 2) negligible changes to preferred cover types or fisher habitats associated with the riparian areas in the Upper Whitefish and Lazy Creek cumulative-effects analysis areas would be anticipated; 3) minor reductions in landscape connectivity in either of the cumulative-effects analysis areas would be anticipated; 4) harvesting in a relatively small portion of each of the cumulative-effects analysis areas would partially reduce snags and snag recruits, while increasing the coarse woody debris levels, largely in the smaller-sized pieces; and 5) no appreciable changes to motorized human access would occur.

TABLE III-16 – STREAMS AND RIPARIAN HABITATS. Miles of perennial stream, miles of intermittent stream, and acres of riparian habitats associated with these streams below 6,000 feet in elevation, by subunit.

	MILES OF CLASS 1 STREAM	MILES OF CLASS 2 STREAM	ACRES OF RIPARIAN HABITATS [a]
Upper Whitefish	61	36	1,798
Lazy Creek	36	7	894

[a] *Acreages within 100 feet of Class 1 and 50 feet of Class 2 streams*

TABLE III-17 – CEAA FISHER HABITATS. Acres of fisher habitats, preferred fisher cover types, and not fisher preferred cover types by cumulative effects analysis area.

	UPPER WHITEFISH		LAZY CREEK	
	RIPARIAN	UPLAND	RIPARIAN	UPLAND
Fisher habitat	1,164	8,168	612	5,880
Preferred cover type	1,362	11,489	646	8,189
Not preferred cover type	436	6,601	219	4,313
Percentage of fisher habitats [a]	85.5%	71.1%	94.7%	71.8%

[a] *Percentage of preferred cover types meeting structural characteristics to be considered fisher habitat*

TABLE III-18 –CHANGES IN FISHER HABITATS. Acres of fisher habitats, preferred fisher cover types, and percentage of each of the cumulative effects analysis areas by riparian and upland zones.

	UPPER WHITEFISH				LAZY CREEK			
	RIPARIAN		UPLAND		RIPARIAN		UPLAND	
	No Action	Action	No Action	Action	No Action	Action	No Action	Action
Acres of Fisher habitats removed	0	1.3	0	188.3	0	1.5	0	49.6
Acres of Fisher habitats modified	0	1.9	0	54.5	0	0	0	46.1
Acres of Preferred cover types modified	0	0.2	0	5.2	0	0	0	0.1
Percentage of fisher habitats [a]	85.5 %	85.4 %	71.1 %	69.5 %	94.7 %	94.5 %	71.8 %	71.2 %

[a] *Fisher habitats are those lands in preferred cover types that are sawtimber size class in moderate to well-stocked density.*

Pileated Woodpecker

Issue

Timber harvesting and associated activities could remove canopy cover and snags needed by pileated woodpeckers to forage and nest and/or displace pileated woodpeckers from active nests, resulting in increased mortality to pileated woodpecker chicks.

Introduction

Pileated woodpeckers play an important ecological role by excavating cavities that are used in subsequent years by many other species of birds and mammals. Pileated woodpeckers excavate the largest cavities of any woodpecker. Preferred nest trees are western larch, ponderosa pine, cottonwood, and quaking aspen, usually 20 inches dbh and larger. Pileated woodpeckers primarily eat carpenter ants, which inhabit large downed logs, stumps, and snags. *Aney and McClelland (1985)* described pileated nesting habitat as..."stands of 50 to 100 contiguous acres, generally below 5,000 feet in elevation with basal areas of 100 to 125 square feet per acre and a relatively closed canopy." The feeding and nesting habitat requirements—including large snags or decayed trees for nesting and downed wood for feeding—closely tie these woodpeckers to mature forests with late-successional characteristics. The density of pileated woodpeckers is positively correlated with the amount of dead and/or dying wood in a stand (*McClelland 1979*).

Analysis Area

Direct and indirect effects were analyzed for activities conducted in the project area. Cumulative effects were analyzed on the contiguous Stillwater State Forest. This scale includes enough area to support many pairs of pileated woodpeckers (*Bull and Jackson 1995*).

Analysis Methods

To assess potential pileated woodpecker nesting habitats on DNRC-managed lands in the cumulative-effects analysis area, SLI data were used to identify sawtimber stands with more than 100 square feet basal area per acre, older than 100 years, had greater than 40-percent canopy closure, and occurred below 5,000 feet in elevation. Foraging habitats are areas that do not meet the definition above, but include the remaining sawtimber stands below 5,000 feet in elevation, with greater than 40-percent canopy cover. Direct and indirect effects, as well as cumulative effects, were analyzed using a combination of field evaluation, aerial-photograph interpretation, and these mapped potential habitats. Factors that were considered included the amount of potential habitat, degree of harvesting, and amount of continuous forested habitat.

Existing Environment

In the project area, potential pileated woodpecker nesting habitat exists on approximately 620 acres that are dominated by western larch/Douglas-fir and mixed conifers. Additionally, 498 acres of sawtimber stands dominated by western larch/Douglas-fir and Engelmann spruce exist in the project area that may be functioning as lower-quality foraging stands. Although nesting habitat is defined differently than foraging habitat, nesting habitat also provides foraging opportunities for pileated woodpeckers.

Removal of large western larch by past timber-harvesting activity has reduced the quality of habitat for pileated woodpeckers. Large live and dead trees are less common than would occur naturally due to these past timber-harvesting activities in portions of the project area. Black cottonwood occurs in some riparian areas in the project area. During field visits, numerous feeding sites and approximately 1.07 large (greater than 21 inches dbh) snags per acre were

observed (range 0 to 13.2 large snags per acre); these provide foraging and nesting opportunities for pileated woodpeckers. Additionally, roughly 3.6 medium-sized snags (15 to 21 inches dbh) per acre were observed (0 to 19.8 snags per acre), which are likely suitable foraging habitats. Pileated woodpeckers and associated large cavities were detected in the project area.

In the cumulative-effects analysis area, potential pileated woodpecker nesting habitat exists on approximately 19,293 acres, with at least an additional 48,185 acres of sawtimber-sized stands that may be suitable foraging habitats. Similar to the project area, these nesting habitats are dominated by western larch/Douglas-fir and mixed conifers, with a larger percentage of subalpine fir. In the cumulative-effects analysis area, extensive harvesting has occurred in the past, which has fragmented the contiguous forest to a degree. However, in the more recent past, stands have been managed for mature western larch and western white pine, snags, and snag-recruit trees, which benefit pileated woodpeckers in the long-term. Ongoing harvesting associated with the Duck-to-Dog, Chicken-Antice, Olney Urban Interface, Beaver/Swift/Skyles, Southeast Stryker Ridge, and Lupfer #3 timber sale projects would continue reducing pileated woodpecker habitats.

Environmental Effects

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

No disturbance of pileated woodpeckers would occur. Forest succession and natural disturbance agents would continue to bring about changes in existing stands. Trees would continue to grow, mature, and die, thus providing potential nesting and foraging structure for pileated woodpeckers. Continual conversion to shade-tolerant species would reduce the quality of habitat for pileated woodpeckers over time. Therefore, a reduction in suitable nesting trees would eventually be likely, which could lead to decreased reproduction in the project area in the long-term. Thus, negligible adverse indirect effects to pileated woodpeckers in the project area would be expected since: 1) no further harvesting would occur; 2) no changes in the amount of continuously forested habitats would be anticipated; 3) no appreciable changes to existing pileated woodpecker habitats would be anticipated; and 4) long-term, succession-related declines in the abundance of shade-intolerant tree species, which are valuable to pileated woodpeckers, would be anticipated.

Direct and Indirect Effects of the Action Alternative on Pileated Woodpeckers

Pileated woodpeckers tend to be tolerant of human activities (*Bull and Jackson 1995*), but might be temporarily displaced by the proposed harvesting. Harvesting 376 acres would reduce continuously-forested habitats for pileated woodpeckers. At least 257 acres of potential nesting habitat would be removed, with another 103 acres of potential nesting habitats that would be altered with the proposed intermediate or old-growth maintenance treatments. Meanwhile, an additional 20 acres of potential foraging habitats would be modified—most to the point of being unusable by pileated woodpeckers—following proposed treatments. Where regeneration harvests are proposed, potential pileated woodpecker nesting and foraging habitats would be removed for 30 to 100 years, depending on the density of trees retained. Where intermediate or old-growth maintenance treatments are proposed, potential use by pileated woodpeckers could continue, but likely at a reduced rate. Elements of the forest structure important for nesting pileated woodpeckers, including snags (a minimum of 2 snags greater than 21 inches dbh per acre where they exist and would be expected to persist if

they are not lost due to firewood gathering), coarse woody debris (10 to 20 tons per acre), numerous leave trees, and snag recruits (a minimum of 2 trees per acre greater than 21 inch dbh where they exist) would be retained in the proposed harvest areas. Some areas currently lack sufficient large snags, while other areas are close to open roads where snag loss could continue due to legal and illegal firewood and forest-product gathering. Since pileated woodpecker density is positively correlated with the amount of dead and/or dying wood in a stand (*McClelland 1979*), pileated woodpecker densities in the project area would be expected to be reduced on 376 acres, and at least 274 of those acres would be too open to be considered pileated woodpecker habitats following proposed treatments. The silvicultural prescriptions would retain healthy western larch, western white pine, and Douglas-fir—while promoting the regeneration of many of these same species—which would benefit pileated woodpeckers in the future by providing nesting, roosting, and foraging habitats. Thus, minor adverse direct and indirect effects would be anticipated that would affect pileated woodpeckers in the project area since: 1) harvesting would reduce the amount of continuous forested habitats available; 2) potential nesting and foraging habitats would be reduced; 3) several snags and snag recruits per acre would be removed; however, mitigation measures to retain a minimum of 2 snags per acre and 2 snag recruits per acre in most of the harvest areas would be included, and 4) harvest prescriptions would promote seral species in the proposed harvest areas.

Cumulative Effects of the No-Action Alternative on Pileated Woodpeckers

No disturbance of pileated woodpeckers would occur. Trees would continue to grow, mature, and die, thus providing potential nesting and foraging structure for pileated woodpeckers. Continued widespread use of the cumulative-effects analysis area by pileated woodpeckers would be expected. Ongoing harvesting would continue to remove potential pileated woodpecker habitats while reducing the amount of the cumulative-effects analysis area that would be in mature, forested cover types. Thus, negligible adverse cumulative effects to pileated woodpeckers in the cumulative-effects analysis area would be expected since: 1) no further changes to existing habitats would occur; 2) no further changes to the amount of continuously-forested habitats available for pileated woodpeckers would be anticipated; and 3) long-term, succession-related declines in the abundance of shade-intolerant tree species, which are valuable to pileated woodpeckers, would occur.

Cumulative Effects of the Action Alternative on Pileated Woodpeckers

Under this alternative, reductions in pileated woodpecker habitat would be expected. Several snags, coarse woody debris, and potential nesting trees would be retained in the project area; however, future recruitment of these attributes may be reduced in a portion of the area by the proposed activities. In the project area, the canopy on at least 269 acres proposed for regeneration treatments would likely be too open for appreciable pileated woodpecker use. Use of the remaining 107 acres by pileated woodpeckers would likely be reduced due to increasing openness of the stands, or the anticipated species composition in the resultant stands. Recently-harvested stands in the cumulative-effects analysis area reduced pileated woodpecker habitats as well. Ongoing harvesting would continue to remove potential pileated woodpecker habitats while reducing the amount of the cumulative-effects analysis area that would be in mature, forested cover types.

The loss of pileated woodpecker habitats under this alternative would be additive to habitat losses associated with past harvesting; continued widespread use of the cumulative-effects analysis area would be expected. Additionally, continued maturation of stands across the cumulative-effects analysis area is increasing suitable pileated woodpecker habitats. Thus, minor adverse cumulative effects would be anticipated that would affect pileated woodpeckers in the cumulative-effects analysis area since: 1) harvesting would reduce the amount of continuous forested habitats available in the cumulative-effects analysis area, but considerable forested habitats would persist; 2) potential nesting and foraging habitats would be reduced, but extensive habitats would persist in the cumulative-effects analysis area; 3) several snags and snag recruits per acre would be removed in the proposed harvest areas; however, mitigation measures would retain some of these attributes in several of the harvest areas; and 4) harvest prescriptions would promote seral species in the proposed harvest areas.

Elk Security Habitat

Issue

The proposed activities could remove elk security cover, which could affect hunter opportunity and local quality of recreational hunting.

Introduction

Timber harvesting can increase elk vulnerability by changing the size, structure, juxtaposition, and accessibility of areas that provide security during hunting season (*Hillis et al. 1991*). As visibility and accessibility increase within forested landscapes, elk and deer have a greater probability of being observed and, subsequently, harvested by hunters. Because the female segments of the elk and deer populations are normally regulated carefully during hunting seasons, primary concerns are related to a substantial reduction of the male segment and the subsequent decrease in hunter opportunity. The presence of fewer males at the beginning of the hunting season reduces the odds of a hunter seeing or harvesting such an animal throughout the remainder of the season.

Analysis Area

Direct and indirect effects were analyzed on the project area. Cumulative effects to elk security were analyzed on the contiguous Stillwater State Forest. This cumulative-effects analysis area should provide enough area for an elk herd to avoid hunting pressure during the general hunting season and is at least double the size of an elk herd's fall home range.

Analysis Methods

Given that areas within 0.5 mile of an open road do not provide elk security habitat (*Hillis et al. 1991*), existing open roads were buffered 0.5 mile and identified as areas not meeting the criteria for elk security habitat. Areas of forest that were recently harvested in the cumulative-effects analysis area, were not expected to provide security habitat and were removed from potential security cover. Additionally, elk security habitat patches need to be somewhat larger forested blocks (greater than 250 acres), with adequate cover to afford elk security during the general big game hunting season. Therefore, areas failing to meet this criteria were also removed, leaving patches that were distant enough from open roads, were large enough to meet the minimum criteria, and had adequate cover to provide elk security habitat (*Hillis et al. 1991*). Factors considered in the analysis include the amount of available security habitat and the level of human access for recreational hunting.

Existing Environment

A sizable portion of the project area is in close proximity to open roads. Areas that are within 0.5 mile of an open road do not provide elk security habitat. However, approximately 301 acres in the project area are part of a 2,423-acre contiguous patch of security habitat that exists in the cumulative-effects analysis area. Additionally, hiding cover—which is inherently a component of elk security habitat—is abundant in the project area. Moderate levels of hunter access exist in the project area, with a couple of open roads and some non-motorized access on closed roads.

In the cumulative-effects analysis area, approximately 33,042 forested acres meets the distance, cover, and size requirements of elk security across ownerships on Stillwater State Forest. This amount of security habitat (35.8 percent of the cumulative-effects analysis area) exceeds the 30-percent minimum threshold established by *Hillis et al. (1991)*. Additionally, appreciable amounts of hiding cover exist in the cumulative-effects analysis area. Hunter access in the cumulative-effects analysis area is relatively unlimited, with several open roads and considerable non-motorized access on closed roads.

Potential shifts in big game use are expected with the ongoing harvesting associated with the Duck-to-Dog, Chicken-Antice, Olney Urban Interface, Beaver/Swift/Skyles, Southeast Stryker Ridge, and Lupfer #3 timber sale projects.

Minor reductions in elk security habitats were anticipated with the Duck-to-Dog, Chicken-Antice, and Southeast Stryker Ridge timber sale projects, meanwhile no changes in elk security habitats are occurring with the Olney Urban Interface, Beaver/Swift/Skyles, and Lupfer #3 timber sale projects. Evidence of non-winter use by elk was noted throughout the project area during field reviews.

Environmental Effects

Direct and Indirect Effects of the No-Action Alternative on Elk Security Habitats

No changes in elk security cover would be expected as no elk security habitat exists solely within the project alone. Existing cover would continue to contribute to blocks of security habitat in the larger landscape. Timber stands would continue advancing to climax plant species. Recently harvested stands would gradually start contributing to elk security habitats. No alterations in cover would occur that would increase elk vulnerability during the hunting season. No changes would be anticipated in disturbance, human access, and potential mortality due to hunting. Thus, no adverse indirect effects to elk security habitats in the project area would be expected since: 1) no changes in existing elk security habitats would be anticipated and continued maturation of forest cover would improve elk security habitats; 2) the level of human access would remain similar; and 3) no appreciable changes to big game survival would be anticipated.

Direct and Indirect Effects of the Action Alternative on Elk Security Habitats

No changes in open roads or motorized access for the general public would occur. During all phases of the project, any roads opened with project activities would be restricted to the public and closed after the completion of project activities. Proposed new roads would be restricted to the general public, but could facilitate non-motorized access during the hunting season by people using mountain bikes, horses, or foot travel. None of the proposed harvest units would be far enough away from the open roads to contribute to existing elk security cover; therefore any proposed harvesting would not reduce available elk security cover. In the project area, proposed units with seedtree treatments would likely be too open to provide

elk hiding cover, while those areas receiving intermediate or old-growth maintenance treatments would likely continue to provide some cover that could benefit elk during the hunting season. The retention of structure and pockets of cover in the proposed units, including numerous riparian areas, would further contribute to big game security and hiding cover. Efforts to retain visual screening along open roads would benefit elk and other big game during the hunting seasons. Reductions in suitable hiding cover would be additive to past harvesting in the project area. Overall, increased sight distances and the reduction in hiding cover may increase elk vulnerability risk in the project area. Collectively, minor adverse effects to elk security habitat would be anticipated that would affect elk vulnerability risk in the project area since: 1) no changes in open roads or motorized access for the general public would be anticipated that would increase hunter access; 2) minor increases in nonmotorized access could increase hunter access; 3) no elk security habitats would be affected; and 4) negligible changes in big game survival would be anticipated.

Cumulative Effects of the No-Action Alternative on Elk Security Habitats

No changes in elk security habitat would be anticipated. Approximately 35.8 percent of the cumulative-effects analysis area would continue providing elk security habitat, which would exceed the 30-percent minimum threshold recommended by *Hillis et al. (1991)*. Past harvesting on Stillwater State Forest reduced elk security habitats and allowed increased access; continued maturation in previously harvested stands in the cumulative-effects analysis area would improve hiding cover in those older units. No other changes in disturbance and potential mortality due to hunting would be anticipated. Ongoing harvesting would continue to alter hiding cover, with minor reductions in elk security habitats. Thus, minor positive cumulative effects to elk security habitats would be anticipated that would benefit elk since: 1) no changes in open roads, motorized access, or human access would be anticipated; 2) no further reductions in elk security habitat would occur; and 3) modest levels of security habitat and hiding cover would persist within the cumulative-effects analysis area.

Cumulative Effects of the No-Action Alternative on Elk Security Habitats

No changes would be anticipated in open roads or motorized access for the general public that would influence elk vulnerability, but project-level alterations of cover could reduce elk hiding cover on approximately 376 acres. Increased sight distances could reduce elk survival in the project area, and proposed activities could facilitate an increase in nonmotorized traffic. Motorized access on open roads and nonmotorized access via closed roads are both relatively high in the cumulative-effects analysis area. Portions of the cumulative-effects analysis area have been harvested, reducing hiding cover and elk security habitat.

A reduction in elk hiding cover caused by the proposed harvesting would be additive to the harvesting that is ongoing and has occurred recently on Stillwater State Forest. Continued maturation in previously harvested stands in the cumulative-effects analysis area would improve hiding cover in those older units and partially offset these current losses.

Since there would be no reductions in elk security habitats, roughly 35.8 percent of the cumulative-effects analysis area would continue providing elk security habitats, which would exceed the 30-percent minimum threshold recommended by *Hillis et al. (1991)*. Negligible impacts to big game survival would be anticipated. Thus, negligible adverse cumulative effects to elk security would be anticipated that would affect

elk using the cumulative-effects analysis area since: 1) no changes in open roads or motorized access for the general public would be expected; 2) changes to nonmotorized access would be minor; 3) no elk security habitat would be altered with the proposed activities; and 4) sizeable amounts of security habitat and hiding cover would persist in the cumulative-effects analysis area.

Environmental Assessment

APPENDIX A

Stipulations and Specifications

Stipulations and Specifications

Stipulations and specifications for the Action Alternative include project design provisions that follow Forest Management Rules, relevant laws and regulations. They also include mitigations that were designed to avoid or reduce potential effects to resources considered in this analysis. In part, stipulations and specifications are a direct result of issue identification and resource concerns. This section is organized by resource.

Stipulations and specifications that apply to operations required by, and occurring during the contract period, would be contained within the Timber Sale Contract. As such, they are binding and enforceable. Project administrators would enforce stipulations and specifications relating to activities such as hazard reduction, site preparation, and planting, that may occur during or after the contract period.

The following stipulations and specifications would be incorporated into the selected action alternative to mitigate potential effects of resources.

Aesthetics

- Damaged residual vegetation visible from open roads would be slashed.
- The size and number of landings would be limited.

In areas where cable logging is required, the width of the cable corridor would be limited, and a minimum distance between corridors would be required to reduce the amount and visibility of corridors in the harvest areas.

- Disturbed soil sites along road right-of-ways would be grass-seeded.
- Leave trees are to be left with both even and clumpy distributions.
- The temporary road into Unit 10 and all jump-ups would be reclaimed after harvesting.
- A higher concentration of trees would be left within 100-foot buffers in units along the Upper Whitefish and Lower Whitefish roads.

Air Quality

- To minimize cumulative effects during burning operations, burning would be done in compliance with the Montana Airshed Group, reporting regulations and any burning restrictions imposed in Airshed 2. This would provide for burning during conditions of acceptable ventilation and dispersion.
- Dozer, excavator, landing, and roadwork debris would be piled clean to allow ignition during fall and spring when ventilation is good and surrounding fuels are wet. The Forest Officer may require that piles be covered so the fuels are drier, ignite easier, burn hotter, and extinguish sooner.
- In order to reduce smoke production, some large woody debris would be left in the

woods to minimize the number of burn piles.

- Dust abatement may be applied on some road segments, depending on the seasonal conditions and level of public traffic.

Archaeology

- A contract clause provides for suspending operations if cultural resources were discovered; operations in that area may only resume as directed by the Forest Officer following consultation with a DNRC Archeologist.
- If cultural resources were discovered, the Confederated Salish-Kootenai Tribe would be notified.

Fisheries

- Apply all applicable Forestry Best Management Practices (BMPs), including the Streamside Management Zone (SMZ) Law and Rules, and Forest Management Rules for fisheries, soils, and watershed management (*ARMs 36.11.425* and *36.11.426*).
- Apply the SMZ Law and Rules to all streams and lakes.
- Monitor all road-stream crossings for sedimentation and deterioration of road prism.
- Only allow equipment traffic at road-stream crossings when road prisms have adequate load-bearing capacity, thus reducing the potential for rutting.
- Spur A would be brushed, and would have improvements made to the surface and ditches to meet BMPs. Following site preparation, several culverts would be removed and the stream channels rehabilitated.

Noxious Weed Management

- All tracked and wheeled equipment would be cleaned of noxious weeds prior to beginning project operations. The Forest Officer would inspect equipment periodically during project implementation.
- Disturbed roadside sites would be promptly revegetated with a native grass seed mix. Roads used and closed as part of this proposal would be reshaped and reseeded.

Recreation

- The winter log hauling would be limited to one year.
- Log hauling may not take place on weekends, although the operators may use their personal or repair vehicles to the job site.
- Log hauling would not take place between the periods of December 24 and January 2.
- The road would be plowed where the snow berm is winged-off making a suitable trail for snowmobiles.
- Information would be disseminated to the public through signage, press releases, and pre-operation meetings with DNRC winter recreation lease holders.
- Speed limits would be set.
- Current road restrictions would continue to apply for the general public.

Soils

Soil Compaction and Displacement

- Logging equipment would not operate off forest roads unless:
  - Soil moisture is less than 20 percent, except in Units 1-6, which would be less than 18 percent, frozen, or snow-covered to minimize soil compaction and rutting, and maintain drainage features,
  - Soil is snow covered to a depth that would prevent compaction, rutting, or displacement.
- Existing skid trails and landings would be used where their design is consistent with prescribed treatments and meets current BMP guidelines.
- To reduce the number of skid trails and the potential for erosion, designated skid trails would be required where moist soils or short steep pitches (less than 300 feet) would not be accessed by other logging systems.
- Skid trail density in a harvest area would not exceed 20 percent of the total area in a cutting unit.
- Conventional ground-based skidding equipment would not be operated on steep slopes (greater than 40 percent). Soft-tracked yarders are suitable on slopes up to 55 percent with less impact than conventional tractor skidding. Cable yarding would be used on steeper slopes.
- Piling and scarification may be completed with an excavator where slopes are gentle enough to permit. Steeper slopes and even gentler slopes would have slash treatment and site preparation done with an excavator. A majority of all feasible fine litter and 10 to 15 tons of large woody debris would be retained following harvesting (*ARM 36.11.410* and *36.11.414*).

Erosion

- Ground-skidding machinery would be required to be equipped with winchline to limit equipment operations on steeper slopes.
- Roads used by the purchaser would be reshaped and the ditches redefined following use to reduce surface erosion.
- Drain dips and gravel would be installed on roads as needed to improve road drainage and reduce maintenance needs and erosion.
- Some road sections would be repaired to upgrade the roads to design standards that reduce erosion potential and maintenance needs.
- Certified weed-free grass seed and fertilizer would be applied in a prompt and timely manner to all newly constructed road surfaces, cutslopes, and fillslopes. These applications would also be applied to any existing disturbed cutslopes, fillslopes, and landings immediately adjacent to open roads. Seeding to stabilize soils and to reduce or prevent the establishment of noxious weeds would include:
  - Seeding all road cuts and fills concurrent with construction.
  - Applying “quick-cover” seed mix within 1 day of work completion at culvert installation sites involving stream crossings.
  - Seeding all road surfaces and reseeding culvert installation sites when the final blading is completed for each specified road segment.
- Based on ground and weather conditions, water bars, logging-slash barriers and, in some cases, temporary culverts would be installed on skid trails where erosion is anticipated, and as directed by the Forest Officer. These erosion-control features would be periodically inspected and maintained throughout the contract period or extensions thereof.

Vegetation

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

Watershed

- Planned erosion-control measures include:
  - grade breaks on roads,
  - surface water-diverting mechanisms on roads,
  - slash-filter windrows, and
  - grass seeding.
- Details for these control measures would be included in *ATTACHMENT B* of the *TIMBER SALE AGREEMENT*.
- Streamside Management Zones and Riparian Management Zones (RMZs) would be defined along those streams and/or wetlands where they occur within, or adjacent to, harvest areas. This project would meet or exceed SMZ and RMZ rules.
- Individual trees would be removed from SMZs of Units 10 and 11.
- Brush would be removed from existing road prisms to allow for effective road maintenance. Road maintenance can help reduce sediment delivery.
- The contractor would be responsible for the immediate cleanup of any spills (fuel, oil, dirt, etc.,) that may affect water quality.
- Leaking equipment would not be permitted to operate at stream-crossing construction sites.

Wildlife

- If a threatened or endangered species is encountered, a DNRC biologist will be consulted 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.
- Public access would be restricted at all times on restricted roads that are opened for harvesting activities; signs would be used during active periods and a physical closure (gate, barriers, equipment, etc.) would be used during inactive periods (nights, weekends, etc.). At the ends of the road segments that may be opened with the proposed activities, effective closures would be provided by using existing vegetation, signs, or other barriers, to prevent motorized access beyond the proposed units.
- Roads and skid trails that may be opened with the proposed activities would be reclosed to reduce the potential for unauthorized motor vehicle use. The newly constructed road used to access Unit 10 will be reclaimed.
- A combination of topography, group retention of trees, and roadside vegetation would be used to reduce views into harvest units along open roads.
- When possible, forested corridors would be retained to maintain landscape connectivity, and patches of dense vegetation would be retained to provide security cover. Where feasible, heavier cover would be retained along ridgelines.
- Snags, snag recruits, and coarse woody debris would be managed according to *ARM 36.11.411 through 36.11.414*, particularly favoring western larch and western white pine. Clumps of existing snags could be maintained where they

exist, to offset areas without sufficient snags.

- Contractors and purchasers conducting contract operations would be prohibited from carrying firearms while operating on restricted roads.
- Harvesting activities would be conducted to limit disturbance to grizzly bear habitats by: harvesting certain units (3a, 3b, and 4) during the denning period (November 16-March 31); harvesting certain units (portions of unit 5, 6, 7, 8, 9a, and 9b) during short-duration, high intensity periods of less than 30 days during the denning period; or harvesting from open roads (portions of units 1, 2, 5, 6, 8, 9a, 9b, and 10).
- Access on new temporary roads would be restricted to administrative use only.
- Seed tree units have been designed to provide visual screening for bears by ensuring that vegetation or topographic breaks are no greater than 600 feet in at least one direction from any point in the unit.

Environmental Assessment

APPENDIX B
References

References

Ake, K. 1994. Protocol paper: Moving Window Motorized Access Density Analysis and Security Core Area Analysis for Grizzly Bear. Unpublished mimeograph, 2/22/1995. Flathead National Forest, Kalispell, MT. 10pp.

Aney, W. and R. McClelland. 1985. Pileated Woodpecker Habitat Relationships (Revised). Pages 10-17 in Warren, N. eds. 1990. Old Growth Habitats and Associated Wildlife Species in the Northern Rocky Mountains. USFS, Northern Region, Wildlife Habitat Relationships Program R1-90-42. 47pp.

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.

Bousfield, W.E., N.W. Wulf, and C.E. Carlson. 1986. Rating susceptibility of stand to western spruce budworm: user's guide and documentation to SBW-Hazard. USDA Forest Service, Cooperative Forestry and Pest Management, Missoula, MT. Forest Pest Management Report 86-7.

Bower, J. 2004. Trends in Large Woody Debris (LWD) Recruitment to Stream Channels in Western Montana (Draft). Unpublished. Department of Natural Resources and Conservation, Missoula, MT.

Brown, J.K. 1974. Handbook for inventorying downed woody material. In: USDA and Forest Service (Editors). Ogden, Utah: Intermountain Forest and Range Experiment Station.

Bull, E. L., and J. A. Jackson. 1995. Pileated Woodpecker: *Dryocopus pileatus*. American Ornithologists' Union. Washington DC. 24pp.

Bull, E.L., C. G. Parks, and T. R. Torgersen. 1997. Trees and Logs Important to Wildlife in the Interior Columbia River Basin. General Technical Report PNW-391. USDA Forest Service, Pacific Northwest Research Station, Portland, OR. 55pp.

Buskirk, S.W., and R.A. Powell. 1994. Habitat Ecology of Fishers and American Martens. Pages 283-296 in Buskirk, S.W., A. Harestad, M. Raphael, eds. Biology and Conservation of Martens, Sables and Fishers. Cornell University Press, Ithaca, NY.

Callahan, Paul. 2000. Forest Road Sedimentation Assessment Methodology. Land and Water Consulting, Inc.

DEQ. 2010. Clean Water Act Information Center (http://cwaic.mt.gov/), Montana Water Quality Assessment Database. Assessment Record MT76P003_20.

DEQ. 2007. Montana Nonpoint Source Management Plan. Montana Department of Environmental Quality, Water Quality Planning Bureau, Watershed Protection Section. Helena, MT. 136 pages.

DNRC. 2009. SE Stryker RidgeTimber Sale Project Final Environmental Impact Statement. Montana DNRC, Olney, MT.

DNRC. 2008. Chicken-Antice Timber Sale Project Final Environmental Impact Statement. Montana DNRC, Olney, MT.

DNRC. 2005. DNRC Compiled Soils Monitoring Report on Timber Harvest Projects, 1988-2004. Prepared by J. Collins, Forest Management Bureau. Missoula, MT.

DNRC. 2005. West Fork of Swift Creek Timber Sale Project Final Environmental Impact Statement. Montana DNRC, Olney, MT.

DNRC. 1996. State Forest Land Management Plan Final Environmental Impact Statement. Montana Department of Natural Resources and Conservation, Forest Management Bureau. Missoula, MT.

EPA. 1997. Global Warming – Climate. http://yosemite.epa.gov/oar/globalwarming.nsf/25 content/climate.html Accessed April 27, 2010

Ethridge R. 2004. Montana Forestry Best Management Practices Monitoring—The 2004 Forestry BMP Audits Report. Montana Department of Natural Resources and Conservation, Missoula, MT. 64 pages.

Ethridge R. 2002. Montana Forestry Best Management Practices Monitoring—The 2002 Forestry BMP Audits Report. Montana Department of Natural Resources and Conservation, Missoula, MT. 64 pages.

Ethridge R. and P. Heffernan. 2000. Montana Forestry Best Management Practices Monitoring—The 2000 Forestry BMP Audits Report. Montana Department of Natural Resources and Conservation. Missoula, MT. 69 pages.

Fins, L., J. Byler, D.Ferguson, A. Harvey, M.F. Mahalovich, G. McDonald, D. Miller, J. Schwandt, and A. Zack. 2001. Return of the Giants. University of Idaho College of Natural Resources, Station Bulletin 72.

Fisher, W.C., and A.F. Bradley. 1987. Fire Ecology of Western Montana Forest Habitat Types. USFS General Technical Report INT-223.

Flathead County Weed Board. October 2007. Flathead County Weed Management Plan.

Foresman, K.R. 2001. The Wild Mammals of Montana. Special Publication 12. American Society of Mammalogists. Allen Press, KS. 278pp.

Fortunate, Norman, et al. 1998. Montana Best Management Practices Monitoring 1998 Forestry BMP Audits Report. Montana Department of Natural Resources and Conservation, Missoula, MT. 62 pages.

Fox, D. 2007. When Worlds Collide. Conservation 8:28–34.

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.

Graham, R.T., A.E. Harvey, M.F. Jurgensen, T.B. Jain, J.R. Tonn, and D. S. Page-Dumroese. 1994. Managing Coarse Woody Debris in Forest of the Rocky Mountains. USDA Forest Service Research Paper. INT-RP-447. 13 pp.

Green, P., J. Joy, D. Sirucek, W. Hann, A. Zack, and B. Naumann. 1992. Old Growth Forest Types of the Northern Region. R-1 SES. USDA Forest Service, Northern Region, Missoula MT. 60pp.

Harmon, M.E.; J.F. Franklin, and F. J Swanson. 1986. Ecology of coarse woody debris in temperate ecosystems. Advances in Ecological Research, Vol. 15. New York: Academic Press: 133-302.

Haupt, H.F., et al., 1974. Forest Hydrology Part II Hydrologic Effects of Vegetation Manipulation. USDA Forest Service, Region 1. Missoula, Montana.

Heinemeyer, K. S., and J. L. 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.

Hejl, S. J. and R. E. Woods. 1991. Bird Assemblages in Old-Growth and Rotation-Aged Douglas-Fir/Ponderosa Pine Stands in the Northern Rocky Mountains: A Preliminary Assessment. Pages 93-100 *in* D. M. Baumgartner and J. E. Lotan, eds. Proc. Symposium: Interior Douglas-fir: The Species and Its Management. Washington State University, Pullman, WA. 306pp.

Hillis, J.M., and M.J. Thompson, J.E. Canfield, L.J. Lyon, C.L. Marcum, P.M. Dolan, and D.W. McCleerey. 1991. Defining Elk Security: The Hillis Paradigm. Pages 38-43 in A.G. Christensen, L.J. Lyon, and T.N. Lonner, comps., Proc. Elk Vulnerability Symposium., Montana State University, Bozeman, MT. 330pp.

IPCC (Intergovernmental Panel on Climate Change). 2007a. Climate change 2007: synthesis report. Intergovernmental Panel on Climate Change (IPCC). Online version available at: http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf Accessed April 13, 2010.

IPCC. 2007b. Climate change 2007: synthesis report. Summary for policymakers. Intergovernmental Panel on Climate Change (IPCC). Online version available at: http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr_spm.pdf Accessed April 13, 2010.

Jobes, A.P. E. Nol, and D.R. Voigt. 2004. Effects of selection cutting on bird communities in contiguous eastern hardwood forests. Journal of Wildlife Management, (68) 1: 51-60.

Jones, J.L. 1991. Habitat Use of Fisher in North-Central Idaho. M.S. Thesis, University of Idaho, Moscow, ID. 147 pp.

Johnson, S. 1984. Home Range, Movements, and Habitat Use of Fishers in Wisconsin. M.S. Thesis, University Wisconsin, Stevens Point. 78pp.

Koopal, M., Chadwick, A., Sawtelle, C. 2008. Fisheries Resource Summary Report. Unpublished. Prepared for Montana Department of Natural Resources and Conservation, Northwestern Land Office. Kalispell, MT.

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.

Kunkel, K.E., D.H. Pletscher, D.K. Boyd, R.R. Ream, and M.W. Fairchild. 2004. Factors Correlated with Foraging Behavior of Wolves in and near Glacier National Park, Montana. Journal of Wildlife Management 68(1): 167-178.

Losensky, B.J. 1997. Historical Vegetation of Montana. Montana Department of Natural Resources and Conservation. Missoula, MT

Larson, M.J., M.F. Jurgensen, and A. E. Harvey. 1978. N2 fixation associated with wood decayed by some common fungi in western Montana. Canadian Journal of Forestry Research. 8:341-345.

Lenard, S; J. Carlson, J. Ellis, C. Jones, and C. Tilly. 2003. P.D. Skaar's Montana Bird Distribution, Sixth Edition. Montana Audubon, Helena, MT.

Maloy, O.C. 2001. White Pine Blister Rust. Online. Plant Health Progress doi:10.1094/PHP-2001-0924-01-HM.

Mace, R.D., and J.S. Waller. 1997. Final Report: Grizzly Bear Ecology in the Swan Mountains, Montana. Montana Fish, Wildlife and Parks, Helena, MT. 191pp.

Mace, R.D., J.S. Waller, T.L. Manley, L.J. Lyon, and H. Zuuring. 1997. Relationships among Grizzly Bears, Roads, and Habitat in the Swan Mountains, Montana. Pages 64-80 in Mace, R.D., and J.S. Waller. 1997. Final Report: Grizzly Bear Ecology in the Swan Mountains, Montana. Montana Fish, Wildlife and Parks, Helena, MT. 191pp

Martinson, A. H. and W. J. Basko. 1998. Soil Survey of Flathead National Forest Area, Montana. USDA Forest Service, Flathead National Forest, Kalispell, Montana.

Maxell, B. A., J.K Werner, P. Hendricks, D.L. Flath. 2003. Herpetology in Montana: A History, Status Summary, Checklists, Dichotomous Keys, Accounts for Native, Potentially Native, and Exotic Species, and Indexed Bibliography. Northwest Fauna Number 5. Society for Northwestern Vertebrate Biology. Olympia, WA. 138pp.

McClelland, B.R. 1979. The Pileated Woodpecker in Forests of the Northern Rocky Mountains. Pages 283-299 *in* Role of Insectivorous Birds in Forest Ecosystems. Academic Press.

Montana Natural Heritage Program and Montana Fish, Wildlife and Parks. 2009. Montana Animal Species of Concern. Helena, MT: Montana Natural Heritage Program and Montana Fish, Wildlife and Parks. 17pp.

MRIS. Montana Fisheries Information System. Fisheries database managed by Montana Fish, Wildlife and Parks, Information Services Division, Helena, MT. http://fwp.mt.gov/fishing/mfish/

NRCS, 1996. MT651-Soil Survey of Sanders and Parts of Lincoln and Flathead Counties Montana Part I. United States Department of Agriculture Natural Resources Conservation Service.

Oakleaf, J.K., D. L. Murray, J. R. Oakleaf, E. E. Bangs, C. M. Mack, D. W. Smith, J. A. Fontaine, M. D. Jimenez, T. J. Meier, and C. C. Niemeyer. 2006. Habitat Selection by Recolonizing Wolves in the Northern Rocky Mountains of the United States. Journal of Wildlife Management 70:554-563.

Overton, C.K., S.P. Wollrab, B.C. Roberts, M.A. Radko. 1997. R1/R4 (Northern/Intermountain Regions) Fish and Fish Habitat Standard Inventory Procedures Handbook. General Technical Report INT-GTR-346. U.S. Department of Agriculture, Forest Service, Intermountain Research Station, Ogden, UT.

Parks, C.G., and D.C. Shaw. 1996. Death and Decay: A Vital Part of Living Canopies. Northwest Science. Vol. 70, Special Issue: 46-53.

Pfister, R., B. Kovalchik, S. Arno, and R. Presby. 1977. Forest Habitat Types of Montana. USDA Forest Service General Technical Report INT-34. Intermountain Forest and Range Experiment Station Ogden, UT. 174pp.

Pfister, R., B. Kovalchik, S. Arno, and R. Presby. 1977. Forest Habitat Types of Montana. USDA Forest Service. General Technical Report INT-34. Intermountain Forest and Range Experimental Station. Ogden, UT

Powell, R. 1982. The Fisher: National History, Ecology, and Behavior. University of Minnesota Press, Minneapolis, MN. 217pp.

Powell, R. A., and W. J. Zielinski. 1994. Fisher. Pages 38-73 in L.F. Ruggiero, K. B. Aubry, S. W. Buskirk, L. J. Lyon, and W. J. Zielinski, tech eds. The Scientific Basis for Conserving Forest Carnivores: American Marten, Fisher, Lynx, and Wolverine in the Western United States. USDA Forest Service General Technical Report RM-254. Fort Collins, CO.

Raskin , Edward B., Casey J. Clishe, Andrew T. Loch, Johanna M. Bell (2006). Effectiveness of Timber Harvest Practices for Controlling Sediment Related Water Quality Impacts. Journal of the American Water Resources Association 42 (5), 1307–1327.

Rieman, B.E., and G.L. Chandler. 1999. Empirical Evaluation of Temperature Effects on Bull Trout Distribution in the Northwest. Final Report to U.S. Environmental Protection Agency, Boise, Idaho.

Rosgen, D. L.1996. Applied River Morphology. Wildland Hydrology, Pagosa Springs, CO

Rogers D. 2006. Montana Forestry Best Management Practices Monitoring—The 2006 Forestry BMP Audits Report. Montana Department of Natural Resources and Conservation. Missoula, MT. 66 pages.

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.

USFWS. 1993. Grizzly Bear Recovery Plan. Missoula MT. 181pp.

USFWS, Nez Perce Tribe, National Park Service, Montana Fish, Wildlife & Parks, Blackfeet Nation, Confederated Salish and Kootenai Tribes, Idaho Fish and Game, and USDA Wildlife Services. 2010. Rocky Mountain Wolf Recovery 2009 Interagency Annual Report. C.A. Sime and E. E. Bangs, eds. USFWS, Ecological Services, 585 Shepard Way, Helena, Montana. 59601.

Sime, Carolyn A., V. Asher, L. Bradley, K. Laudon, N. Lance, and M. Ross, and J. Steuber. 2010. Montana gray wolf conservation and management 2009 annual report. Montana Fish, Wildlife & Parks. Helena, Montana. 173 pp.

Wicklow, M.C., W. B. Bolen, and W.C. Denison. 1973. Comparison of Soil micro-fungi in 40-year-old stands of pure alder, pure conifer and alder-conifer mixtures. Soil Biology and Biochemistry, 6:73-78.

Ziesak, R. 2008. Montana Forestry Best Management Practices Monitoring—The 2008 Forestry BMP Audits Report. Montana Department of Natural Resources and Conservation. Missoula, MT. 65 pages.

Environmental Assessment

APPENDIX C

Acronyms

Acronyms

ARM ..... *Administrative Rules of Montana*

BMP..... *Best Management Practices*

BMU ..... *Bear Management Unit*

CEAA ..... *Cumulative Effects Analysis Area*

cmp ..... *corrugated metal pipe*

dbh..... *diameter at breast height*

DEQ..... *Department of Environmental Quality*

DFWP ..... *Montana Department of Fish, Wildlife, and Parks*

DNRC ..... *Department of Natural Resources and Conservation*

EA..... *Environmental Assessment*

ECA ..... *Equivalent Clearcut Acres*

EIS ..... *Environmental Impact Statement*

FOGI..... *Full Old-Growth Index*

FI ..... *Forest Improvement*

GIS..... *Geographic Information System*

ID Team ..... *Interdisciplinary Team*

MCA ..... *Montana Codes Annotated*

MEPA ..... *Montana Environmental Policy Act*

Mbf ..... *Thousand Board Feet*

MMbf..... *Million Board Feet*

MNHP..... *Montana Natural Heritage Program*

NWLO ..... *Northwestern Land Office*

RMZ ..... *Riparian Management Zone*

SFLMP..... *State Forest Land Management Plan*

SLI ..... *Stand Level Inventory*

SMZ..... *Streamside Management Zone*

USFS..... *United States Forest Service*

USFWS ..... *United States Fish and Wildlife Service*

WMZ ..... *Wetland Management Zone*

Forest Management Rules ...*Administrative Rules for Forest Management*

Land Board.. *Board of Land Commissioners*

124 Permit... *Stream Protection Act Permit*

318 Authorization ..... *A Short-Term Exemption from Montana's Surface Water Quality and Standards*

Environmental Assessment

APPENDIX D

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