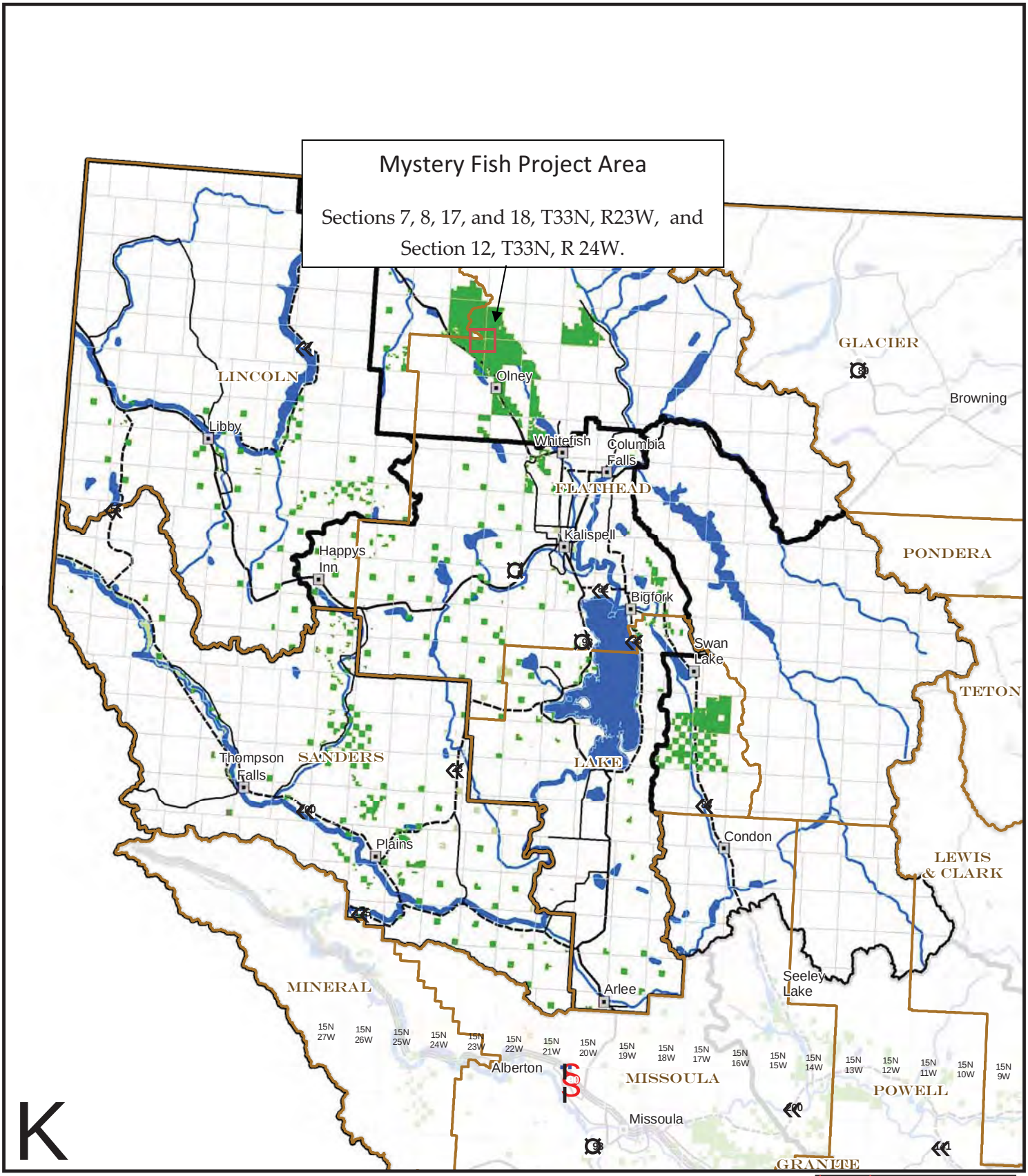
Mystery Fish Timber Sale Project

Draft Environmental Assessment

March 2012

Department of Natural Resources and Conservation
Northwest Land Office—Stillwater Unit



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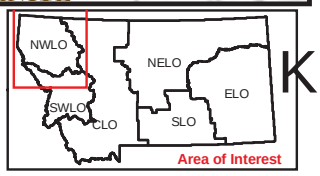

6 December 2010
Montana DNRC
Technical Services Section/dr

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Chapter I

Purpose and Need

Proposed Action

The Montana Department of Natural Resources and Conservation (DNRC), Stillwater Unit, is proposing the Mystery Fish Timber Sale Project in the Stillwater State Forest. The project area encompasses 1,915 acres and is located 5 miles north of Olney in portions of sections 7, 8, 16, 17, 18, 20, and 21 of T33N, R23W and Section 12 of T33N, R24W (see *Vicinity Map* on the inside of the front cover). The Common Schools Trust (kindergarten through grade 12) would be the beneficiary of income generated by this project.

An action and a no-action alternative are being analyzed. If the Action Alternative is selected, 5 million board feet (MMbf) of timber would be harvested from approximately 456 acres. Under the Action Alternative, 11 harvest units totaling approximately 456 acres would be commercially harvested. Approximately 212 acres would be harvested using conventional ground-based equipment while the remaining 244 acres would be treated using cable equipment. Approximately 323 acres would be harvested using a seedtree-with-reserves prescription and 133 acres with a clear cut with reserves prescription. Approximately 2.4 miles of new road within the project area and 2 miles of temporary road would be constructed, and 12 to 18 miles of existing road would be maintained or have minor drainage improvements installed as necessary to protect water quality and to ensure compliance with Montana Best Management Practices (BMPs) for Forestry.

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*]).

In 1996, the Land Board approved the Record of Decision (ROD) for the State Forest Land Management Plan (SFLMP). The SFLMP provides philosophical basis, consistent policy, technical rationale, and guidance for the management of forested state trust lands. In 2003, DNRC adopted the Administrative Rules for Forest Management (Forest Management Rules;

ARM 36.11.401 through 456). The Forest Management Rules are the specific legal resource management standards and measures under which DNRC implements the SFLMP and subsequently its forest management program.

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

This project was developed in compliance with the SFLMP, the Forest Management Rules, and conservation commitments contained in the Selected Alternative in the Final EIS of the Montana DNRC Forested State Trust Lands HCP and associated ROD, as well as other applicable state and federal laws.

Objectives of Proposed Action

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

- Harvest 3 to 8 MMbf of sawtimber to generate revenue for the Common Schools trust and to contribute to the sustainable yield for the DNRC timber-management program, as mandated by *State Statute 77-5-222, MCA*.
- Promote biodiversity by managing for appropriate stand structures and species compositions.
- Regenerate new stands of healthy trees, improve the growth and vigor of retained trees, and reduce fire hazards.
- Improve existing transportation infrastructure and construct new roads to provide long-term access to the project area consistent with the Stillwater Block Transportation Plan.
- Complete site improvements on existing roads to improve drainage, water quality, and safety. 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 *Montana Environmental Policy Act (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 decisionmaking 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 2011, DNRC initiated the public scoping process for this project by placing notices in the Whitefish Pilot and Daily Interlake, and sending the Initial Proposal Letter with maps to individuals, agencies, industry representatives, and other organizations that have expressed interest in Stillwater Unit's management activities.

The scoping period was open for 30 days. Public input received consisted of (3) emails. The issues and concerns identified through public scoping were summarized and used to further refine the project. See *Issues and Concerns* for a summary of issues raised by the public, and an explanation on how DNRC considered those issues during project development.

This Draft EA will be distributed for a 30-day public review period during which time interested individuals will have the opportunity to review the document and send comments to the Interdisciplinary Team (ID Team).

After public comments are received, compiled, and addressed, DNRC will prepare a Final EA. The Final EA will primarily be a revision of the Draft EA that incorporates any necessary changes based on public comments received during the 30-day public review period. The Final EA will also include responses to comments received during the review period.

Following development of the Final EA, the Decision Maker will review public comments, the Final EA, and information contained in the project file. The Decision Maker will consider and determine the following:

- which alternative presented in the Final EA meets the project's purpose and objectives;
- which alternative (or combination/modification of alternatives) should be implemented and why;
- if issues and concerns have been adequately addressed; and

- if there is a need for further environmental analysis or to prepare an EIS.

These determinations will be published and all interested parties will be notified. The decisions presented in the Decision Notice will become recommendations from DNRC to the Land Board. Ultimately the Land Board will make the final decision to approve or not approve the alternative selected by the Decision Maker.

Interdisciplinary Team

As required by MEPA, 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 fisheries biologist, a silviculturist, and several foresters. In July of 2011, the team began compiling public and internal issues and gathering information related to the existing environmental conditions.

Other EAs/EISs or Plans That Influence the Project Proposal

- Highway 93 Corridor Timber Sale Checklist EA. DNRC. November 2011.
- Coal Ridge Timber Sale EA. DNRC. April 2011.
- Lupfer III Timber Sale Checklist EA. DNRC. April 2010.
- Southeast Stryker Timber Sale EA. DNRC. March 2010.
- Beaver/Swift/Skyles Timber Sale EA. DNRC. April 2009.
- Chicken-Antice Timber Sale EA. DNRC. December 2008.
- Olney Urban Interface Timber Sale Checklist EA. DNRC. March 2009.
- Final HCP EIS. DNRC. September 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 only to burn on days that are approved for good smoke dispersion as determined by the Smoke Management Unit in Missoula, Montana.

Montana Department of Environmental Quality (DEQ)

A short-term Exemption from Montana's Surface Water Quality Standards (318 Authorization), issued by the 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 Department of Fish Wildlife and Parks recommends it.

DNRC is classified as a major open burner by the DEQ, and is issued a permit from the DEQ to conduct burning activities on state lands managed by the DNRC. As a major open burning permit holder, DNRC agrees to comply with all of the limitations and conditions of the permit.

Montana Department of Fish, Wildlife and Parks (DFWP)

A *Stream Protection Act Permit (124 Permit)* would be required from the 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 two stream crossing culverts.

U.S. Fish and Wildlife Service (USFWS)

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

Issues and Concerns

Through the scoping process, resource specialists of DNRC and other agencies and the public raised concerns about the project's potential impacts on the environment. These concerns were considered by DNRC in the development of project alternatives (see *CHAPTER II*). A summary of the comments that were incorporated in the alternatives 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 III: pages 4-7*
	Timber harvesting and road building in old-growth timber stands may affect the amount and distribution of old growth remaining on the Stillwater Unit.	*CHAPTER II: pages 4 & 8* *CHAPTER III: pages 8-12*
	The timber sale design should promote a healthy and vigorous forest, reduce the risks of wildfires, and improve the species composition to levels and types that were historically present.	*CHAPTER III: pages 13-14*
Forest fuels	Forest fuel loadings are at a high level, causing many areas to be susceptible to intense fires.	*CHAPTER III: pages 14-17*
Noxious weeds	Soil disturbances and logging equipment could increase the amount and distribution of noxious weeds in the project area.	*CHAPTER II: page 7* *CHAPTER III: pages 17-18*
Soils and geology	Timber harvesting and associated activities may affect soil conditions in the proposed project area through harvesting activities, and through repeated entries to previously harvested areas. Operation of ground-based machinery can displace fertile layers of topsoil, which can lead to a decrease in vegetation growth.	*CHAPTER III: pages 19-28*
	Soil compaction caused by timber harvesting activities can reduce the infiltration capacity of impacted soils that can increase runoff and overland flow and off-site erosion. Surface erosion can affect vegetation growth and water quality.	*CHAPTER III: pages 19-28*
	Slope stability can be affected by timber management activities by removing stabilizing vegetation, concentrating runoff, or by increasing the soil moisture. The primary risk areas for slope stability problems include, but are not limited to, landtypes that are prone to soil mass movement, and soils on steep slopes (generally over 60 percent).	*CHAPTER III: pages 19-28*
Hydrology and fisheries	Timber harvesting and road construction has the potential to increase water yield, which, in turn, may affect erosive power, sediment production, and stream channel stability. Water yield increases can also affect the timing, distribution, and amount of water yield in a harvested watershed.	*CHAPTER II: page 8* *CHAPTER III: pages 30-44*
	Timber harvesting and road construction may increase sediment delivery into streams/lakes and affect water quality.	*CHAPTER III: pages 29-42*
	Timber harvesting and road construction may adversely affect fisheries habitat features, including channel forms, stream temperature, and connectivity.	*CHAPTER III: pages 45-56*

RESOURCE AREA	ISSUE	WHERE ADDRESSED IN EA PACKAGE
Wildlife	The proposed activities could decrease forested cover, which may reduce habitat connectivity and suitability for wildlife species associated with mature forest.	*CHAPTER III: pages 59-64*
	The proposed activities could reduce abundance of snags and coarse woody debris, which could lower habitat quality for species that depend on these structural attributes, and could alter their ability to survive and/or reproduce.	*CHAPTER III: pages 69-72*
	The proposed activities could alter grizzly bear cover, reduce secure areas, and increase human access, which could adversely affect bears by displacing them from important habitats and/or increasing risk of human-caused bear mortality.	*CHAPTER II: page 8* *CHAPTER III: pages 76-80*
	The proposed activities could result in the modification of habitat preferred by Canada lynx and decrease the area's suitability for lynx.	*CHAPTER III: pages 80-84*
	The proposed activities could decrease habitat suitability for fishers by decreasing canopy cover and snag/coarse woody abundance, and by increasing risk of trapping mortality through greater road access.	*CHAPTER III: pages 84-89*
	Timber harvesting and associated activities could displace gray wolves from the vicinity of the project area, particularly denning and rendezvous sites, and/or alter big game prey availability, which could adversely affect gray wolves.	*CHAPTER III: pages 89-93*
	Timber harvesting and associated activities could negatively affect pileated woodpecker habitat suitability by removing canopy cover and snags used for foraging and nesting and by creating disturbance.	*CHAPTER III: pages 93-96*
	Timber harvesting and associated activities could reduce habitat quality for big game, especially during the fall hunting and winter seasons.	*CHAPTER III: pages 96-100*
Aesthetics	Activities associated with the proposed Action may affect the visual quality as seen from U.S. Highway 93 and roads within the project area.	*CHAPTER II: page 7* *CHAPTER III: pages 103-106*
Economics	The proposed Action may affect revenue generated for Common School Trust funds, funding for Forest Improvement (FI) projects, timber-related employment, and revenue generated in the regional economy. The economic analysis is one criteria used by the decision maker as guidance for formulating a decision.	*CHAPTER III: pages 107-113*

Chapter II

Alternatives

Introduction

This chapter includes a description of the No-Action and Action Alternatives, the history of alternative development, mitigation measures 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 Mystery Fish Project Area was initially listed on the *2008 List of Upcoming Timber Sales for the Northwestern Land Office*. The project area was identified for timber harvesting for several reasons which include: 1) reducing the stocking densities of shade-tolerant trees in a historically shade-intolerant area, 2) promoting seral tree species such as western larch and western white pine, and 3) fulfilling revenue and sustainable yield requirements.

This proposed action has been designed to provide revenue to the Common Schools Trust while maintaining a healthy, productive forest. As noted in *CHAPTER I- 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, 36.11.470,* and *36.11.471)* and conservation commitments contained in the Selected Alternative in the Final EIS of the Montana DNRC Forested State Trust Lands Habitat Conservation Plan (HCP), as well as other applicable state and federal laws, provide direction for conducting the analyses and designing and implementing the project.

The project area, comprised of 1,915 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 the requirements of the Salvage Timber Program *(MCA 77-5-207)*. 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 Interdisciplinary (ID) Team members began work on the project in the spring/summer of 2011. 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 on the human and natural environment.

Throughout 2011, ID Team members and other DNRC personnel were involved in field reconnaissance and data collection in the project area. Information was collected on:

- existing roads, to determine the needs for improvements to 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, Forest Management Rules, and the HCP, an Initial Proposal was developed.

Public scoping consisted of an announcement in the *Whitefish Pilot* and the *Daily Interlake*. Additionally, an Initial Proposal letter was sent to interested parties in June 2011 with a 30-day comment period. Public input received consisted of 3 e-mails. The issues and concerns received are summarized in Chapter I, *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 mitigation measures. Based on determinations reached by the ID Team, issues and concerns did not drive further alternative development, although substantial adjustments were subsequently made to the Initial Proposal that had been distributed in June 2011. The ID team decided to drop one proposed unit from the Initial Proposal. The largest proposed unit in sections 16 and 17, T33N, R23W, (152 acres) was dropped because this was discovered to be high attribute old growth with minimal forest health issues; therefore, an old-growth maintenance harvest treatment was not warranted at this time. Acreages in sections 7, 8, 17, and 18, T33N, R23W were reduced due to riparian management concerns, operability, economic concerns, and to minimize effects to old-growth stands currently exhibiting high attribute old-growth conditions with minimal forest health issues similar to those stands in sections 16 and 17. Old-growth stands dropped from the proposed project are expected to persist in old-growth status longer on the landscape than those proposed for harvesting. Old-growth forest stands identified for proposed harvest were generally stands with lower abundance of large trees (>21″ dbh) and higher levels of disease/insect mortality compared to other stands within the project area.

Project Design Concepts

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

➢ **Stand Prioritization**

Stands were prioritized for treatment based on:

- **Cover Type**

  ARM 36.11.407 directs the DNRC to manage forest cover types to meet desired future conditions as specified in ARM 36.11.405.

  Desired future conditions for the project area would be comprised of the following cover types and percentages: 72 percent western larch/Douglas-fir, 8 percent western white pine, 19 percent subalpine fir, and 1 percent non-forest.

  Currently, the project area is comprised of the following cover types and percentages: 10 percent western larch/Douglas-fir, 3 percent western white pine, 61 percent subalpine fir, 24 percent mixed conifer, 1 percent lodgepole pine, and 1 percent non-forest.

  The conversion of these stands to desired future condition 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 have reduced the presence of western white pine and white bark pine to scattered individuals; Douglas-fir beetle is attacking and killing Douglas-fir trees in some areas; and dwarf mistletoe is prominent in several areas. 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, it is the subalpine fir that has been the most severely attacked. Stress from defoliation has lead to pockets of mortality and this effect 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 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 both current and future logging costs.

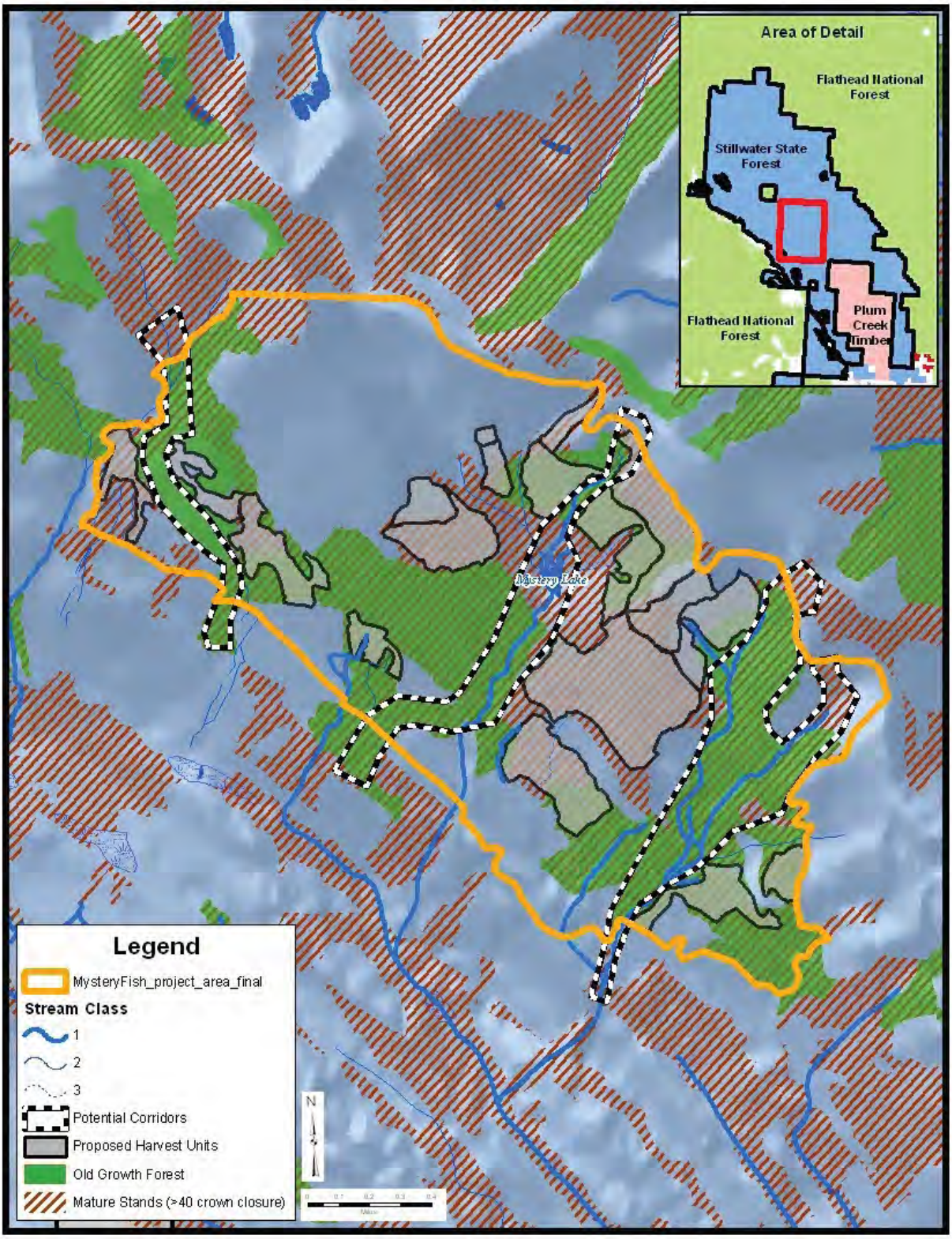
- **Old Growth**

  During the course of field reconnaissance, 321 acres of old growth were verified that had not previously been confirmed, and 44 acres that had been classified potential old growth by Stand Level Inventory (SLI) were found to not meet the minimum requirements for old-growth classification under Green *et.al (1992).* The high attribute old-growth stands that do not have insect and disease problems and are likely to persist as old growth for the foreseeable future were not considered for treatment. The stands where western larch is heavily infested with dwarf mistletoe and the Douglas-fir shows the presence of *Armillaria* root rot and Douglas-fir bark beetle activity were proposed for treatment because at the current rate of mortality in large-diameter trees, these stands of old growth would likely not meet the criteria for old growth within the next 10 years. Other low attribute old-growth stands were proposed for harvest where 1) the dominant trees are primarily Engelmann spruce and subalpine fir (many of which exhibit such things as broken tops, insect and disease damage, and bole damage), 2) crown cover averages 8 to 39%, 3) there are very few intermediate trees, and 4) there is a proliferation of brush (fool's huckleberry and alder) which has limited tree regeneration.

- **Connectivity of Old Growth and Mature Forest**

  Mature forested stands are well-connected within the proposed project area, functioning as one forest patch. The location of old growth and mature timber stands *(Figure II-1 MATURE FORESTED HABITATS AND LANDSCAPE CONNECTIVITY CORRIDORS)* within the project area was analyzed in order to help assess connectivity for wildlife.

Figure II-1: MATURE FORESTED HABITAT AND LANDSCAPE CONNECTIVITY CORRIDORS.
Relationship of the project area and proposed units to mature forested stands and identified potential connectivity corridors.



- **Transportation Development**

The development of a long-term transportation plan within this area has been identified as an objective for the Mystery Fish Timber Sale Project. Transportation planning for this project includes:

- **Assessment of Existing Road Locations and Standards**
  Roads have been reviewed to see where BMPs are met, whether or not the standard of road is suitable for this proposal and future uses, and what improvements or road abandonments would be required in order to meet safety standards, BMPs, applicable HCP commitments and Forest Management Rules associated with Road Management *(ARM 36.11.421).*

- **Road Improvement and 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 as described above.

- **Road Planning to Access State Land for Continued Forest Management**
  Areas of the forest are not currently accessible by road. DNRC would minimize the number of roads, plan for longer skids, and optimize the locations of those roads across the landscape for the purpose of reaching these areas, now and in the future.

Mitigation Measures 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 mitigation measures 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 mitigation measures, refer to *ATTACHMENT A– STIPULATIONS AND SPECIFICATIONS*. The following is a brief list of mitigation measures that address some issues involved in this project:

Access and Roads

- The Stillwater Unit would implement the Stillwater Block Transportation Plan with the construction of 2.4 miles of the Mystery Road (*USFWS & DNRC HCP/EIS 2010*) (see Figure *II-2 – PROPOSED MYSTERY FISH PROJECT MAP).*
- Motorized 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.).

- Roads and skid trails that are opened with the proposed activities would be reclosed to reduce the potential for unauthorized motor vehicle use.

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 wildlife 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 roads into units and all jump-ups would be reclaimed following management activities with high visibility cut and fill portions recontoured to near-natural slope.
- Sites of disturbed soil along road right-of-ways would be grass seeded.
- A higher concentration of trees in the proposed units would be left within 100 feet of the Upper Stryker Ridge Road and the Middle Stryker Ridge Road.
- The proposed new road location and the temp road locations would be located to minimize cut and fill sections of the road and use terrain features to reduce the road's visibility from the Highway 93 corridor.
- Locations on these roads that have potentially higher visibility would leave a larger component of sapling and overstory trees below the cut and fill sections to help mask those sections.

Noxious Weed Management

- All off-road equipment would be cleaned of noxious weeds prior to beginning project operations.
- Prompt vegetation seeding (with a native grass seed mix) of disturbed roadside sites would be required. Roads used and closed as part of this proposal would be reshaped and seeded.
- The DNRC would require that the purchaser of the timber sale be responsible for weed spraying on restricted roads that would be used for log hauling in the project area.
- DNRC foresters would monitor the project area for weeds and strive to contain and suppress Category 2 weeds, such as orange hawkweed.

Old Growth and Timber Stand Structural Diversity

- 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.

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.
- The new temporary road construction in units would be reclaimed to near-natural levels following timber-harvesting activities.
- All applicable *Forestry Best Management Practices (BMPs)*, including the *Streamside Management Zone Law and Rules*, HCP, 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 will 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.
- 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.
- Some forested corridors would be retained to maintain landscape connectivity and patches of dense vegetation, when possible, to provide security cover for wildlife.
- A DNRC biologist would be consulted if a threatened or endangered species is encountered in order 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.

Alternative Descriptions

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

- ***No-Action Alternative***

  No timber harvesting, improvements to existing roads, or revenue generation for Common Schools Trust would take place in the area of the Mystery Fish 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.

  Current levels of sediment delivery from roads within and accessing the project area that do not fully meet BMPs may continue to occur.

  Natural events, such as plant succession, tree mortality due to insect infestations and disease infections, wind throw, 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,* HCP commitments, and the *Forest Management Rules*. 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 trusts.

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

  FIGURE II-2 – MYSTERY FISH PROPOSED PROJECT MAP displays the proposed harvest locations, harvest treatments, and roads.

Timber-Management Activities

Under this alternative, approximately 5.0 MMbf would be harvested from an estimated 456 acres using a combination of harvest treatments and both skyline and ground-based harvest systems. The two primary harvest treatments are Seedtree with Reserves and Clearcut with Reserves.

Harvest Treatments

Seedtree with Reserves (323 acres): This treatment would regenerate portions of the unit by cutting all merchantable timber with the exception of 6 to 10 trees per acre of the larger-diameter western larch, Douglas-fir, and Engelmann spruce. 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.

Clearcut with Reserves (133 acres): The removal, in a single cutting, of all merchantable trees in a stand. Clearcutting emulates components of conditions that are created by stand-replacement disturbances. Additional reserve trees would be retained.

For the regeneration prescriptions that specify "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.

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

This alternative proposes to harvest approximately 27 acres of the *high attribute old growth*, 49 acres of the *medium attribute old growth,* and 83 acres of the *low attribute old growth* with regeneration treatments. Old-growth forest stands identified for proposed harvest were generally stands with lower abundance of large trees (>21" dbh) and higher levels of disease/insect mortality compared to other stands within the project area. Thus, old-growth stands not considered for harvest treatments contain higher habitat quality and are expected to persist in old-growth status longer on the landscape than those proposed for harvesting.

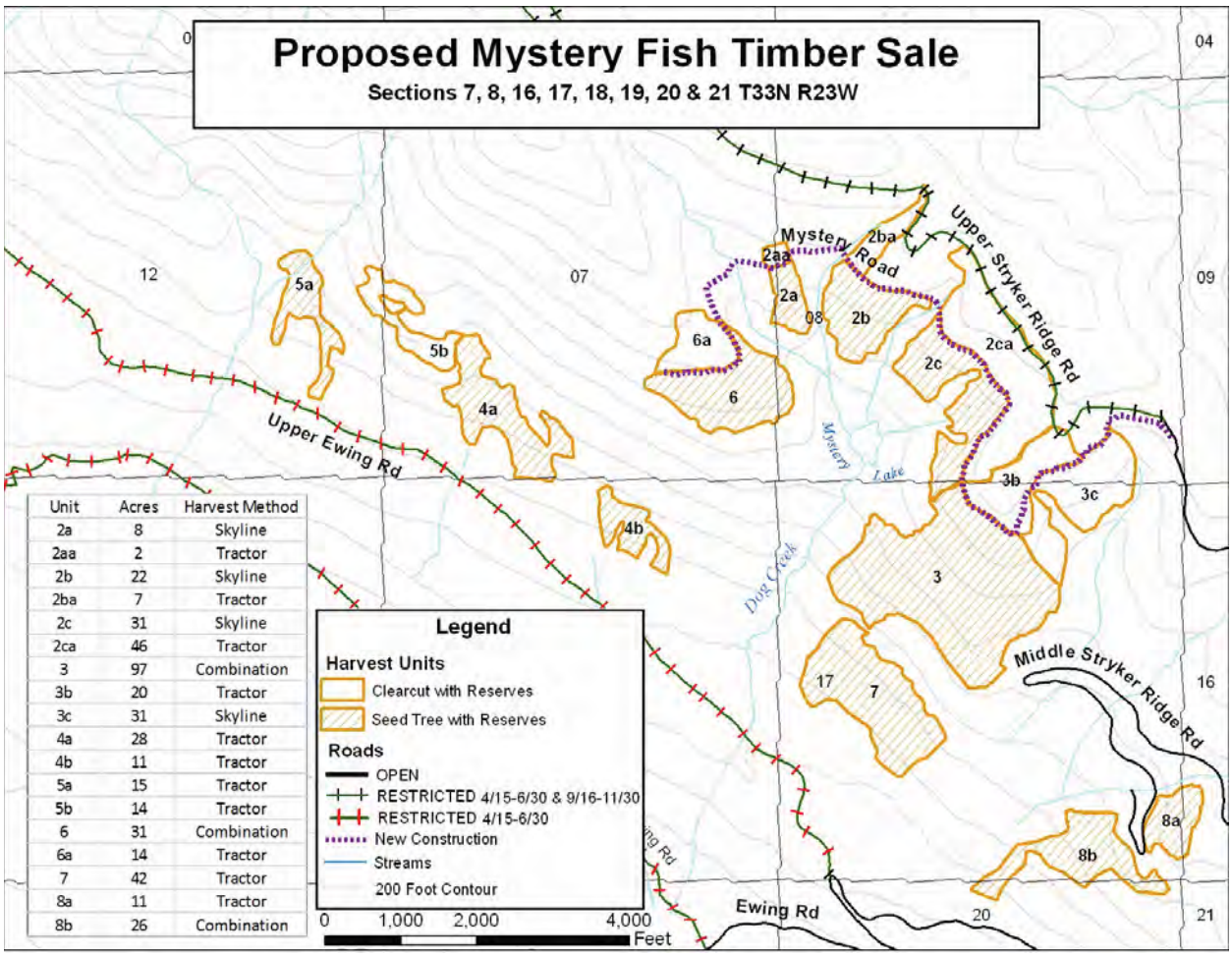
In areas planned for regeneration, sapling-sized trees of low vigor that remain after the harvesting of sawlogs would be felled or cut. These trees and excess logging slash would be piled or trampled. On the units being piled or trampled, a maximum of 30 percent of the area would be disturbed with an excavator or dozer in order to create enough exposed soil to regenerate seedlings. Within those areas too steep for an excavator or dozer, site preparation would be achieved through broadcast burning. Units 2a, 2b, 2c, 3a, 3c and 6

would be broadcast burned. This is the fuels reduction and site preparation phase of forest-improvement practices.

The proposed treatments would leave 8 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 or utilized as biomass. If not utilized in this way, the slash may be piled in either landing piles or smaller piles, and burned during periods when air-quality standards can be met.

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

Figure II-2: PROPOSED MYSTERY FISH PROJECT MAP



Unit	Acres	Harvest Method
2a	8	Skyline
2aa	2	Tractor
2b	22	Skyline
2ba	7	Tractor
2c	31	Skyline
2ca	46	Tractor
3	97	Combination
3b	20	Tractor
3c	31	Skyline
4a	28	Tractor
4b	11	Tractor
5a	15	Tractor
5b	14	Tractor
6	31	Combination
6a	14	Tractor
7	42	Tractor
8a	11	Tractor
8b	26	Combination

Table II-1: PROPOSED PRESCRIPTIONS FOR THE MYSTERY FISH TIMBER SALE PROPOSAL

PROPOSED HARVEST AREA	HARVEST TREATMENT	TOTAL ACRES HARVESTED/ ESTIMATED VOLUME (Mbf)	HARVEST PARTICULARS	FOLLOW-UP TREATMENTS
2aa	Clearcut with Reserves.	2/6.5 Mbf	- Utilize a harvest prescription of, clear cut with reserves; favoring western white pine, western larch and Douglas-fir for the reserve trees. - Tractor log.	- Pile and burn slash. - Mechanically site-prep. - Plant with western larch. .
2a	Seedtree with Reserves.	8/83 Mbf	- Utilize a harvest prescription of seedtree with reserves; favoring western white pine, western larch and Douglas-fir. - Leave 6-10 TPA. - Cable yarding	- Pile and burn slash. - Mechanically site-prep. .
2ba	Clearcut with Reserves.	7/49 Mbf	- Utilize a harvest prescription of, clear cut with reserves; favoring western white pine, western larch and Douglas-fir for the reserve trees. - Tractor log.	- Pile and burn slash. - Mechanically site-prep. - Plant with western larch
2b	Seedtree with Reserves.	22/190 Mbf	- Utilize a harvest prescription of seedtree with reserves; favoring western white pine, western larch and Douglas-fir. - Leave 6-10 TPA. - Cable yarding and ground based.	- Broadcast burn.
2ca	Clearcut with Reserves.	46/294 Mbf	- Utilize a harvest prescription of, clear cut with reserves; favoring western white pine, western larch and Douglas-fir for the reserve trees. - Tractor log.	- Pile and burn slash. - Mechanically site-prep. - Plant with western larch
2c	Seedtree with Reserves.	31/482 Mbf	- Utilize a harvest prescription of seedtree with reserves; favoring western white pine, western larch and Douglas-fir. - Leave 6-10 TPA. - Cable yarding	- Broadcast burn. .

PROPOSED HARVEST AREA	HARVEST TREATMENT	TOTAL ACRES HARVESTED/ ESTIMATED VOLUME (Mbf)	HARVEST PARTICULARS	FOLLOW-UP TREATMENTS
3a	Seedtree with reserves.	97/1405 Mbf	- Utilize a harvest prescription of seedtree with reserves; favoring western larch,western white pine, and Douglas-fir. - Leave 6-10 TPA. - Combination cable yarding and ground based.	- Pile and burn slash. - Mechanically site-prep open areas in tractor portion of unit - Broadcast burn skyline portion of unit.
3b	Clearcut with Reserves.	20/158 Mbf	- Utilize a harvest prescription of clear cut with reserves; favoring western larch and Douglas-fir for the reserve trees. - Tractor log.	- Pile and burn slash. - Mechanically site-prep. - Plant with western larch.
3c	Clearcut with Reserves.	31/236 Mbf	- Utilize a harvest prescription of seedtree with reserves; favoring western larch and Douglas-fir. - Leave 6-10 TPA. - Cable yarding.	- Broadcast burn - Plant with western larch.
4a	Seedtree with reserves.	28/360 Mbf	- Utilize a harvest prescription of seedtree with reserves; favoring western larch and Douglas-fir. - Leave 6-10 TPA. - Tractor log.	- Pile and burn slash. - Mechanically site-prep.
4b	Seedtree with reserves.	11/202 Mbf	- Utilize a harvest prescription of seedtree with reserves; favoring western larch and Douglas-fir. - Leave 6-10 TPA. - Tractor log.	- Pile and burn slash. - Mechanically site-prep.
5a	Seedtree with reserves.	15/174 Mbf	- Utilize a harvest prescription of seedtree with reserves; favoring western larch and Douglas-fir. - Leave 6-10 TPA. Tractor log.	- Pile and burn slash. - Mechanically site-prep. - Plant with western larch.
5b	Clearcut with Reserves.	14/99 Mbf	- Utilize a harvest prescription of clear cut with reserves; favoring western larch and Douglas-fir for the reserve trees. - Tractor log.	- Pile and burn slash. - Mechanically site-prep. - Plant with western larch.

PROPOSED HARVEST AREA	HARVEST TREATMENT	TOTAL ACRES HARVESTED/ ESTIMATED VOLUME (Mbf)	HARVEST PARTICULARS	FOLLOW-UP TREATMENTS
6a	Clearcut with Reserves.	14/71 Mbf	- Utilize a harvest prescription of clear cut with reserves; favoring western larch and Douglas-fir for the reserve trees. - Tractor log.	- Pile and burn slash. - Mechanically site-prep. - Plant with western larch.
6	Seedtree with reserves.	31/300 Mbf	- Utilize a harvest prescription of seedtree with reserves; favoring western larch,western white pine, and Douglas-fir. - Leave 6-10 TPA. - Combination cable yarding and ground based.	- Pile and burn slash. - Mechanically site-prep open areas in tractor portion of unit - Broadcast burn skyline portion of unit. - Plant rust resistant western white pine.
7	Seedtree with reserves.	42/308 Mbf	- Utilize a harvest prescription of seedtree with reserves; favoring western larch and Douglas-fir. - Leave 6-10 TPA. - Tractor log.	- Pile and burn slash. - Mechanically site-prep.
8a	Seedtree with reserves.	11/155Mbf	- Utilize a harvest prescription of seedtree with reserves; favoring western larch and Douglas-fir. - Leave 6-10 TPA. - Tractor log.	- Pile and burn slash. - Mechanically site-prep .
8b	Seedtree with reserves.	26/353 Mbf	- Utilize a harvest prescription of seedtree with reserves; favoring western larch and Douglas-fir. - Leave 6-10 TPA. - Combination cable yarding and ground based.	- Pile and burn slash. - Mechanically site-prep.

Roads and Access

Some changes to the current transportation system and road management would occur with the *Transportation Plan* design for this area. *FIGURE II-3 – MYSTERY FISH ROAD MAP* and *TABLE II-2 - ROADS* show an overall plan for roads, but several specific actions include:

- Mystery Road would be opened for roadwork and harvesting activities, as well as administrative use related to the sale.
- Two currently brushed-in roads would be re-opened for harvesting and administrative use only.
- Seven temporary roads would be built and reclaimed after management activities.

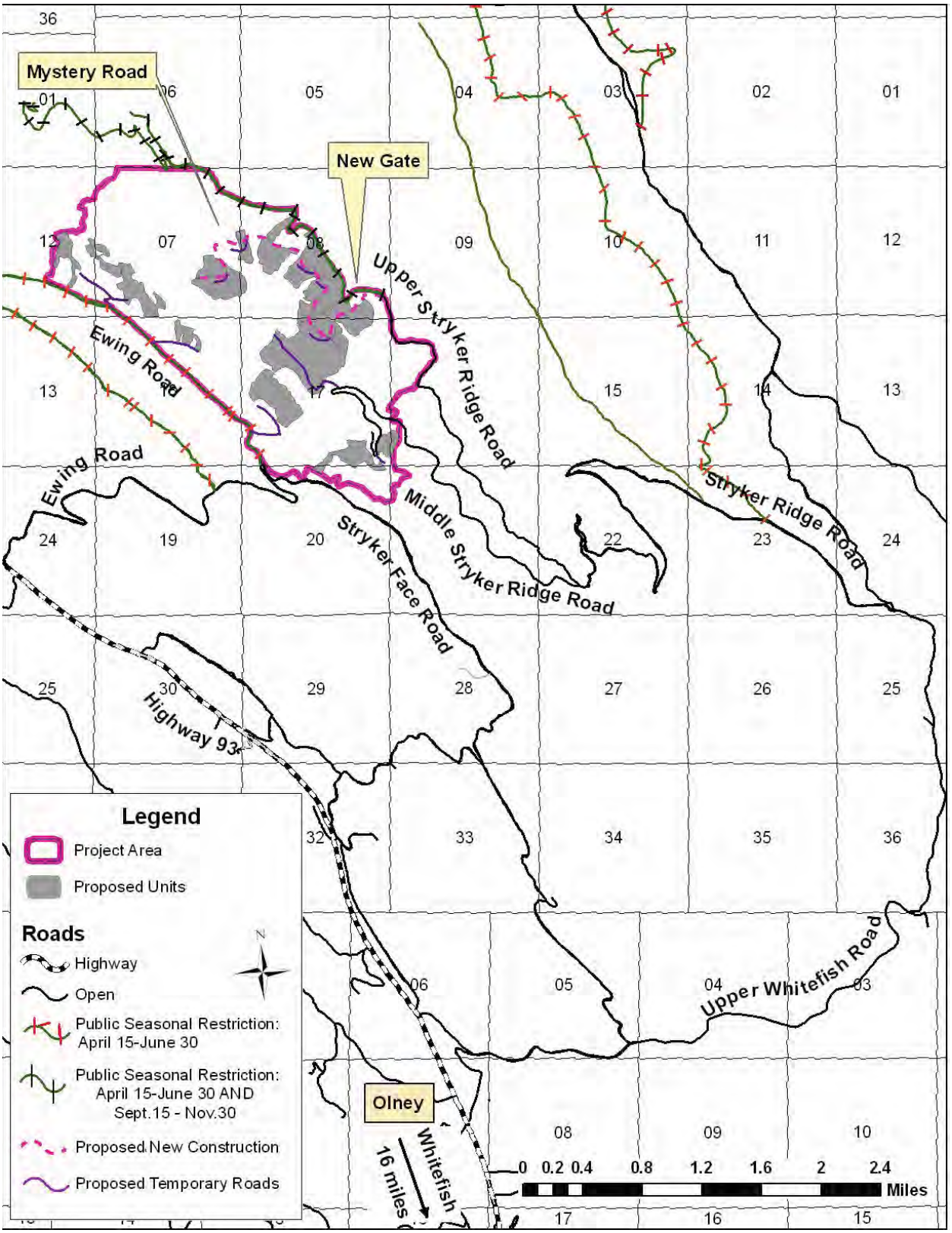
TABLE II-2 - ROADS displays the roads accessing this proposal, amount of road, standard of road, and a discussion about the roads.

Table II-2: ROADS

ROAD	ROAD LENGTH (miles)	STANDARD OF ROAD	ROAD CLASS	USE/TREATMENT
Upper Whitefish Rd.	7	Primary – Existing Road	Open	Maintenance and/or have minor drainage improvements installed.
Stryker Ridge Rd.	5.3	Secondary – Existing Road	Open	Maintenance and/or have minor drainage improvements installed.
Upper Stryker Ridge Rd.	4.05	Secondary – Existing Road	Open	Maintenance and/or have minor drainage improvements installed. Weed spraying required.
Middle Stryker Ridge Rd.	3.4	Secondary – Existing Road	Open	Maintenance and/or have minor drainage improvements installed. Weed spraying required.
Mystery Rd.	2.4	Secondary – New Construction	Closed to public year-round with a gate.	New construction. Gated.
Ewing Road	4.2	Secondary – Existing Road	Open	Maintenance and/or have minor drainage improvements installed.
	2.1	Secondary – Existing Road	Restricted April 1-July 1	Maintenance and/or have minor drainage improvements installed.
Stryker Face Road	0.5	Secondary – Existing Road	Open	Maintenance.
Temporary Spur 2a	0.1 (526′)	Temporary Road	Closed year-round	New construction of low-standard temporary road. Road would be reclaimed following forest management activities.

ROAD	ROAD LENGTH (miles)	STANDARD OF ROAD	ROAD CLASS	USE/TREATMENT
Temporary Spur 2b	0.16 (862′)	Temporary Road	Closed year-round	New construction of low-standard temporary road. Road would be reclaimed following forest management activities.
Temporary Spur 2c	0.08 (401′)	Temporary Road	Closed year-round	New construction of low-standard temporary road. Road would be reclaimed following forest management activities.
Temporary Spur 3	0.16 (827′)	Temporary Road	Closed year-round	New construction of low-standard temporary road. Road would be reclaimed following forest management activities.
Temporary Spur 3a	0.66 (3477′) 1200′ full bench ,1000′half, 1300′ flat ground	Temporary Road	Closed year-round	New construction of low-standard temporary road. Road would be reclaimed following forest management activities.
Temporary Spur 5	0.28 (1458′)	Temporary Road	Closed year-round	New construction of low-standard temporary road. Road would be reclaimed following forest management activities.
Temporary Spur 4a	0.23 (1232′)	Temporary Road	Closed year-round	New construction of low-standard temporary road. Road would be reclaimed following forest management activities.
Temporary Spur 4b	0.32 (1689′)	Brush out road and install 2-18″x 26′ cmps	Closed year-round	Road would be closed following forest management activities.
Temporary Spur 7	0. 45 (1024′-brushed in existing road: 1340′ temp on excavated skid trail prism)	Temporary Road	Closed year-round	New construction of low-standard temporary road. Road would be reclaimed following forest management activities.

Figure II-3: MYSTERY FISH ROAD MAP



Environmental Effects Summary

TABLE II–3- SUMMARY OF ENVIRONMENTAL EFFECTS contains a summary of the information found in *CHAPTER III – EXISTING ENVIRONMENT AND ENVIRONMENTAL EFFECTS.* The following table compares the direct, indirect, and cumulative effects between the Action and No-Action alternatives. The current, or existing condition, can be viewed as a baseline condition, which can be used to make comparisons with the predicted changes that may result from the selection of either alternative.

TABLE II-3: 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 175 acres of mixed conifer and 145 acres of subalpine fir cover type would be converted to the western larch/Douglas-fir cover type. Approximately 22 acres of the western larch/Douglas-fir cover type and 97 acres of the subalpine fir cover type would remain the same. Approximately 17 acres of the mixed conifer type would be converted to the western white pine cover type. Of the 456 acres proposed to be harvested, there would be a change in age class from 150+ to 0-39 years on approximately 133 acres. On the remaining 323 acres, no notable changes in age class would occur 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.
OLD-GROWTH	***No-Action Alternative***	
	In the short-term, no changes would be expected.	Old-growth acres would be maintained at 12,528 acres; the amount of old-growth on Stillwater Unit would remain at 10.7 percent.

RESOURCE	DIRECT AND INDIRECT EFFECTS	CUMULATIVE EFFECTS
OLD-GROWTH	***Action Alternative***	
	Approximately 27 acres of the high attribute old growth, 49 acres of the medium attribute old growth, and 83 acres of the low attribute old growth would be harvested with regeneration treatments. The post-treatment timber stand would no longer meet DNRC's criteria for old growth.	Old-growth acres would be reduced to 12,369 acres; the amount of old-growth on Stillwater Unit would change to 10.6 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. Salvage harvesting on other projects would reduce losses caused by 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.
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. No soil would be disturbed and no ground based equipment operation would occur as a result of this project. All impacts from past management activities would continue to improve or degrade as dictated by natural and pre-existing conditions.

RESOURCE	DIRECT AND INDIRECT EFFECTS	CUMULATIVE EFFECTS
SOILS	***Action Alternative***	
	Based on DNRC soil monitoring on soils and sites similar to those found in the project area, direct impacts to soil physical properties would be expected on up to 50 of the total 456 acres proposed for harvesting in the proposed project area. This level is below the range analyzed for in the *EXPECTED FUTURE CONDITIONS* section of the *SFLMP*, and well within the 20-percent impacted area established as a level of concern in the *SFLMP (DNRC 1996)*. In addition, BMPs and a combination of mitigation measures would be implemented to limit the area and degree of soil impacts as noted in ARM 36.11.422 and the SFLMP (DNRC, 1996). There would be a moderate risk of direct and indirect effects to slope stability from the proposed action alternative on approximately 15 acres. These acres are where proposed harvest units are located on slopes greater than 60%, and as a result are an elevated risk for slope stability. The risk would remain until re-vegetation begins on these units.	Due to mitigation measures and the limited area of reentry, the cumulative effects from compaction, erosion, and displacement would be low.
WATER RESOURCES		
SEDIMENT DELIVERY AND WATER YIELD	***No-Action Alternative***	
	No direct effects to sediment delivery are expected beyond those currently occurring. Indirect effects of the No-Action Alternative to sediment delivery would be an increased risk of sediment delivery to streams from crossings that do not meet applicable BMPs. 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.

RESOURCE	DIRECT AND INDIRECT EFFECTS	CUMULATIVE EFFECTS
SEDIMENT DELIVERY AND WATER YIELD	***Action Alternative***	
	There is a low risk of direct or indirect effects to sediment delivery to streams from the timber harvesting activities proposed. Direct and indirect effects to sediment delivery from use of the Upper Stryker Ridge and Upper Whitefish Lake roads from the Action Alternative are expected to be similar to the existing conditions. Erosion control and BMPs would be improved on up to 10 miles of existing road in the Dog Creek watershed. This work would reduce the estimated sediment delivery to Dog Creek and its tributaries by approximately 7.3 tons of sediment per year. This alternative would construct approximately 2.4 miles of new road and approximately 2.0 miles of temporary road to access proposed harvest units. The action alternative would also replace 2 failed existing stream crossings on an unnamed tributary to Dog Creek in Section 18 of the proposed project area with properly sized structures. Direct and indirect effects of the Action Alternative to water yield in the Dog Creek watershed would include an increase in annual water yield by an estimated 3.0 percent over the current level. These changes have a low risk of low impacts to the stream channels in the Dog Creek watershed.	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.
FISHERIES RESOURCES	***No-Action Alternative***	
	No additional direct or indirect effects to fisheries resources would occur within all analysis areas.(Lower Swift, Meadow, Middle Swift, Rock Creek, and Upper Dog creek analysis areas)	Existing adverse cumulative effects to fisheries resources in the Lower Swift, Meadow, and Middle Swift creek analysis areas are likely low. Existing adverse cumulative effects are likely moderate in the Rock Creek analysis area and high in the Upper Dog Creek analysis area. The primary mechanism for the elevated existing impacts in the Rock and Upper Dog creek analysis areas is the displacement of native fisheries by non-native fisheries.

RESOURCE	DIRECT AND INDIRECT EFFECTS	CUMULATIVE EFFECTS
FISHERIES RESOURCES	***Action Alternative***	
	The proposed actions do not include any timber harvest within 300' of a fish-bearing stream. Also as part of the proposed actions, two road-stream crossings would be constructed in the Upper Dog Creek analysis area to mitigate existing impacts to the sediment and channel form components of fisheries resources. Short-term impacts to sediment are expected as a result of the construction of the two road-stream crossings, but long-term impacts at the affected areas are expected to be low. A risk of additional low, direct and indirect long-term impacts to fisheries resources is expected in all analysis areas as a result of implementing the Action Alternative.	The overall cumulative effects to fisheries resources in all five analysis areas are expected to generally be the same as those described under Existing Conditions.
WILDLIFE		
MATURE 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.	Ongoing and proposed forest management projects not associated the proposed Mystery Fish Timber Sale within the cumulative effects analysis area could alter mature forest wildlife habitat in the present and future. 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	
	Under the action alternative, approximately 373 acres (19.5%) of mature canopy forest would undergo harvesting. Crown closure on these 373 acres would be reduced from >40% to 5-15%. Species that rely on mature canopy forested habitats would experience a reduction in habitat for 50 to 80 years. Roughly 766 acres of mature, closed-canopy forest in the project area would remain unharvested and could provide suitable habitat for species utilizing smaller patches of mature forest (mean patch size 59 acres). 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 habitats.	Reductions in mature, closed canopy forested habitats associated with this alternative (13% of available mature habitat in cumulative area) would be additive to losses associated with past harvesting activities and any ongoing activities within the CEAA (e.g. SE Stryker Ridge Timber Sale). Across the CEAA, a considerable percentage (49.8%) of mature, closed-canopy forested habitats would exist (average patch size = 62 acres) and landscape connectivity would be minimally altered given the existing condition of the surrounding forested landscape.

OLD-GROWTH WILDLIFE HABITAT	***No-Action Alternative***	
	No changes to the amounts, quality, or spatial arrangement of old growth would occur under this Alternative. Old-growth-associated wildlife species would not be affected.	Ongoing and proposed forest management projects not associated the proposed Mystery Fish Timber Sale within the cumulative effects analysis area could alter mature forest wildlife habitat in the present and future. Existing stands of old growth would remain in their current state and no additional cumulative effects to old-growth associated wildlife species would be anticipated.
	Action Alternative	
	159 acres of old-growth forest would be removed from the 1,915-acre project area (4.3% of the project area; 20.0% of the existing old growth in the project area), resulting in 619 acres (32.3%) of old-growth forest remaining. Old-growth forest stands identified for proposed harvest were generally stands with lower abundance of large trees (>21" dbh) and higher levels of disease/insect mortality compared to other stands within the project area. Old-growth stands selected for retention contain higher habitat quality that are expected to persist in old-growth status longer on the landscape than those proposed for harvesting. A moderate level of adverse direct and indirect effects to wildlife associated with old-growth forests would be expected under the Action Alternative as a result of reduced availability of habitat and increases in old-growth fragmentation habitat parameters, such as reduced overall average patch size and reduced average size of large patches.	A moderate level of adverse cumulative effects to wildlife associated with old-growth forests would be expected under the Action Alternative as a result of reduced availability of habitat and increases in old-growth fragmentation habitat parameters, such as reduced average size of large patches. Effects to old-growth and associated wildlife species that would be likely under this alternative would be in addition to those that have occurred in CEAA over the last several decades on DNRC lands (e.g. ongoing SE Stryker Timber Sale).
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.	Ongoing and proposed forest management projects not associated the proposed Mystery Fish Timber Sale within the cumulative effects analysis area could alter snag and downed wood wildlife habitat in the present and future. Snags and coarse woody debris would not be furthered altered under this No-Action Alternative. Wildlife species relying on snags and coarse woody debris would be expected to persist across the analysis area.

RESOURCE	DIRECT AND INDIRECT EFFECTS	CUMULATIVE EFFECTS
SNAGS AND COARSE WOODY DEBRIS	***Action Alternative***	
	Minor adverse direct and indirect effects to snags and coarse woody debris would be anticipated that would affect habitat suitability of wildlife species requiring these habitat attributes since: 1) harvesting would reduce snags, snag recruitment trees, and coarse woody debris on 456 acres (23.8%), but levels of these habitat attributes in unharvested areas (67.2%) would remain high 2) snags and future recruitment trees would be retained in all proposed treatment areas, and 3) open road access for firewood gathering would be unchanged in the long-term.	Lands within the cumulative effects analysis area have experienced different management rules through time, and snags and coarse woody debris have received different levels of consideration; however, harvesting (1,052 acres, 18.3% of the CEAA) has reduced these attributes. The losses of snags associated with this alternative would be additive to the losses associated with past harvesting and any ongoing harvesting on within the CEAA (SE Stryker Ridge Timber Sale). However, the project requirements to retain 2 large snags and snag recruits per acre (greater than 21 inches dbh or next largest size class), and 10 to 15 tons of coarse woody debris per acre would mitigate additional cumulative effects associated with this project. Approximately 4,314 acres (75.2%) within the CEAA have not been harvested and likely contain moderate to high levels of snags and coarse woody debris.
GRIZZLY BEAR	***No-Action Alternative***	
	No direct effects to grizzly bears would be expected. No changes in road densities or hiding cover would be anticipated.	Ongoing and proposed forest management projects not associated with the proposed Mystery Fish timber sale could alter grizzly bear habitat and/or disturb bears in the present and future. Since no additional changes in available habitats or level of human disturbance would be anticipated as a result of the No-Action Alternative, no cumulative effects to grizzly bear diplacement or effects involving mortality risk would be anticipated.
	Action Alternative	
	Minor to moderate adverse direct or indirect effects to grizzly bears in the project area would be expected since: 1) minor to moderate levels of temporary (1 to 4 years) disturbance and displacement would be anticipated; 2) hiding cover on 456 acres (23.8%) would be lost in the short term, but would be expected to recover fairly rapidly; 3) commercial harvest and motorized activities would be restricted during the spring period; and 4) short-term increases in open road densities would be anticipated, but no changes to long-term open-road densities would occur and visual screening would be maintained along open roads.	Reductions in forest cover on 456 acres (1.1%) and disturbance levels would be additive to past timber harvesting that have affected approximately 3,993 acres. (9.8%), and currently proposed harvest projects (i.e. Fish Bull Face Timber Sale). 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***	
	No changes in lynx habitat elements would be expected in the project area and landscape connectivity would not be altered. Thus, no direct or indirect effects influencing lynx habitat suitability would be expected to occur in the project area.	Ongoing and proposed forest management projects not associated with the proposed Mystery Fish timber sale could alter lynx habitat in the present and future. No additional cumulative effects to suitable lynx habitat are expected to result from the No-Action Alternative that could affect lynx habitat suitability in the CEAA.
	Action Alternative	
	Minor adverse direct and indirect effects to habitat suitability for Canada lynx would be expected since: 1) the amount of existing suitable lynx habitat in the project area would be reduced by 24.1%, but the majority (75.1%) would remain suitable, 2) suitable lynx habitats would likely develop in the next 15 to 30 years in the project area, 3) coarse woody debris and patches of regenerating conifers would be retained to increase forest structural complexity in harvest units when they grow back into suitable lynx habitat, and 4) moderate levels of landscape connectivity would persist despite an overall minor reduction in landscape connectivity.	Approximately 456 acres (1.2%) of the 39,240-acre cumulative effects analysis area would be altered and converted to temporary nonsuitable habitat. Within the cumulative effects analysis area, considerable amounts of suitable lynx habitats (85.5%) would continue to persist. Reductions in suitable lynx habitat and increases in temporary nonsuitable habitat in the proposed harvest units would not be expected to appreciably alter lynx use of the cumulative effects analysis area given that surrounding habitat suitability is high. Suitable lynx habitat within the CEAA is being altered by the ongoing Duck to Dog and Highway 93 timber sales, and could be altered within next 5 years by the proposed Fish Bull Face timber sale.
FISHER	***No-Action Alternative***	
	No change to the stands providing fisher denning and foraging habitats would be expected as no timber harvesting activities would occur under this alternative. Also, no changes in landscape connectivity would occur.	Ongoing and proposed forest management projects not associated with the proposed Mystery Fish timber sale could alter fisher habitat in the present and future. No additional cumulative effects to suitable fisher habitat are expected to result from the No-Action Alternative that could affect fisher habitat suitability in the CEAA.
	Action Alternative	
	Minor adverse direct and indirect effects would be anticipated that would affect fisher habitat suitability in the project area since: 1) harvesting would remove a minor amount of suitable riparian (2.1%) and upland (14.6%) fisher habitat, 2) minor reductions in habitat connectivity would occur and riparian fisher habitats maintained, and 3) long-term motorized access would remain the same.	Approximately 283 acres (3.0%) of 9,362 acres of suitable fisher habitat in the DNRC-owned cumulative effects analysis area would be harvested. This reduction would be additive to the losses associated with past and current timber harvesting in the cumulative effects analysis area, including the Duck to Dog and proposed Fish Bull Face timber sales. Future harvest operations or natural disturbance on non-DNRC ownerships could affect fisher habitat on the larger landscape. Negligible reductions in landscape connectivity within the cumulative effects analysis area would occur; suitable forest stands along the majority of riparian areas would persist.

RESOURCE	DIRECT AND INDIRECT EFFECTS	CUMULATIVE EFFECTS
GRAY WOLF	***No-Action Alternative***	
	No effects would be expected because there would be no change in human disturbance levels, nor any changes to prey availability for wolves.	Ongoing and proposed forest management projects not associated with the proposed Mystery Fish timber sale could displace wolves and/or alter wolf prey availability in the present and future. No additional cumulative effects to wolf displacement risk or prey availability are expected to result from the No-Action Alternative that could affect wolves in the CEAA.
	Action Alternative	
	Minor adverse direct and indirect effects to wolf prey availability and minor adverse direct and indirect effects affecting gray wolf displacement risk would be expected since: 1) no known wolf den and/or rendezvous sites are within the project area, 2) there would be minimal reductions in habitat quality of big game winter range that could alter wolf prey availability, and 3) there would be short-term increases in motorized disturbance, and potential for slight long-term increases in non-motorized access.	Disturbance associated with the Action Alternative would be additive to ongoing and proposed forest management activities within the CEAA (i.e. Highway 93 Timber Sale, Duck to Dog Timber Sale, proposed Fish Bull Face Timber Sale). Reductions in cover may cause slight decreases in use by deer, moose, and elk; however, no appreciable changes in deer and elk distribution or abundance would be expected at the scale of the CEAA. The reductions that would occur under this alternative to big game winter range would not be expected to affect the overall use of the cumulative effects analysis area by wolves.
PILEATED WOODPECKER	***No-Action Alternative***	
	Negligible adverse effects to pileated woodpecker habitat suitability would be anticipated, as no timber harvesting would occur..	Ongoing and proposed forest management projects not associated with the proposed Mystery Fish timber sale could serve as a disturbance to pileated woodpeckers and/or alter habitat suitability in the present and future. No additional cumulative effects to pileated woodpecker disturbance risk or habitat suitability are expected to result from the No-Action Alternative.
	Action Alternative	
	Minor adverse direct and indirect effects would be anticipated that would affect pileated woodpeckers in the project area since: 1) 28.3% of available suitable habitat would be harvested; 2) the majority of current pileated woodpecker habitat would remain unharvested (602 acres, 71.7%); 3) some snags and snag recruits would be removed, however, mitigation measures to retain a minimum of 2 snags per acre and 2 snag recruits per acre in harvest areas would be included; 4) harvest prescriptions would retain and promote seral species in the proposed harvest areas where pileated habitat is currently not present; and 5) temporary levels of potential disturbance would increase, but long-term disturbance would be unchanged.	Minor cumulative effects to habitat suitability for pileated woodpeckers would be anticipated since: 1) a minor amount (12.8%) of suitable pileated woodpecker habitat currently present within the CEAA would be altered; 2) 28.3% of suitable pileated woodpecker habitat would remain; 3) some snags and snag recruits per acre would be removed in the proposed harvest areas for operational and human safety purposes; however, mitigation measures would retain some snags and recruitment trees in harvested areas; and 4) disturbance and firewood gathering would not appreciably change in the long-term. These effects would be additive to habitat modification and disturbance levels from ongoing (SE Stryker Timber Sale) and proposed (Fish Bull Face Timber Sale) timber harvesting.

BIG GAME HABITAT	***No-Action Alternative***	
	No changes in big game habitat would be expected as no timber harvesting activities would occur. Existing cover would continue to contribute to winter range quality and security habitat would not be altered.	Ongoing and proposed forest management projects not associated with the proposed Mystery Fish timber sale could alter big game habitat quality in the present and future. No additional cumulative effects to big game habitat quality are expected to result from the No-Action Alternative.
	Action Alternative	
	Minor adverse direct and indirect effects to big game security habitat and winter range habitat quality would be expected. Approximately 456 acres (23.8%) of big game habitat would be harvested. Of these acres, roughly 85 acres of elk security habitat and 447 acres of mature canopy forest currently providing thermal cover would be harvested. Harvest prescriptions in all harvest units would result in areas that are currently too open to effectively function as security cover, thermal cover or snow intercept. Proposed tree removal would increase sight distances in harvest units and could increase risk of hunting mortality. Proposed broadcast burning on 175 acres of harvest units could improve ungulate forage and long-term habitat quality. Some short-term (1-4 years) displacement of big game would be expected as a result of the proposed motorized logging disturbance.	Minor adverse cumulative effects to big game winter range and elk security habitat would be expected. Forest stands providing suitable thermal cover and snow intercept would be removed from approximately 447 acres (1.1%) of winter range within the CEAA (40,860 acres). Elk security cover across 85 acres (0.4%) would also be reduced within the CEAA. Short-term displacement of big game associated with this alternative would be additive to any displacement associated with ongoing and proposed timber harvesting (Duck to Dog Timber Sale, proposed Fish Bull Face Timber Sale).

RESOURCE	DIRECT AND INDIRECT EFFECTS	CUMULATIVE EFFECTS
AESTHETICS		
	No-Action Alternative	
	Timber harvesting and road construction would not take place at this time.	Timber harvesting and road construction would not take place at this time. Effects to the visual resource include activities such as firewood gathering and recreational use, which are presently taking place. Natural processes on the landscape, such as wildfire, blowdown events, insect infestations or disease infections, would continue to alter the visual resource over time. Cumulatively there would not be additional harvest units visible from Highway 93.
	Action Alternative	
	When viewing the proposed harvest units from roads within the project area, the viewing distance into the harvest units would be increased due to the reduction in tree densities. These new harvest areas would primarily be open stands with scattered overstory trees. Vegetative screens along roadways would reduce the number of vantage points potentially available. The background views of the treated areas, as seen from Highway 93, would have an open appearance with scattered overstory trees retained. Some openings would not be visible due to their position on the face; while others would add to the number of existing openings now visible. This would change the texture from the surrounding untreated forest canopy and would define boundary lines along adjacent timber stands. The irregular edges on the proposed harvest units would help reduce the visual impact. When available, additional "reserve" trees would be retained around harvest unit perimeters to provide a transition into the adjacent untreated forests. Construction of 2.4 miles of new road and up to 2.0 miles of temporary roads would be built, and segments of these roads would be noticeable from Highway 93. The proposed new road and the temporary roads would be located to minimize cut and fill sections of the road and use terrain features such as locating the road on benches to reduce the road's visibility. There would be a larger component of sapling and overstory trees retained below the cut /fill sections to help mask the road.	Cumulative effects to the background view seen from Highway 93 are that these proposed units and roads would be additive to the more open views associated with the SE Stryker Ridge and Stryker Ridge II Timber Sale units.

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 $568,500 in project revenue would be deposited into the Common School trust account and approximately $125,650 would be put into the FI account. Approximately $98,850 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. This sale would provide work for approximately 50 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 proposed action contributes proportionally to public school funding. Funds distributed by the state trusts partially offset tax dollars needed to fund public education. The cumulative effect of this proposed action in conjunction with revenue-generating activities of other trust land is the continued financial contribution to public education in Montana. Tax dollars offset by these contributions either go to improve the State of Montana's budget for other public services or they benefit Montana taxpayers by partially reducing their tax burden. The proposed action also contributes 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.

Chapter III

Existing Conditions and Environmental Effects

Introduction

This chapter presents both the existing environment of the project and potential consequences to that environment by implementing the 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 *CHAPTER II – ALTERNATIVES – MITGATIONS AND APPENDIX A – STIPULATIONS AND SPECIFICATIONS*). The proposed Action Alternative is limited to the specific timber harvest, fuel treatments, reforestation activities, and road work in the Mystery Fish Timber Sale Project area, although some components are analyzed across the Stillwater Unit's landscape.

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 SLI and other project documents. The project files for the Mystery Fish Timber Sale Project include all project-specific information, including resource reports and 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 taking place over a period of time.

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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 were used, as well as 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*. 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, Swedish Chicken, Lazy Swift 2, and Butcher Stewart 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 the 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 the Stillwater Unit. The Stillwater Unit administers Stillwater State Forest, Coal Creek State Forest, most of the scattered State 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	1.5
Subalpine fir	27.0	17.7
Lodgepole pine	11.0	10.2
Ponderosa pine	0.7	1.7
Mixed conifer	26.8	6.6
Western larch/Douglas-fir	24.8	47.1
Western white pine	2.0	14.9
Hardwoods	0.3	3.1
Area that does not have a cover type designated in the SLI*	3.7	

**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 harvests, reconnaissance shows that many areas are regenerating to the early successional cover type of primarily lodgepole pine or western larch/Douglas-fir.*

Data indicates, as illustrated by *TABLE III-1 (above)* 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 species. 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	11.4
40-to-99-year	12	17.9	24.0
100-to-150-year	22	24.7	13.4
150+-year	29	32.8	47.4
No age provided in SLI			3.7

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	25	466	635	2, 534	621	4281
Hardwoods	100	122	69	64	0	355
Lodgepole pine	2,532	8,843	444	408	1,003	13,230
Mixed conifer	2,460	7,011	4,339	16,417	304	30,531
Ponderosa pine	371	0	491	242	0	1,104
Subalpine fir	2,599	7,627	3,646	17,372	357	31,601
Western larch/ Douglas-fir	510	3,888	5,881	16,427	2,076	28,782
Western white pine	325	234	256	2,087	0	2,902
Nonstocked	4,437	0	0	0	0	4,437
Total acres (total percent)	13,359 (11.4)	28,191 (24.0)	15,761 (13.4)	55,551 (47.4)	4,361 (3.7)	117,223

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 and proportions of older age classes would increase.

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 175 acres of mixed conifer and 145 acres of subalpine fir cover type would be converted to the western larch/Douglas-fir cover type.
- Approximately 22 acres of the western larch/Douglas-fir cover type and 97 acres of the subalpine fir cover type would remain the same.
- Approximately 17 acres of mixed conifer cover type would be converted to the western white pine cover type.
- 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.

Due to the amount of older-aged trees being retained and DNRC's SLI methodologies used in determining age class, no notable change in age class would occur on 323 of the 456 acres that would be harvested under this alternative. 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 because at least 10% canopy will be retained. Clearcuts with reserves are proposed on 133 acres of the preferred alternative. In this 133 acres, the age class would move from 150+ years old to the 0-39 years 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 data has 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.

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 *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 the Stillwater Unit, approximately 10.7 percent (12,528 acres) of the Stillwater Unit analysis area can be classified as old growth. *FIGURE III - 1 – OLD GROWTH WITHIN THE PROPOSED MYSTERY FISH PROJECT AREA* shows the old-growth stands in the project area.

TABLE III-4 – OLD-GROWTH ACRES BY COVER TYPE 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	4,052	4,394	2,292	840	12,528

**This information comes from 2009 SLI and field reconnaissance done during 2009, 2010, and 2011, 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 775 acres of old growth within the project area. Currently, SLI and field reconnaissance shows approximately 450 acres (58 percent) of the old-growth stands are in the *high attribute* category, 116 acres (15 percent) of the old-growth stands are in the *medium attribute* category, and 209 acres (27 percent) are in the *low attribute* category.

High Attribute Old Growth:

- Western larch and Douglas-fir are the dominant overstory species. Both species average 200 years+ in age. There are from 15-30 trees per acre (TPA) within the 21-inch or greater dbh class.
- 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.
- 2 to 4 large diameter snags per acre (21"+ dbh) are present.
- Subalpine fir and Englemann spruce 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 ranges from 60 to 120 years old; Englemann spruce ranges between 120 and 200 years old.
- Large downed trees in varying stages of decay are distributed throughout each of the high attribute old-growth stands.
- Canopy cover averages >70%.

Medium Attribute Old Growth:

- Engelmann spruce and subalpine fir are the dominant overstory species with a smaller component of Douglas-fir and western larch. All of the overstory species average 200 years+ in age and there are from 10-15 trees per acre (TPA) within the 21-inch or greater dbh class.
- The stand structures are all two-storied or multi-storied, with tree sizes from seedlings to large sawtimber.
- Large downed trees in varying degrees of decay are not present.
- An average of 2 large diameter snags per acre (21"+) are present.
- Canopy Cover averages 40-70%.

Low Attribute Old Growth:

- Engelmann spruce and subalpine fir are the dominant overstory species with a smaller component of Douglas-fir and western larch. All of the overstory species average 200 years+ in age and there are approximately 10 -12 trees per acre within the 21-inch or greater dbh class. The Engelmann spruce and subalpine fir are showing signs of declining health through rot in the bole, broken tops, and reduced vigor (dying and thinning primarily due to spruce budworm) in the foliage. The western larch has dwarf mistletoe present at an endemic level in most of the stands but heavier in proposed Unit 3c (risk ratings 5-6).
- The stand structures are single and two storied with the understory comprised of Englemann spruce and subalpine fir sawtimber or advanced regeneration (saplings).
- There is a large component of fool's huckleberry and alder brush present which is a limiting factor in regeneration of tree species in these stands.
- The downed woody component is either entirely missing or present at very low levels.
- 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.
- Canopy Closure averages approximately 8-39%.

Environmental Effects to Old Growth

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

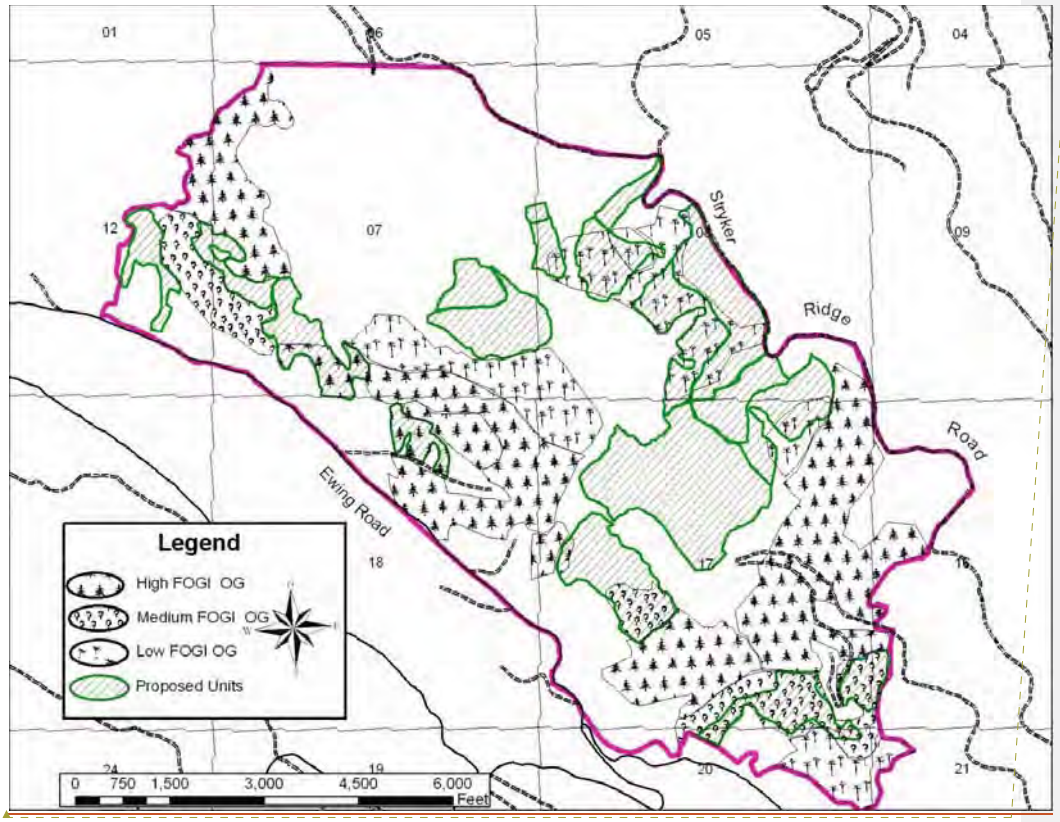
In approximately 43 acres of the *high to medium attribute old growth*, the western larch is heavily infested with dwarf mistletoe and the Douglas-fir shows the presence of *Armillaria* root rot and Douglas-fir bark beetle activity. At the current rate of mortality in large-diameter trees, these 43 acres of old growth would likely not meet the criteria for old growth within the next 10 years.

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

Approximately 27 acres of the *high attribute old growth*, 49 acres of the *medium attribute old growth,* and 83 acres of the *low attribute old growth* would be harvested with regeneration treatments. The post-treatment timber stand would no longer meet DNRC's criteria for old growth. Future SLI updates would be made on the portions of the timber stands where old growth would be harvested.

FIGURE III-1 shows the distribution of old growth within the project area.

***FIGURE III-1** – OLD GROWTH WITHIN THE PROPOSED MYSTERY FISH PROJECT AREA*



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

Stands that currently meet DNRC*s* old growth definition 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.

189 acres of old growth have been or are planned to be treated using old growth maintenance treatments (89 acres in Swedish Chicken Timber Sale, 25 acres in the Coal Ridge Timber Sale, 24 acres in Butcher Stewart Timber Sale, and 51 acres in the Upper Whitefish Timber Sale). This would not affect the distribution of old growth, since all 189 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.

An estimate of 12, 528 acres or 10.7% of the forest stands on the Stillwater Unit would remain old growth.

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

In addition to the general effects to old growth described in the Cumulative Effects section of the No-Action Alternative, 159 acres of old growth would be harvested with regeneration treatments in the proposed Mystery Fish Timber Sale. The estimated amount of old growth on the Stillwater Unit would be reduced to 12, 369 acres or 10.6%.

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.

Existing Condition

Damage and mortality from insects and diseases are limited to small portions of the project area, but there is an increasing incidence of various damaging agents. 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 and subalpine fir throughout this area. Larch mistletoe is found in several areas of the project area. The root disease *Armillaria* (affecting Douglas-fir) is found primarily in the lower elevation units.

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 and parasites such as Armillaria root rot and dwarf mistletoe 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 recently killed trees.

This project would reduce susceptibility to western spruce budworm on 456 acres through the use of harvest treatments that 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 5,500 rust-resistant western white pine seedlings on 17 acres after harvesting has been completed, thereby providing the continued presence of western white pine in the project area. Approximately 20,000 western larch would be

planted on 134 acres after the harvesting has been completed to help move those acres from the subalpine fir covertype to the desired future condition of western larch/Douglas-fir covertype.

Individual larch heavily infected with dwarf mistletoe would be harvested, resulting in the reduced spread of mistletoe and improved vigor of the residual stands, and increased resources for individual trees to live with or possibly resist mistletoe infection.

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

In the project area no harvesting of live, dead, dying, or high-risk trees would occur. Some salvage harvesting of insect-infested and disease-infected trees may occur under a separate environmental review document if an outbreak permit is requested. 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 through seed dispersion from the larger dominant trees to the saplings and intermediate story trees. 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.

Elsewhere on the Stillwater Unit, silvicultural prescriptions have generally been implemented that would reduce losses and recover mortality caused by insects and disease.

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 shade-tolerant species (Engelmann spruce, subalpine fir, grand fir, western hemlock, and western red cedar) begin to develop. The Stillwater Unit'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 dense 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 groups present in the Mystery Fish project area are summarized in *TABLE III-5– CHARACTERISTICS OF FIRE GROUPS OCCURRING WITHIN THE MYSTERY FISH TIMBER SALE PROJECT.*

***TABLE III-5** – CHARACTERISTICS OF FIRE GROUPS OCCURRING WITHIN THE MYSTERY FISH TIMBER SALE PROJECT.*

	FIRE GROUP		
	8	**9**	**11**
Habitat type group	Dry lower subalpine habitat types	Moist lower subalpine habitat types	Moist grand fir, western red cedar, and western hemlock habitat types
Percent of the project area	4	59	37
Fire return interval/ Severity *(Fischer and Bradley)*	Frequent to Infrequent/Mixed	Infrequent/ Low or High	Infrequent/ Low to Moderate
Average fuel loading (tons/acre) *(Fischer and Bradley)*	18	25	25
Postharvest fuel loading (tons/acre)	10 to 15	10 to 15	10 to 15

Timber Sale Project Fire Groups

The Mystery Fish Timber Sale project is represented primarily by Fire Groups 9 and 11. Fire Group 9 represents moist, lower subalpine habitat types and Fire Group 11 represents moist grand fir, western red cedar, and western hemlock habitat types where fires are infrequent, and either very low intensity or severe, with long lasting effects. 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, 12 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 18.9 with a wide range of 1.2 to 46.9 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 to 14 tons per acre to maintain forest productivity. Currently, 58% of the transects were in the recommended range, 21% were below the recommended range and 21% 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 the regeneration treatments would emulate a stand-replacement fire without the risk of burning the seed trees of desired seral species, or overheating 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 fuel loading and continuity, as well as the difficult terrain and limited access, potentially occurring wildfires would likely be stand-replacing events and difficult to suppress.

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 non-native 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*)
- oxeye daisy (*Chrysanthemum leucanthemum*)
- orange hawkweed (*Hieracium aurantiacum*)

Spotted knapweed and oxeye daisy are listed as Category 1 weeds, which are established weeds with high disbursement; orange hawkweed is a Category 2 weed, which is established, but has 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 and inspecting 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.

Soils Analysis

Introduction

Landform Description

The landform and parent materials in the project area are generally quartzite and argillite bedrock soils with small areas of glacial till or glacial drift influence. Volcanic ash surface layers are common above 5000 feet, especially on northern aspects. The majority of the bedrock consists of slightly metamorphosed sedimentary rocks formed from sand, silt, clay, and carbonate materials deposited in an ancient shallow sea during the Precambrian period.

Soil Physical Properties

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

Nutrient Cycling

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

Slope Stability

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

Analysis Methods

Soil Physical Properties

Impacts to soil physical properties will be analyzed by evaluating the current levels of soil disturbance in the proposed project area based on field review and aerial photo review of existing and proposed harvest units. Percent of area affected is determined through pace transects, measurement, aerial photo interpretation, and GIS to determine skid trail spacing and skid trail width. From this, skid trail density and percent of area impacted are determined. Estimated effects of proposed ground-based and cable yarding activities will be assessed based on findings of DNRC soil monitoring. Soil erosion potential will be measured using the K-value as determined by the NRCS (1996). A description of the K-value and its associated interpretations is found in *Table III-7 Soil Map Unit Descriptions.*

Nutrient Cycling

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

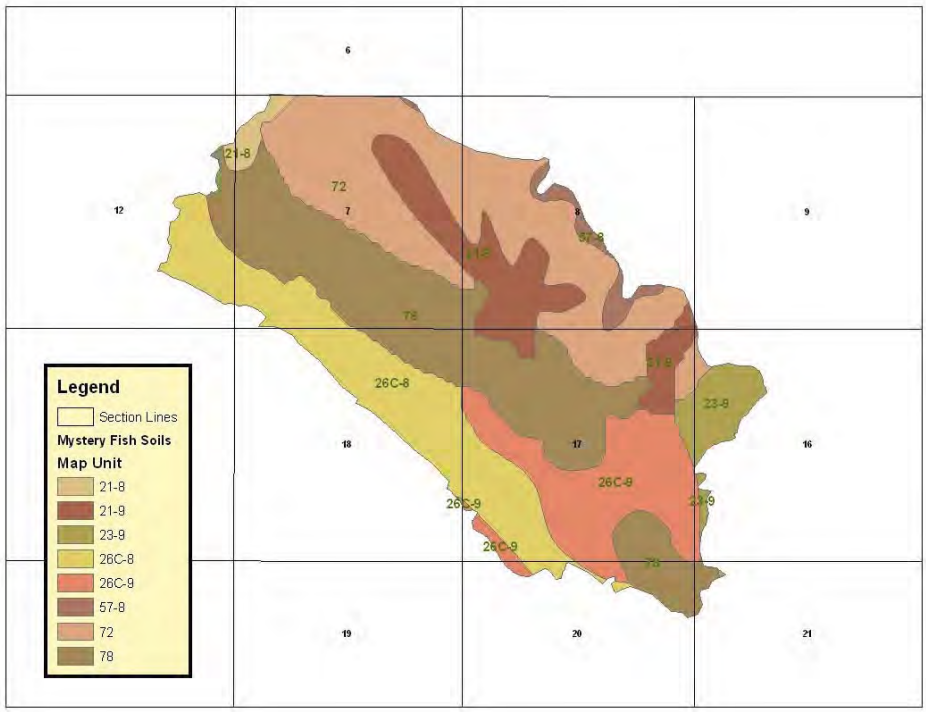
Slope Stability

Slope stability risk factors will be analyzed by reviewing the Web Soil Survey to identify landtypes listed as high risk for mass movement. Field reconnaissance will also be used to identify any slopes greater than 60 percent as an elevated risk for mass movement.

Analysis Area

The analysis area for evaluating soil physical properties, nutrient cycling and slope stability will include DNRC owned land within the Mystery Fish project area. A map of the Landtypes in the Mystery Fish project area is found below in *Figure III-2 Mystery Fish Landtype Map*.

FIGURE III-2 – Mystery Fish Landtype Map



Existing Environment

Soil Physical Properties

In the gross project area, DNRC has conducted timber harvesting since the 1960s. Timber sale records dating back to the 1960s indicate most of the proposed project area has been harvested using primarily ground-based yarding methods. Ground-based yarding can create soil impacts through displacement and compaction of productive surface layers of soil, mainly on heavily used trails. Existing skid trails are spaced at between 60 and 120 feet apart, and none were identified as erosion or sediment sources. Trails are still apparent, but most are well vegetated and past impacts are beginning to ameliorate from freeze-thaw cycles and root penetration. In some areas, excavated skid trails were constructed to skid logs across steeper slopes. In some cases, these excavated trails have intercepted springs and sub-surface water. These springs generally become sub-surface prior to reaching other water sources, but excavated trails with surface water are considered unsuitable for continued use. Based on pace transects of trail spacing, knife penetration tests for compaction, and ocular estimates of re-vegetation, approximately 10% of previously ground-skidded harvest units are in an impacted condition in the proposed project area.

Nutrient Cycling

Nutrient cycling was assessed in the proposed project area by completing 12 transects to estimate the current levels of coarse woody debris. These transects were focused on proposed harvest units. The average coarse woody debris is 18.9 tons/acre, with a range of 1.2 to 46.9 tons/acre and a median of 14.3 tons/acre. These results are generally within the recommended range discussed in *Managing Coarse Woody Debris in Forests of the Rocky Mountains* (Graham et al, 1994) on similar habitat types. Subalpine fir habitat types in Montana are recommended to have a range of 12 to 24 tons/acre to maintain forest productivity and nutrient cycling.

Slope Stability

Soil types in the project area are primarily moderately steep (40-60%) and steep (>60%) glacially scoured ridges and hillsides. The Web Soil Survey reports the findings in the *Flathead National Forest Area, Montana (MT619)* (NRCS, 1998) soil survey. This survey identified no areas of soils at high risk for mass movements in the project area. Although many steep slopes exist in the project area, site-specific field reconnaissance identified no slope failures in the proposed project area. As a result, slope stability will not be analyzed further for this project since there is a low risk of impacts to slope stability in the project area. A list of soil map units found in the Mystery Fish project area and their associated management implications is found in *Table III-7 Soil Map Unit Descriptions for the Mystery Fish Project Area.*

Environmental Effects

Soil Physical Properties

DIRECT AND INDIRECT EFFECTS

DIRECT AND INDIRECT EFFECTS OF NO-ACTION ALTERNATIVE TO SOIL PHYSICAL PROPERTIES

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

DIRECT AND INDIRECT EFFECTS OF THE ACTION ALTERNATIVE TO SOIL PHYSICAL PROPERTIES

Based on DNRC soil monitoring on soils and sites similar to those found in the project area, direct impacts to soil physical properties would be expected on up to 48 of the total 456 acres proposed for harvesting in the proposed project area. Soil monitoring conducted on DNRC lands shows that sites harvested on DNRC lands statewide on

similar soils with ground-based machinery had a range of impacts from 7.2 to 9.7 percent of the acres treated, with an average disturbance rate of 8.3% (DNRC, 2009). These impacts include operations on dry soils in non-winter conditions. Soil monitoring conducted on DNRC lands shows that sites harvested on DNRC lands statewide on similar soils with cable yarding equipment had a range of impacts from 2.3 to 11.4 percent of the acres treated, with an average disturbance rate of 6.2% (DNRC, 2009). As a result, the extent of impacts expected would likely be similar to those reported by DNRC soil monitoring (DNRC, 2009), or approximately 7.2 to 9.7 percent of ground-based harvested acres, and approximately 2.3 to 11.4 percent of cable harvest acres. The proposal includes 272 acres of ground-based mechanical harvesting.

Ground-based site preparation would be done on tractor units, and prescribed fire would be used for site preparation on portions of cable harvest units. These activities would also generate direct impacts to the soil physical properties. Site-preparation disturbance would be intentionally done, and these impacts are considered light and promote reforestation of the site. **Table III-6** summarizes the expected impacts to the soil resource as a result of the Action Alternative. These activities would leave approximately 10.4 percent of the proposed harvest units in an impacted condition. This level is below the range analyzed for in the *EXPECTED FUTURE CONDITIONS* section of the *SFLMP*, and well within the 20-percent impacted area established as a level of concern in the *SFLMP (DNRC 1996)*. In addition, BMPs and a combination of mitigation measures would be implemented to limit the area and degree of soil impacts as noted in ARM 36.11.422 and the SFLMP (DNRC, 1996).

Table III-6 *– Summary of Direct Effects of Alternatives on Soil Physical Properties*

Description of Parameter	**No Action**	**Action Alternative**
Acres of Harvest	0	456
Acres of ground based yarding	0	272
Acres of ground based impacts[1]	0	**23**
Acres of skyline yarding	0	184
Acres of skyline impacts[2]	0	**11.4**
Miles of new roads	0	4.4
Acres of new roads[3]	0	**13.2**
Total estimated acres of impacts	0	**47.6**
Percent of harvest area with impacts	0%	10.4%

1) 8.3% of tractor units based on average impacts found on similar soils and sites by DNRC soil monitoring
2) 6.2% of skyline units affected by corridors
3) Assuming an average width of 25 feet, roads are approximately 3 acres per mile

CUMULATIVE EFFECTS

CUMULATIVE EFFECTS OF THE NO ACTION ALTERNATIVE TO SOIL PHYSICAL PROPERTIES

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

CUMULATIVE EFFECTS OF THE ACTION ALTERNATIVE TO SOIL PHYSICAL PROPERTIES

Cumulative effects to soil physical properties may occur from repeated entries into a forest stand where additional ground is impacted by equipment operations. None of the proposed units in this alternative have had any past harvesting activity. As a result, the cumulative effects to soil physical properties in these areas would be identical to those displayed in the Direct and Indirect Effects section of this analysis. Cumulative impacts to soil physical properties under the Action Alternative would fall below the range analyzed for in the EXPECTED FUTURE CONDITIONS section of the SFLMP and are well within the 20-percent impacted area established as a level of concern in the SFLMP (DNRC, 1996).

Nutrient Cycling

DIRECT AND INDIRECT EFFECTS

DIRECT AND INDIRECT EFFECTS OF NO-ACTION ALTERNATIVE TO NUTRIENT CYCLING

The No Action Alternative would have no direct or indirect effects on nutrient cycling. No harvesting activity would take place under this alternative, which would leave the woody debris levels in the project area unchanged from the description in the Existing Conditions portion of this analysis. Nutrient cycling from coarse woody debris would stay near current levels as dictated by natural and pre-existing conditions.

DIRECT AND INDIRECT EFFECTS OF THE ACTION ALTERNATIVE TO NUTRIENT CYCLING

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

CUMULATIVE EFFECTS

CUMULATIVE EFFECTS OF THE NO ACTION ALTERNATIVE TO NUTRIENT CYCLING

This alternative would have no cumulative impacts to nutrient cycling in the project area. The impacts of this alternative would be similar to those described in the Existing Conditions portion of this analysis. Nutrient cycling from coarse woody debris would stay near current levels as dictated by natural and pre-existing conditions.

CUMULATIVE EFFECTS OF THE ACTION ALTERNATIVE TO NUTRIENT CYCLING

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

TABLE III-7 – Soil Map Unit Descriptions for the Mystery Fish Project Area

Map Unit	Name	Soil & Vegetation Descriptions	Management Considerations			
			K_w**/ erosion potential*	Timber	Roads	Comments
21-8	Cirque Basins, 20-40%	Soils of this map unit are glacial till formed from metasedimentary rocks. Vegetation is upper subalpine forest with forbs/shrub understory.	K_w = 0.17-0.55 Erosion risk is moderate	Potential Prod: Low Equipment: Tractor Regen: Harsh climate	Roads perform well with standard location, construction and maintenance practices. Rock may limit excavation.	Rock outcrops may limit tractor operation.
21-9	Rock Outcrops, Shallow Glacial Till, 40-60%	Soils of this map unit are glacial till formed from metasedimentary rocks. Vegetation is upper subalpine forest with forbs/shrub understory.	K_w = 0.17-0.55 Erosion risk is moderate	Potential Prod: Low Equipment: Cable Regen: Harsh climate	Roads perform well with standard location, construction and maintenance practices. Slope steepness may increase cost.	Rock outcrops may require ripping/blasting for roads.
23-9	Glaciated Mountain Slopes, 40-60%	Soils of this map unit are glacial till formed from metasedimentary rocks. Vegetation is moist mixed forest and dry mixed forest with forbs/shrub understory.	K_w = 0.17-0.64 Erosion risk is moderate	Potential Prod: Moderate/high Equipment: Cable Regen: Can be limited by grass competition	Roads perform well with standard location, construction and maintenance practices. Slope steepness may increase cost.	Road cuts and fills may be difficult to re-vegetate
26C-8	Glacial Moraines, 20-40%	Soils of this map unit are glacial till. Vegetation is a moist mixed forest with forbs/shrub understory.	K_w = 0.20-0.64 Erosion risk is moderate	Potential Prod: High Equipment: Tractor Regen: Can be limited by frost pockets	Roads perform well with standard location, construction and maintenance practices. Slope steepness may increase cost.	Season of use important (compaction & displacement).

26C-9	Glacial Moraines, 40-60%	Soils of this map unit are glacial till. Vegetation is a moist mixed forest with forbs/shrub understory.	K_w = 0.20-0.64 Erosion risk is moderate	Potential Prod: High Equipment: Cable Regen: None	Roads perform well with standard location, construction and maintenance practices. Cutslopes may ravel.	Season of use important (compaction & displacement).
57-8	Glaciated Mountain Ridges, 20-40%	Soils of this map unit glacially scoured metasedimentary rocks. Vegetation is lower subalpine forest with forbs/shrub understory.	K_w = 0.15-0.49 Erosion risk is moderate	Potential Prod: Moderate Equipment: Tractor Regen: Can be limited by moisture stress	Roads perform well with standard location, construction and maintenance practices.	Season of use important (compaction & displacement).
72	Glacial Cirque Wall, 60-90%	Soils of this map unit glacially scoured metasedimentary rocks. Vegetation is upper subalpine forest with forbs/shrub understory.	K_w = 0.32-0.55 Erosion risk is moderate	Potential Prod: Low Equipment: Cable Regen: Can be limited by harsh climate	Rock may limit excavation, Slope steepness may increase cost.	Cliffs and rock outcropping may affect feasibility of operation.
78	Glacial Trough Wall, 60-90%	Soils of this map unit glacially scoured metasedimentary rocks. Vegetation is a dry mixed forest with grass/shrub understory.	K_w = 0.02-0.10 Erosion risk is moderate	Potential Prod: Low Equipment: Cable Regen: Can be limited by moisture stress & grass	Rock may limit excavation, Slope steepness may increase cost.	Cliffs and rock outcropping may affect feasibility of operation.

** Erosion Potential is based on slope and soil erosion factor K**. The soil loss is caused by sheet or rill erosion in off-road or off-trail areas where 50 to 70 percent of the surface has been exposed by logging, grazing, mining, or other kinds of disturbance. The hazard is described as slight (low), moderate, severe, or very severe. A rating of slight indicates that erosion is unlikely under ordinary climatic conditions; moderate indicates that some erosion is likely and that erosion-control measures may be needed; severe indicates that erosion is very likely and that erosion-control measures, including revegetation of bare areas, are advised; and very severe indicates that significant erosion is expected, loss of soil productivity and off-site damage are likely, and erosion–control measures are costly and generally impractical. (NRCS, 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, 19).*