

# **Squeezer Meadow Multiple Timber Sale Project Final Environmental Impact Statement**



**Montana Department of Natural Resources and Conservation  
Swan Unit**



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### SQUEEZER MEADOW MULTIPLE TIMBER SALE PROJECT FINAL ENVIRONMENTAL IMPACT STATEMENT

5/3/2024

Enclosed is a copy of the Squeezer Meadow Multiple Timber Sale Project Final Environmental Impact Statement (FEIS).

The proposed project is located approximately 9 miles southeast of Swan Lake, Montana in the Swan River State Forest.

The Department does not present a preferred alternative of the action alternatives analyzed in the FEIS. The proposed harvest volumes range from 0 with No-Action Alternative A, 39.9 MMBF with Action Alternative B, and 35.5 MMBF with Action Alternative C.

My proposed decision in the FEIS is Action Alternative B. The rationale for my proposed decision is at the end of Chapter II in the FEIS. I anticipate making my final decision on May 20<sup>th</sup>, 2024. The Land Board has the ultimate decision responsibility.

The FEIS was designed to address Swan River State Forest's primary commitment to Montana's mandated timber harvest levels over a 5 to 7 year period. This approach does a better job of analyzing cumulative effects to valuable resources and improves coordination for project planning within active subzones by the Habitat Conservation Plan.

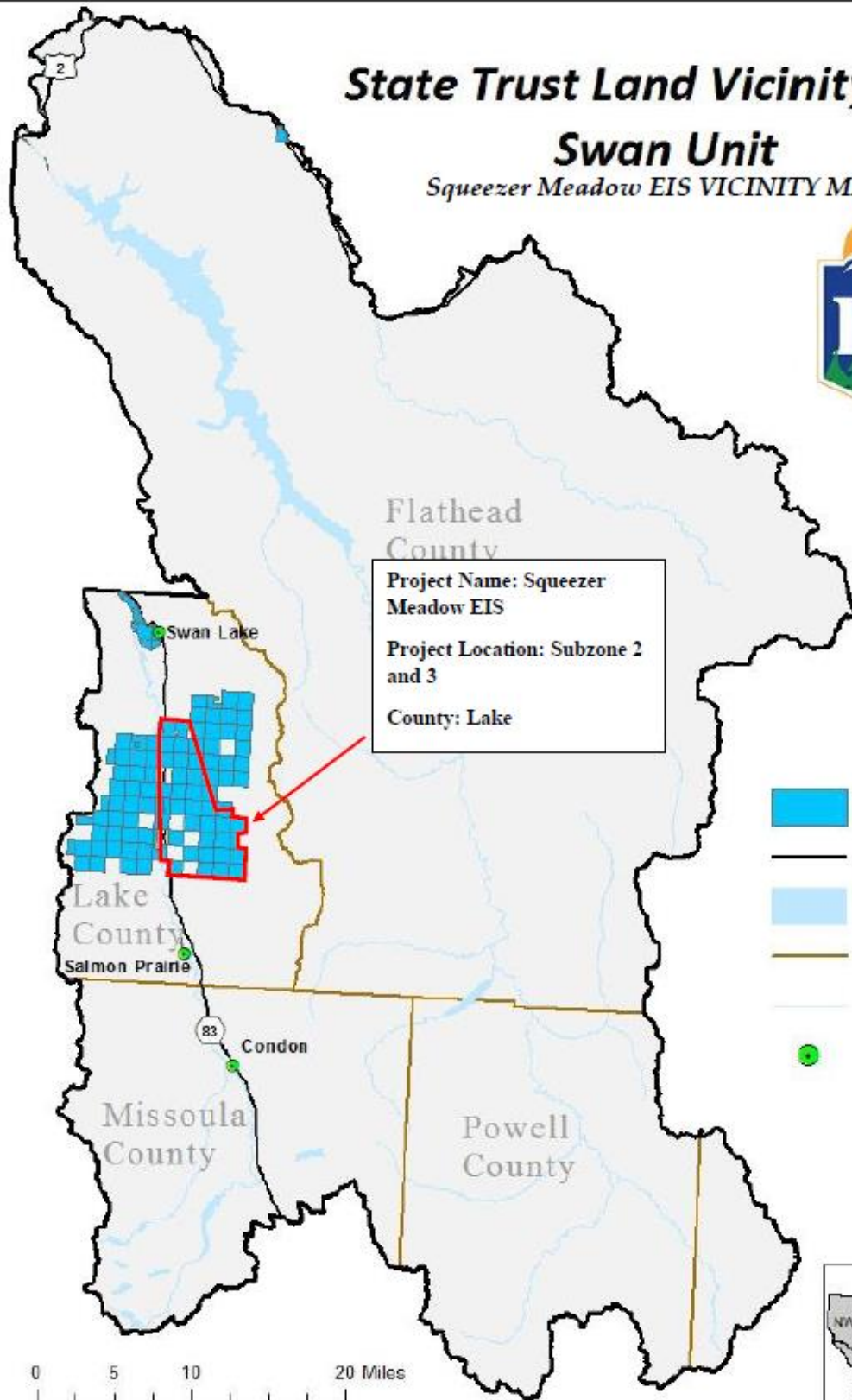
Sincerely,

Dave Marx, Unit Manager  
Swan River State Forest  
34925 MT Highway 83,  
Swan Lake, Mt 59911  
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# State Trust Land Vicinity Map

## Swan Unit

Squeezer Meadow EIS VICINITY MAP

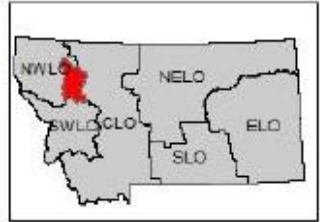


Project Name: Squeezer Meadow EIS  
Project Location: Subzone 2 and 3  
County: Lake

- State Trust Land
- Major Roads
- Water Bodies
- County Lines
- Rivers
- Towns

0 5 10 20 Miles

Produced by Montana Department of Natural Resources and Conservation 11/1/2019  
Datum: NAD 1983 StatePlane



# **SQUEEZER MEADOW MULTIPLE TIMBER SALE PROJECT FINAL ENVIRONMENTAL IMPACT STATEMENT**

## **PREFACE**

This document has been designed and developed to provide the decisionmaker with sufficient information to make an informed, reasoned decision concerning the proposed Squeezer Meadow Multiple Timber Sale Project (proposed action) and to inform the interested public about this project so they may express their concerns to the project leader and decisionmaker.

The FEIS consists of the following sections:

- Chapter I – Purpose and Need
- Chapter II – Alternatives
- Chapter III – Existing Environment and Environmental Effects
- References
- Preparers and Contributors
- Scoping List and Respondents
- Stipulations and Specifications
- Glossary
- Acronyms and Abbreviations
- Appendices

*CHAPTERS I and II* offer a summary overview of the proposed action. These chapters have been written so nontechnical readers can easily understand the purpose and need of the proposed action, alternatives to the proposed action, and the potential environmental, economic, and social effects associated with the No-Action and Action Alternatives.

*CHAPTER I* provides a brief description of the proposed action and explains key factors about the project, such as:

- 1) the purpose and need of the proposed action, which includes the project objectives;
- 2) the *Environmental Impact Statement (EIS)* process, which includes how scoping is done and the decisions made by the decisionmaker concerning this project;
- 3) the proposed schedule of activities;
- 4) the scope of this *Final Environmental Impact Statement (FEIS)*, which includes other relevant projects, issues studied in detail, and issues eliminated from further analysis, and
- 5) the relevant laws, regulations, and consultations with which DNRC must comply.

*CHAPTER II* provides detailed descriptions of the No-Action and the Action Alternatives. Included is a summary comparison of project activities associated with each alternative and a summary comparison of the predicted environmental effects of each alternative. These comparisons provide the decisionmaker a clear basis for choice between the No-Action and Action Alternatives.

*CHAPTER III* briefly describes the past and current conditions of the pertinent ecological and social resources in the project area that would be meaningfully affected, establishing a part of the baseline used for the comparison of the predicted effects of the alternatives. Chapter III also presents the detailed, analytic predictions of the potential direct, indirect, and cumulative effects associated with the No-Action and Action Alternatives.

*REFERENCES* list the references utilized in the FEIS.

*PREPARERS AND CONTRIBUTORS* lists the preparers of the FEIS.

*SCOPING LIST AND RESPONDENTS* lists the persons, agencies, and organizations that are listed to receive scoping documents, newsletters, and public participation activities associated with the proposed action. This list also contains those individuals who submitted issues and concerns regarding the proposed action. Some individuals submitted comments without their name and could not be listed here.

*STIPULATIONS AND SPECIFICATIONS* includes a list of measures designed to prevent or reduce the potential effects to the resources considered in this FEIS.

*GLOSSARY* defines the technical terms used throughout the document.

*ACRONYMS AND ABBREVIATIONS* lists the acronyms and abbreviations used throughout the document.

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## CHAPTER I – PURPOSE AND NEED

### PROJECT LOCATION

The Swan River State Forest (SRSF), Montana Department of Natural Resources and Conservation (DNRC), Forestry and Trust Land Management Division, is proposing the Squeezer Meadow Multiple Timber Sale Project. The project area is located approximately 9 air miles southeast of Swan Lake, Montana (MT) on Common Schools State Trust Land in the eastern portion of the Swan River State Forest. The project area is approximately 25,436 acres and includes all or portions of the following sections:

<b>SECTIONS</b>	<b>TOWNSHIP</b>	<b>RANGE</b>
16, 17, 18, 19, 20, 21, 22, 27, 28, 29, 30, 32, 33, and 34	24N	17W
24, 25, and 26	24N	18W
3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 15, 16, 18, 20, 22, 23, 24, 25, 26, 27, 28, 30, 32, 34, 35, and 36	23N	17W
1 and 12	23N	18W

The project area also includes existing and proposed roads needed to access the project area and support the proposed activities.

### PURPOSE AND NEED

The project area has a variety of stands in differing stages of development. Some stands are young, vigorous and health, while other are older with reduced vigor and multiple insect and disease issues. In many stands, the current forest cover type is moving away from, or no longer matches, DNRC’s desired cover type for the site.

The lands involved in the proposed action are held by the State of Montana for the support of the Common School Trust (Enabling Act of February 22, 1889). The Board of Land Commissioners (Land Board) and DNRC are required by law to administer these trust lands to produce the largest measure of reasonable and legitimate return over the long run for these beneficiary institutions (1972 Montana Constitution, Article X, Section 11; Montana Code Annotated [MCA] 771202).

Management of the lands in the project area is guided by DNRC’s State Forest Land Management Plan (SFLMP), Forest Management Rules (Administrative Rules of Montana [ARM] 36.11.401 through 470), and the Montana DNRC Forested State Trust Lands Habitat Conservation Plan (HCP). The SFLMP has the following philosophy:

*“Our premise is that the best way to produce long-term income for the trust is to manage intensively for healthy and biologically diverse forests. Our understanding is that a diverse forest is a stable forest that will produce the most reliable and highest long-term revenue stream. Healthy and biologically diverse forests would provide for sustained income from both timber and a variety of other uses. They would also help maintain stable trust income in the face of uncertainty regarding future resource values. In the foreseeable future, timber management will continue to be our primary tool for achieving biodiversity objectives.” (DNRC 1996a: Record of Decision [ROD] 1 and 2)*

## **PROJECT OBJECTIVES**

DNRC has developed the following project objectives:

- Promote biodiversity by moving forest stands towards historic cover type conditions and species composition.
- Improve forest health and productivity by addressing insect and disease issues.
- Generate revenue to the Common Schools trust for funding public education and to benefit local economies.
- Contribute sufficient volume towards DNRC’s annual sustained yield target of 60 million board feet (MMBF) as required by state law (77-5-221 through 223, MCA) while incorporating and meeting important ecological commitments.
- Develop and improve the transportation system and infrastructure for long-term management, fire suppression, and public access.
- Improve water quality by removing and rehabilitating sediment point sources and meet Best Management Practices (BMPs) on all project roads, including haul routes to Highway 83.
- Reduce fuel loads and wildfire hazards by decreasing ground and ladder fuels.

DNRC has developed two Action Alternatives designed to meet the proposed project objectives to varying degrees (see *CHAPTER II – ALTERNATIVES*).

## **ENVIRONMENTAL IMPACT STATEMENT PROCESS**

This section describes the process by which the Interdisciplinary Team (ID Team) developed this FEIS. The FEIS was developed in compliance with the Montana Environmental Policy Act (MEPA); MCA 75-1-101, and DNRC Procedural Rules (ARM 36.2.521 through 543).

### ***PUBLIC INVOLVEMENT***

DNRC invited interested individuals, agencies, and organizations to identify issues and concerns associated with this proposed action. Public involvement activities included public scoping and newsletters.

### ***Public Scoping***

Public scoping occurred in the initial stages of the *EIS* process. Interested parties and landowners nearby the project area are informed that DNRC is proposing an action and they are invited to submit comments related to the proposed action (*ARM 36.2.526*).

In March of 2022, DNRC distributed the *Initial Proposal* and invited public comments. The initial proposal was sent to the Missoulian and Big Fork Eagle newspapers. The *Initial Proposal* was also mailed to individuals, agencies, internal DNRC staff, industry representatives and other organizations that had expressed interest in Statewide or Swan River State Forest management activities (see *SCOPING LIST AND RESPONDENTS*). The *Initial Proposal* included the objectives of the project, maps of the project areas and contact information. During the 30-day comment period, a total of 26 responses were received.

### **NEWSLETTERS**

#### **Newsletter 1**

In July 2022, the ID Team sent a newsletter to individuals/groups that replied to initial scoping or expressed interest verbally. The purpose of this newsletter was to:

- Update the project development since the initial proposal scoping period;
- Introduce the ID team of the project;
- Summarize relevant issues identified up to that point;
- Offer an opportunity to attend a public field tour;
- Allow further opportunities to comment;

Two comments related to the newsletter were received. No interest in a field tour was indicated.

#### **Newsletter 2**

In August 2023, the ID Team sent a second newsletter to individuals/groups that replied to initial scoping or expressed interest verbally. The purpose of the newsletter was to:

- Update the project development since the first newsletter;
- Summarize the proposed action alternatives;
- Invite comments on the proposed action and alternatives;

No comments were received.

### **FIELD TOURS**

DNRC received little interest in hosting a field tour during the scoping period or following the first newsletter. DNRC staff is willing to conduct a field tour on a per request basis, as time allows within the planning process. Questions and concerns would be recorded and cross-referenced with comments received during the public participation process to ensure that relevant and/or new issues are captured.



## **DEVELOPMENT OF ISSUES AND ALTERNATIVES**

### ***ISSUES STUDIED IN DETAIL AND ISSUES ELIMINATED FROM FURTHER***

#### ***Analysis***

After reviewing the responses received during the scoping period and the other public participation events, the ID Team identified 67 issues related to the project (see *ISSUES STUDIED IN DETAIL AND ISSUES ELIMINATED FROM FURTHER ANALYSIS* and under *SCOPE OF THIS FEIS* later in this chapter). Issues raised by the public and by the ID Team, and requirements imposed by the applicable rules, laws and regulations provided the framework by which the ID Team developed a range of alternatives. The ID Team designed the action alternatives to meet the project objectives to varying degrees and identified the direct, indirect, and cumulative impacts on relevant resources in the project area.

#### ***Draft Environmental Impact Statement***

During the summer and fall of 2023, the ID Team prepared the DEIS for publication. A letter of notification was sent to individuals who commented on the scoping notice and on the first newsletter (interested parties) upon publication of the DEIS (see *SCOPING LIST AND RESPONDENTS*), which initiated a 30-day DEIS comment period.

#### ***Final Environmental Impact Statement***

After public comments related to the *DEIS* are received, compiled, and addressed, DNRC will prepare a Final Environmental Impact Statement (FEIS) or adopt the DEIS as the FEIS. The FEIS will consist primarily of a revision of the DEIS that would incorporate new information based on public and internal comments. The FEIS would also include responses to substantive comments within the scope of the project that were received during the 30-day public review period of the DEIS.

#### ***Notification of Decision***

Following publication of the DEIS, the decisionmaker will review public comments, the DEIS, and information contained in the project file. No sooner than 15 days after the publication of the FEIS, the decisionmaker will consider and determine the following:

- Do the alternatives presented in the FEIS meet the project's purpose and objectives?
- Are the proposed mitigations adequate and feasible?
- Which alternative (or combination/modification of alternatives) should be implemented and why?

These determinations will be published, and all interested parties will be notified. The decisions presented in the published document would become recommendations from DNRC to the Montana Board of Land Commissioners (Land Board). Ultimately, the Land Board will make the final decision to approve or not approve the project.

## **PROPOSED SCHEDULE OF ACTIVITIES**

After the decision is published, and if an action alternative is selected, DNRC would prepare the first of several timber sale contract packages. The first timber sale contract package would tentatively be scheduled for presentation to the Land Board in May 2024. If the Land Board approves the timber sale, the sale may be advertised June 2024. Several additional timber sale contracts would follow the land board approval process with harvesting and roadwork activities taking place for 5 to 7 years in the project area.

## **SCOPE OF THIS FEIS**

This section describes those factors that went into determining the scope (depth and breadth) of this environmental analysis.

## **RELEVANT PAST, PRESENT AND REASONABLY FORESEEABLE ACTIONS**

In order to adequately address the cumulative impacts of the proposed action on relevant resources, each analyst must account for the impacts of past, present, and reasonably foreseeable actions within a determined analysis area. The locations and sizes of the analysis areas vary by resource (watershed, soils, etc.) and species (bull trout, grizzly bear, etc.) and are further described by resource in *CHAPTER III – EXISTING ENVIRONMENT AND ENVIRONMENTAL IMPACTS*.

Past, present and reasonably foreseeable action on DNRC managed lands and adjacent land ownerships were considered for each analysis conducted for this *EIS*. DNRC often lacked data regarding actions on adjacent land ownerships; therefore, resource specialists were limited to qualitatively describing and considering, rather than quantifying, such actions for cumulative impacts.

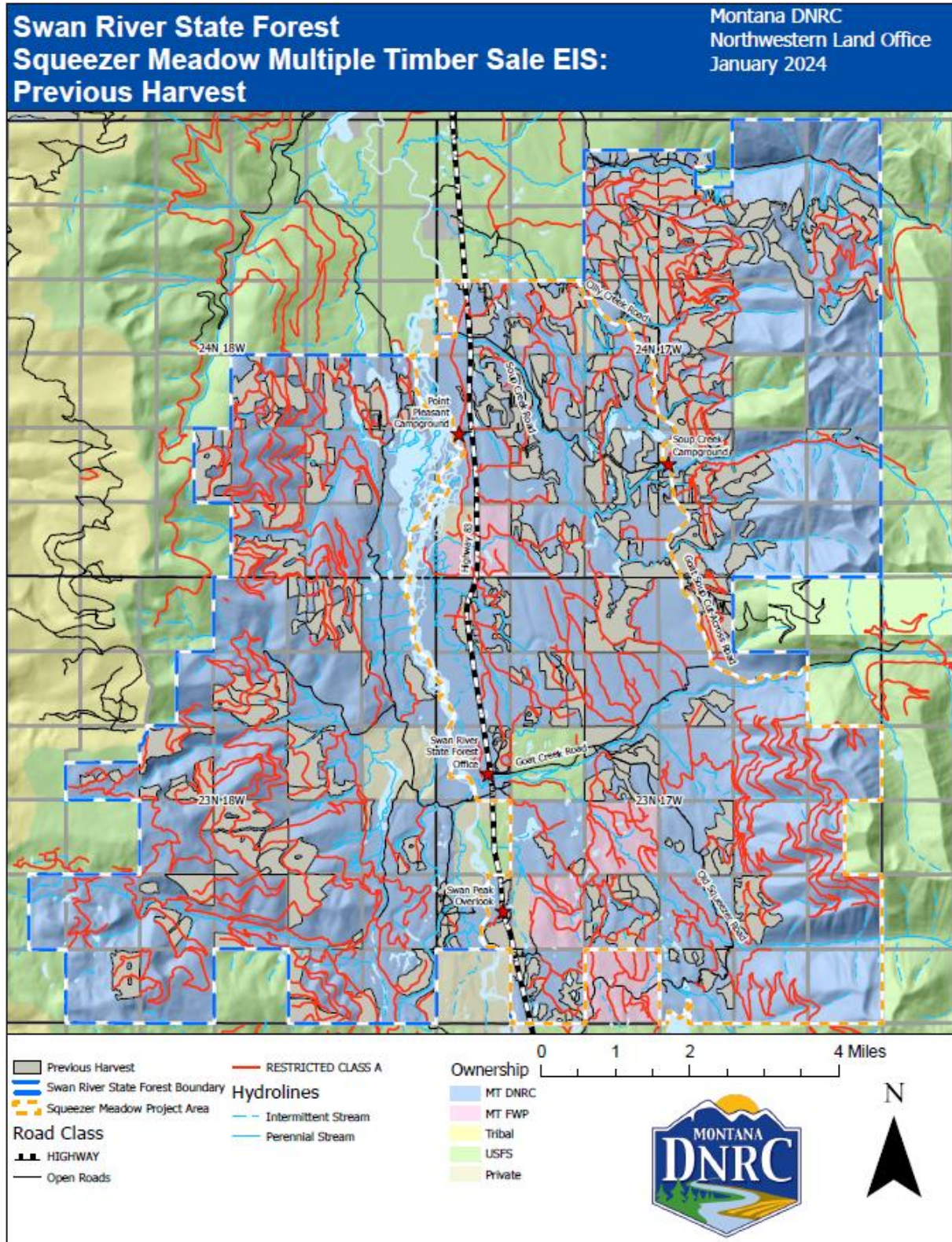
The following list encompasses other relevant DNRC actions considered in this *FEIS*:

- Lost Napa Timber Sale Project (Spring 2024 through Fall 2026)
  - 2,784 acres
  - Sections 1, 2, 3, 4, 9, 10, 11, 12, 13, 14, 15, 16, 22, 24, 25, 26, 27, 34, 35, 36, T24N, 17W; Sections 3, T23N, R17W.
  - 18.5 MMBF
- Wood Lion Timber Sale Project (Summer 2019 through Winter 2021)
  - 2,947 acres
  - Sections 22, 23, 24, 28, 27, 26, 25, 34, 35, 36, T24N, R18W; Sections 3, 2, 1, 9, 10, 11, 12, 17, 16, 15, 14, 21, 22, 23, 24, 29, 28, 27, 26, 25, 32, 33, 35, 36, T23N, R18W; and Sections 18 and 19, T23N, R17W.
  - 24.13 MMBF
- Cilly Cliffs Timber Sale Project (Summer 2015 through Winter 2018)
  - 1,884 acres
  - Sections 1, 2, 3, 4, 9, 10, 11, 12, 13, 14, 15, 16, 17, 22, 27, 33, and 34 T24N, R17W and Section 3 T23N, R17W.
  - 22.3 MMBF

- Scout Lake Timber Sale Project (Summer 2012 through Fall 2016)
  - 2,009 acres
  - Sections 16, 18, 19, 20, 21, 27, 28, 29, 32, 33, 34, T23N, R17W; Sections 6, 8, 16, 18, 20, 22, 26, 28, 30, 34, T23N, R17W; and Section 36, T23N, R18W
  - 19.0 MMBF
- Three Creeks Timber Sale Project (Summer 2007 through Winter 2011)
  - 1,884 acres
  - Sections 1, 3, 4, 9, 10, 15, 16, 22, 25, and 27, T24N, R17W
  - 23.7 MMBF
- Winter Blowdown Salvage Timber Permit Project (Summer 2008)
  - 240 acres
  - Sections 16, 20, 30, 32, and 34, T23N, R17W
  - 200 thousand board feet (MBF)
- Section 28 Salvage Permit (Summer 2009)
  - 80 acres
  - Section 28, T23N, R18W
  - 100 MBF
- Woodward Pointed Face Precommercial Thinning Project (Summer/Fall 2010 through Summer 2011)
  - 176 acres
  - Sections 2 and 12, T23N, R18W and Section 34, T24N, R18W
- Luckow Lodgepole and Lodgepole 2 612s (Fall 2010 & Summer 2011)
  - 100 acres
  - Sections 18 and 32, T23N, R17W
  - 178 MBF
- Shay and Shay 2 Post and Pole (Spring 2010 & Spring/Summer 2011)
  - 35 acres
  - Section 30, T23N, R17W
  - 3,959 lineal feet
- White Pine Pruning and Precommercial Thinning Projects (Summer 2011)
  - 225 acres pruned & 52 acres thinned
  - Sections 2, 12, and 14, T23N, R18W
  - Sections 19, 27, 29, and 30, T24N, R17W
  - Sections 23, 24, 26, 34, and 36, T24N, R18W
- Lost Creek Salvage (Summer/Fall 2012)
  - 25 acres
  - Section 1 T24N R7W
- White Porcupine Timber Sale Project (Summer 2009 through Fall 2014)
  - 1,492 acres
  - Sections 2, 16, 22, 23, 24, 26 T23N, R18W; Sections 22, 23, 26, 28, 34, T24N, R18W
  - 19.8 MMBF
- Westside Blowdown Salvage – (Summer 2012 through Spring 2014)
  - 1,000 acres

- Sections 2, 10, 16, 26 T23N, R18W; Sections 22, 23 26, 28, 34, T24N, R18W
  - 2.0 MMBF
- Perry Squeezer 612 Permit – (Summer/Fall of 2014)
  - 30 acres
  - Section 16, T23N, R17W
  - 100 MBF
- Soup to Simmons PCT – (Summer/Fall of 2014)
  - 120 acres (estimated)
  - Section 18, T24N, R17W; Sections 8, 18, and 32, T23N, R17W; and Section 25, T23N, R18W
- Cilly Ridge Salvage – (Winter 2017)
  - 12 acres (estimated)
  - Section 15, T24N, R17W
- Soup Salvage – (Summer/Fall of 2014)
  - 14 acres (estimated)
  - Section 16, T24N, R17W
- Fatty Restoration – (Summer/Fall of 2014)
  - 200 acres (estimated)
  - Section 35, T23N, R118W;
- West side fir engraver salvage – (Summer/Fall of 2014)
  - 118 acres (estimated)
  - Section 2, T23N, R18W; Section 12, T23N, R18W; and Section 34, T24N, R18W
- Scout lake fire salvage – (Summer/Fall of 2014)
  - 55 acres (estimated)
  - Sections 6, 8, T23N, R18W

**FIGURE I - 1 – PREVIOUS HARVESTS.** Map of previous harvests in the Swan River State Forest.



**ISSUES STUDIED IN DETAIL AND ISSUES ELIMINATED FROM FURTHER ANALYSIS**

Issues are statements of concern about the potential impacts the project may have on various resources. The ID Team identified over 67 issues raised internally and by the public. Some issues were determined to be relevant and within the scope of the project. These were included in the impacts analyses and used to assist the ID Team in developing a reasonable range of alternatives (TABLE I - 1). Issues that were eliminated from further analysis were those that were determined to not be relevant to the development of alternatives or were beyond the scope of the project, and were, therefore, not carried through the impacts analyses (TABLE I - 2).

**TABLE I - 1 - ISSUES STUDIED IN DETAIL.** *Issues studied in detail by resource area and where they are addressed in the FEIS.*

<b>ISSUES STUDIED IN DETAIL</b>	<b>WHERE ADDRESSED IN FEIS</b>
<b>VEGETATION</b>	
The proposed activities may affect forest cover types through tree species removal and subsequent changes in species composition of treated stands.	Chapter III, Pages 108-176
The proposed activities may affect stand age classes through tree removal.	Chapter III, Pages 108-176
The proposed activities may affect forest old-growth amounts and quality through tree removal.	Chapter III, Pages 108-176
The proposed activities may affect forest patch size and shape on the landscape through tree removal.	Chapter III, Pages 108-176
The proposed activities may increase forest fragmentation on the landscape through tree removal.	Chapter III, Pages 108-176
Harvesting activities may affect forest stand vigor through tree removal.	Chapter III, Pages 108-176
The proposed activities may affect forest stand structure through tree removal.	Chapter III, Pages 108-176
The proposed activities may affect forest crown cover through tree removal.	Chapter III, Pages 108-176
The proposed activities may affect forest insect and disease levels through tree removal (both suppressed/stressed and infested/infected).	Chapter III, Pages 108-176
The proposed activities may affect forest fuels and fire behavior through tree removal.	Chapter III, Pages 108-176
Harvest activities may affect sensitive plant populations through ground disturbance or influence their abundance due to changes in water yield or nutrient levels.	Chapter III, Pages 108-176
Harvest activities may increase the abundance and spread of noxious weeds through ground disturbance and road use.	Chapter III, Pages 108-176
Harvest activities may affect forest carbon amounts.	Chapter III, Pages 108-176

<b>GEOLOGY AND SOILS</b>	
The proposed activities have the potential to compact and displace surface soils which reduces hydrologic function, macroporosity, and soil function.	Chapter III, Pages 177-196
The proposed activities have the potential to increase erosion of productive surface soils off-site.	Chapter III, Pages 177-196
The proposed activities may cumulatively affect long term soil productivity.	Chapter III, Pages 177-196
The proposed activities have the potential to increase slope instability through increased water yields, road surface drainage concentration, and exceedance of resisting forces.	Chapter III, Pages 177-196
The proposed activities may remove large volumes of both coarse and fine woody material through timber harvest and may reduce the amount of organic matter and nutrients available for nutrient cycling possibly affecting the long-term productivity of the site.	Chapter III, Pages 177-196
<b>FISHERIES, WATERSHED AND HYDROLOGY</b>	
The proposed activities have the potential to increase water yield, which in turn, may affect erosive power, in-stream sediment production, and stream-channel stability.	Chapter III, Pages 197-258
The proposed activities have the potential to increase sediment delivery impacting fisheries spawning habitat	Chapter III, Pages 197-258
The proposed activities may increase sediment delivery into streams/lakes and affect water quality.	Chapter III, Pages 197-258
The proposed activities may adversely affect water quality by reducing shade and increasing stream temperature.	Chapter III, Pages 197-258
The proposed activities may affect fish population presence and genetics.	Chapter III, Pages 197-258
The proposed activities may affect fish habitat by modifying stream connectivity.	Chapter III, Pages 197-258
The proposed activities may affect fish habitat by modifying flow regime, which may impact sediment delivery and channel form and function.	Chapter III, Pages 197-258
The proposed activities may affect fish habitat by modifying riparian function including large woody debris, stream shading, and stream temperature.	Chapter III, Pages 197-258
The proposed activities may affect fish habitat by modifying stream nutrients.	Chapter III, Pages 197-258
<b>WILDLIFE</b>	
The proposed activities could result in changes in the distribution of different cover types on the landscape which could affect wildlife.	Chapter III, Pages 259-327

The proposed activities could alter the representation of stand age classes on the landscape which could affect habitat for wildlife.	Chapter III, Pages 259-327
The proposed activities could affect wildlife species associated with old-growth forests by reducing the acreage of available habitat and increasing fragmentation.	Chapter III, Pages 259-327
The proposed activities could result in disturbance or alteration of forested corridors and connectivity, which could inhibit wildlife movements.	Chapter III, Pages 259-327
The proposed activities could reduce forested cover which could adversely affect habitat linkage for wildlife.	Chapter III, Pages 259-327
The proposed activities could result in disturbance or alteration of forested corridors and connectivity, which could inhibit wildlife movements.	Chapter III, Pages 259-327
The proposed activities could reduce landscape connectivity and the availability of suitable Canada lynx habitat, reducing the capacity of the area to support Canada lynx.	Chapter III, Pages 259-327
The proposed activities could reduce bald eagle nesting and perching habitats and/or disturb nesting bald eagles.	Chapter III, Pages 259-327
The proposed activities could result in disturbance of wolves at denning or rendezvous sites, which could lead to pup abandonment and/or increased risk of mortality.	Chapter III, Pages 259-327
The proposed activities could result in reduction of hiding cover important for grizzly bears, which could result in: 1) increased displacement of grizzly bears, 2) avoidance of otherwise suitable habitat, and or 3) increased risk of bear-human conflicts.	Chapter III, Pages 259-327
The proposed activities could result in an increase in density of open roads, which could result in increased displacement of grizzly bears and increased risk of bear-human conflicts.	Chapter III, Pages 259-327
The proposed activities could result in a decrease in secure areas for grizzly bears, which could result in increased displacement of grizzly bears and increased risk of bear-human conflicts.	Chapter III, Pages 259-327
The proposed activities could reduce the availability and connectivity of suitable fisher habitat and increase human access, which could reduce habitat suitability and increase trapping mortality risk.	Chapter III, Pages 259-327
The proposed activities could alter the structure of flammulated owl preferred habitat types, which could reduce habitat suitability for flammulated owls.	Chapter III, Pages 259-327
The proposed activities could result in increased human disturbance that could alter wolverine use of suitable habitat.	Chapter III, Pages 259-327



The proposed activities could reduce tree density and alter the structure of mature forest stands, which could reduce habitat suitability for pileated woodpeckers.	Chapter III, Pages 259-327
The proposed activities could remove forest cover on important winter ranges, which could lower their capacity to support big game.	Chapter III, Pages 259-327
The proposed activities could remove elk security cover, which could affect hunter opportunity and the quality of recreational hunting in the local area.	Chapter III, Pages 259-327
<b>ECONOMICS</b>	
The proposed activities may have economic impacts associated with generating revenue for the trust beneficiaries.	Chapter III, Pages 328-335
The proposed activities may have economic impacts associated with creating timber-related employment and stimulating the local economy.	Chapter III, Pages 328-335
The proposed activities may have economic impacts associated with non-market issues within the area.	Chapter III, Pages 328-335
<b>AIR QUALITY</b>	
The proposed activities may adversely affect local air quality through dust produced from harvest activities, road building and maintenance, and hauling.	Chapter III, Pages 336-342
The proposed activities may adversely affect local air quality through smoke produced from burning slash piles and other prescribed burning.	Chapter III, Pages 336-342
The proposed activities may adversely affect local air quality through carbon emissions produced from harvest activities, road building and maintenance, and hauling.	Chapter III, Pages 336-342
<b>RECREATION</b>	
The proposed activities may affect public motorized use, non-motorized uses, and hunting.	Chapter III, Pages 343-350
The proposed activities may affect the revenue generated by recreational uses.	Chapter III, Pages 343-350
<b>AESTHETICS</b>	
The proposed activities may adversely affect local viewsheds and scenic vistas.	Chapter III, Pages 351-362
The proposed activities may increase local noise levels.	Chapter III, Pages 351-362
<b>CULTURAL RESOURCES</b>	
The proposed activities may affect local cultural resources.	Chapter III, Pages 363-364

**TABLE I - 2 - ISSUES ELIMINATED FROM FURTHER ANALYSIS.** *Issues eliminated from further analysis and accompanying rationale.*

ISSUES ELIMINATED FROM FURTHER ANALYSIS	RATIONALE
<p>Why is the project area so large? How is logging such a large area in one project sustainable?</p>	<p>The initial proposal stated the project area covers approximately 25,436 acres. One reason the project area is so large is because it encompasses subzone 2 and 3 described in the Montana DNRC Forested State Trust Lands Habitat Conservation Plan (HCP), which are the active subzones from 2027-2029. Another reason for the large project area is because the project will involve multiple timber sales that will be sold and harvested over several years, and hence needs a larger project area to meet the objectives of this project.</p> <p>DNRC is only proposing harvesting on a portion of the project area. The proposed harvest is based on the Swan River State Forest’s contribution towards DNRC’s annual sustained yield of 60.0 MMBF, which was last calculated in 2020. When calculating the annual sustainable yield, all of DNRC’s resource commitments as well as the growth and yield potential for forested parcels are considered to ensure that the amount harvested on an annual basis from forested state trust lands can be done so on a sustainable basis.</p>
<p>How will climate change affect growth and yield of these forests and habitat for species and how is DNRC planning to mitigate these effects?</p>	<p>Evidence of widespread climate change has been well-documented and reported and is an important consideration today (<i>Intergovernmental Panel on Climate Change (IPCC) 2023</i>). In Montana, effects of climate change will be related to changes in temperature and moisture availability, and the response of individual tree species, forests and habitats will be complex and variable depending local site and stand conditions. Changes in temperature and moisture availability may affect the ability of some tree species to establish and regenerate on some sites. Forest productivity may increase in some areas due to longer growing seasons associated with increased temperature where moisture is not limited, but may decrease in other areas where increasing temperature results in decreased water availability (<i>Wade et al. 2017</i>).</p> <p>Drought severity is expected to increase, leading to increases in forest and tree mortality. Changing climate</p>

may also lead to changes in the range of some species, resulting in changes in forest composition and distribution (*Wade et al. 2017*). Given possible changes in the amounts and types of trees and other plants observed in forests, unique vegetation community associations and new climax community types may also begin to appear in the future (*Fox 2007*).

Changing climate is also expected to alter natural disturbance regimes, such as fire and insects, with the resulting effects expected to have greater impact on Montana's forests than changes in temperature and moisture availability that directly affect individual trees and species (*Wade et al. 2017*). Understanding changes in tree species composition in forests, and the ability of various tree species to thrive under changing climate conditions, may take decades. Predicting possible effects of climate change in forests at local levels is also difficult due to large-scale variables at play, such as possible increases in global evaporation rates, and possible changes in global ocean currents and jet stream. Such outcomes could influence locally-observed precipitation amounts and possible influences on natural disturbance regimes (such as changing the average intensity, frequency and scale of fire events). Normal year to year variation in weather also confounds the ability to identify, understand, predict, and respond to influences of climate change.

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

<p>Existing old growth must be put on longer rotations so that it is retained. Other stands should be put on longer rotations so that they develop into old growth and replace existing old growth. A priority and goal for this project should be to designate an old-growth network to ensure that this component of biodiversity is maintained over the long term.</p>	<p>Creation of an old-growth network is programmatic in nature and beyond the scope of this project. DNRC management decisions regarding old growth at the project level follow ARM 36.11.418(a) and (c). When considering old-growth management at the project level, careful attention is given to many variables, including (but not limited to): cover types, stand locations, patch sizes, habitat connectivity, insect/disease risk, etc. This approach has allowed DNRC to evaluate conservation biology principles and tradeoffs at the landscape scale and have improved flexibility to address stand changes and economic losses brought about by natural-disturbance agents, such as insects, diseases, and wildfire. DNRC must also consider the requirements of MCA 77-5-116, which is a law that prohibits DNRC from establishing old-growth deferrals and set-asides without compensation to trust beneficiaries. For each timber sale project on Swan River State Forest, stand maps are produced to help evaluate management priorities and trade-offs necessary for informed decision making. Old-growth stands receiving uneven-aged harvesting will be managed under a relatively long rotation with DNRC's current approach. Environmental impacts on old growth are described in <i>OLD GROWTH</i> under <i>VEGETATION ANALYSIS</i> in <i>CHAPTER III – EXISTING ENVIRONMENT AND ENVIRONMENTAL IMPACTS</i>. The estimated amounts of old growth prior to this project and the amount of old growth after this project (by alternative) are also disclosed.</p>
<p>The EIS must analyze the blowdown effects to old-growth forests, riparian areas, wetlands or other forest habitats.</p>	<p>Large scale natural weather events are out of the control of the DNRC and do not directly apply to the scope of this project and, thus, this issue was eliminated from further analysis.</p>
<p>Now that DNRC has acquired the Plum Creek lands that were in checkerboard with the SRSF lands you have an opportunity to manage an old-growth network across a broad swath of land.</p>	<p>Former Plum Creek lands that are under DNRC ownership have been inventoried by DNRC and added to its stand level inventory. The data collected reflects the current condition of that land, and that data was used in the analysis for this project.</p> <p>The acquisition of the former Plum Creek lands within the Swan River State Forest boundary increases DNRC's ability to manage stands forest stands, including old growth, at a landscape level. However, creation of an</p>

	<p>old-growth network is programmatic in nature and beyond the scope of this project. As previously mentioned, DNRC’s management decisions regarding old growth occur at the project level and follow ARM 36.11.418(a) and (c). When considering old-growth management at the project level, careful attention is given to many variables, including (but not limited to): cover types, stand locations, patch sizes, habitat connectivity, insect/disease risk, etc. This approach has allowed DNRC to evaluate conservation biology principles and tradeoffs at the landscape scale and have improved flexibility to address stand changes and economic losses brought about by natural-disturbance agents, such as insects, diseases, and wildfire. DNRC must also consider the requirements of MCA 77-5-116, which is a law that prohibits DNRC from establishing old growth deferrals and set-asides without compensation to trust beneficiaries. For each timber sale project on Swan River State Forest, stand maps are produced to help evaluate management priorities and trade-offs necessary for informed decision making. Old growth stands receiving uneven-aged harvesting will be managed under a relatively long rotation with DNRC’s current approach. Environmental impacts on old growth are described in <i>OLD GROWTH</i> under <i>VEGETATION ANALYSIS</i> in <i>CHAPTER III – EXISTING ENVIRONMENT AND ENVIRONMENTAL IMPACTS</i>. The estimated amounts of old growth prior to this project and the amount of old growth after this project (by alternative) are also disclosed.</p>
<p>This project must reduce fragmentation and edge effects and increase patch size and core areas. Large and small openings should be allowed to be created through natural processes rather than clearcut logging.</p>	<p>DNRC is required to mimic natural disturbances when selecting silvicultural prescriptions (ARM 36.11.408). Management of blocked ownership must take into account forest types and structures historically present on the landscape (ARM 36.11.407). All projects proposed under this FEIS are to adhere to these management rules. Patch size and core areas are analyzed in the <i>CHAPTER III- VEGETATION ANALYSIS</i> and <i>WILDLIFE ANALYSIS</i>.</p>
<p>No new roads should be built, not even temporary roads. The existing road network is already too large.</p>	<p>When planning transportation systems, DNRC is instructed to plan for the minimum number of road miles (ARM 36.11.421[1]). DNRC occasionally needs to construct additional roads in order to access timber</p>

	<p>stands for management. Obliterating all historical roads on the landscape would be cost-prohibitive. A historical road that is causing resource damage is prioritized for corrective actions to lessen or eliminate its negative impacts. The action alternatives in this FEIS contain different projected road amounts by alternative (see <i>DESCRIPTION OF ALTERNATIVES</i> in <i>CHAPTER II – ALTERNATIVES</i>). Both action alternatives attempt to minimize the miles of proposed road construction needed to meet project goals.</p>
<p>Temporary roads have enduring impacts on aquatic resources.</p>	<p>Potential sediment delivery to aquatic resources is disclosed in the <i>CHAPTER III - HYDROLOGY ANALYSIS</i>.</p>
<p>Roads take acres out of the timber growing base.</p>	<p>When calculating the annual sustainable yield, acres that are not suitable for timber management are considered 'deferred' and, thus, removed from solution in the calculation. These roads are considered part of these 'deferred' acres.</p>
<p>DNRC must identify all lands that are unsuitable for timber production. DNRC must disclose the basis for the growth and yield calculation on the SRSF.</p>	<p>This issue is programmatic in nature and beyond the scope of this project. DNRC does identify lands unsuitable for timber production and those areas are noted in its stand level inventory. Additionally, such lands are not included in and do not contribute to DNRC's annual sustainable yield. DNRC's annual sustainable yield is based only on commercial forest acres, which are those acres comprised of conifer species and having site productivity greater than 20 cubic feet per acre per year. Furthermore, although some sites may be viable for commercial timber management from a site productivity standpoint, other factors such as topography, wet areas, or lack of legal access, among others, preclude timber management. DNRC identifies such areas as 'deferred' from management, and those areas are not included in the sustainable yield calculation (SYC). The most recent SYC accounted for those factors.</p> <p>The analysis within an EIS is required to analyze the impacts on the human environment associated with the alternatives being considered; in this case, the No-Action and Action Alternatives. An analysis of the economic suitability of various DNRC managed lands for various types of management would not provide a necessary</p>

	and adequate assessment for meeting the requirements of MEPA for the type of project that is being proposed. Foresters have also considered the whole project area, with scrutiny applied to the economics of harvesting and reforestation. The proposed action alternatives utilize conventional, cost-effective ground-based and skyline harvesting systems. The proposed reforestation activities are also common practice and are economically feasible on the areas proposed for harvesting.
The State Forest Land Management Plan has no strategy for carbon reduction.	This does not directly relate to the scope of the project and has been removed from further analysis.
The current ARMs are outdated and do not reflect the best available science for fisher.	This does not directly relate to the scope of the project and has been removed from further analysis.
What monitoring will be done for wildlife, fish, old-growth dependent wildlife, and sensitive plants and what monitoring has been done to determine if proposed treatments have the desired result?	Monitoring results relevant or applicable to the assessment of sensitive plants, fisheries, and wildlife can be found in the <i>VEGETATION</i> , <i>FISHERIES</i> , and <i>WILDLIFE RESOURCE ANALYSIS</i> sections respectively. Additional monitoring data are also summarized and presented in annual HCP reports and 5-year SFLMP reports( <a href="https://dnrc.mt.gov/TrustLand/about/planning-and-reports">https://dnrc.mt.gov/TrustLand/about/planning-and-reports</a> ).
Ensure that biological diversity is maintained.	Under the SFLMP philosophy, DNRC believes that making efforts to emulate natural disturbance patterns, processes, and cover type distributions is a reasonable and responsible way to help ensure that ecosystem processes and endemic species that evolved with them are maintained. The SFLMP also encourages managers to explore new findings and adapt management accordingly.
Previous EISs have disclosed that prior logging projects have a negative impact on wildlife. DNRC must mitigate for these previous negative impacts and ensure that future projects do not diminish biological diversity.	DNRC mitigated for adverse effects to wildlife on previous timber sales according to the SVGBCA, HCP, and Forest Management Rules. These mitigations are described in the <i>WILDLIFE ANALYSIS</i> within each FEIS.
When will DNRC develop conservation strategies for sensitive species, wolves and bald eagles?	DNRC considers potential impacts of forest management activities to sensitive species, including bald eagles, and implements mitigations to reduce possible adverse impacts. These impacts are analyzed

	<p>and disclosed in the <i>WILDLIFE ANALYSIS</i> section, and <i>TABLE III-58 FINE FILTER</i>. Strategies for reducing impacts (potential mitigations) for some sensitive species can be found in ARM 36.11.436. Gray wolves are managed as a game species by Montana Fish, Wildlife and Parks for sustainable harvest and long-term persistence on the landscape.</p>
<p>DNRC needs to quantify what current habitat availability, local population monitoring, and current status of species indicate about population health and relevance to population impacts.</p>	<p>DNRC attempts to promote biodiversity by taking a ‘coarse-filter approach’, which favors an appropriate mix of stand structures and compositions on state trust lands (ARM 36.11.404). Appropriate stand structures are based on ecological characteristics (e.g., land type, habitat type, disturbance regime, unique characteristics). A coarse-filter approach assumes that if landscape patterns and processes are maintained similar to those with which the species evolved, the full complement of species would persist, and biodiversity would be maintained. This coarse-filter approach supports diverse wildlife populations by managing for a variety of forest structures and compositions that approximate historic conditions across the landscape (<i>Lozensky 1997</i>). DNRC cannot assure that the coarse-filter approach will adequately address the full range of biodiversity; therefore, DNRC also employs a ‘fine-filter’ approach for threatened, endangered, and sensitive species (ARM 36.11.406). The fine-filter approach focuses on a single species’ habitat requirements and considers the status for each listed species that may be affected. For each species or habitat issue, existing conditions of wildlife habitats are described and compared to the anticipated effects of the proposed no-action alternative and each action alternative to determine the foreseeable effects to associated wildlife habitats. If suitable habitat conditions for a particular species exist within any defined DNRC project area, that species is considered as present, thus, local population monitoring is typically not conducted.</p>
<p>Does DNRC have any width criteria for wildlife corridors?</p>	<p>This information can be found in the <i>CHAPTER III – WILDLIFE ANALYSIS</i>.</p>
<p>DNRC should disclose whether there have been sightings, nests, or dens of sensitive species in the</p>	<p>DNRC shares wildlife observation data with the Montana Natural Heritage Program (MNHP). MNHP manages these wildlife data for public consumption and</p>



<p>Project Area and what is being done to protect these attributes.</p>	<p>disclosure. Specific conservation or mitigation measures are incorporated into project design and disclosed in <i>CHAPTER III – WILDLIFE ANALYSIS</i>.</p>
<p>Has DNRC defined how much deer and elk winter range needs to be maintained over time on this landscape to maintain stable big game populations? What limitations are there on habitat removal?</p>	<p>Statewide objectives for deer and elk winter range do not directly relate to the scope of the project and have been removed from further analysis. DNRC cooperates and coordinates with Montana Fish, Wildlife and Parks area biologists on issues related to ungulate habitat management. Winter range conditions and potential impacts from forest management activities are analyzed in <i>CHAPTER III – WILDLIFE ANALYSIS, BIG GAME</i>.</p>
<p>Please keep all logging equipment and "vegetation treatments" out of old growth forest stands and riparian areas and please drop all areas west of Highway 83 from your proposal.</p>	<p>MCA 77-5-116 is a law that prohibits DNRC from establishing old-growth deferrals and set-asides without compensation to trust beneficiaries. As such, old growth stands are considered for inclusion with harvesting activities proposed in this project. No harvests are proposed near riparian areas. Grizzly bear subzones 2 and 3 are open for this project and include limited areas west of Highway 83.</p>
<p>Due to the potential bald eagle nesting within 1/4 mile of the Swan River and oxbow slough, the Sprunger-Whitney Nature Trail and Pt. Pleasant campground we request that the sections west of Highway 83 be dropped.</p>	<p>While potential bald eagle nesting habitat is present in the vicinity of the Swan River in the form of mature trees, DNRC is unaware of any records of bald eagles nesting along the river near the Sprunger-Whitney Nature Trail, within the project area, or 2.5 miles from it (<i>Montana Natural Heritage Program data, 19 December 2023</i>). Bald eagles typically nest at Van Lake (southern end of project area) and at the inlet of Swan Lake (north of the project area). Bald eagles are no longer listed as threatened or endangered (as they were in 1995), but are still protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. Should any new nesting bald eagles occur, appropriate mitigations would be implemented to minimize disturbance and avoid take (ARM 36.11.436(7)). Additional analysis of bald eagles can be found in <i>CHAPTER III – WILDLIFE ANALYSIS</i> section, <i>TABLE III-58 FINE FILTER</i>.</p>
<p>What monitoring from previous timber sales told you about your logging practices and assumptions made in those EISs? What is your growth and yield of trees in the large clearcuts from previous projects?</p>	<p>DNRC engages in several monitoring efforts both during and after a timber sale to monitor the effectiveness of treatments, including timber sale inspections, biodiversity field reviews, and regeneration surveys, among others.</p>

	<p>Timber sale inspections conducted during sale administration ensure that harvesting operations are in compliance with certain standard operating procedures, Administrative Rules for Forest Management, Montana Best Management Practices for Forestry (BMPs), and any other mitigation measures stipulated in the sale contract.</p> <p>Biodiversity field reviews are conducted on selected timber sales, typically three to five years following harvesting, to monitor implementation of the biodiversity resource management standards described in the State Forest Land Management Plan and Administrative Rules for Forest Management. These reviews are conducted in a field setting and examine biodiversity issues associated with the timber sale, the silvicultural treatments used, and biodiversity-related mitigations (such as protection of snags, coarse woody debris retention, nutrients, and wildlife) implemented during the sale. Results of these reviews have consistently indicated that biodiversity rules are being successfully considered and applied during project development and implementation.</p> <p>Regeneration surveys are used following harvesting to monitor regeneration success in both naturally regenerated and planted stands. Results of these surveys consistently show that DNRC is meeting stocking objectives for regeneration in most treated stands; and stands with insufficient stocking receive follow-up treatments such as site preparation and/or planting followed by continuous monitoring until the stand meets stocking objectives.</p> <p>Forest growth and yield is accounted for at a programmatic level in DNRC’s Sustainable Yield Calculation, which was last completed in 2020.</p>
<p>Where is the important hare habitat in this project area and what is the estimated population density? Where is current hare habitat in the cumulative effects area? Where is current red squirrel habitat in the project and</p>	<p>DNRC accounts for lynx and lynx prey (e.g. snowshoe hare, red squirrel) through habitat monitoring and management. Habitat for lynx and lynx prey is analyzed in <i>CHAPTER III – WILDLIFE ANALYSIS</i>.</p>

<p>cumulative effects area? How will the (lynx) foraging habitat be affected by this project as well as previous logging and roads?</p>	
<p>What is the impact of removing trees with mistletoe or root disease to wildlife such as fisher?</p>	<p>Potential effects of harvest on fishers and fisher habitat are analyzed in <i>CHAPTER III – WILDLIFE ANALYSIS</i>. Mitigations to be implemented that benefit fishers include retaining large snags and snag recruits in harvest units. Naturally-occurring forest diseases such as mistletoe and root rot will continue to be present in managed stands throughout the Swan River State Forest.</p>
<p>This EIS should disclose what the rate of growth is from past cutting unit, and the number of times past logging units have been replanted.</p>	<p>This issue is programmatic in nature and beyond the scope of this project. Forest growth and yield is accounted for in DNRC’s Sustainable Yield Calculation, which was last completed in 2020. The need for planting is assessed during project development and included in some silvicultural prescriptions based on treatment objectives. DNRC’s regeneration monitoring activities assess regeneration success, stocking levels, and needs for additional activities to achieve desired stocking levels in stands with insufficient regeneration.</p>
<p>DNRC must track the cost expended to plan and implement this timber sale. Without this information it cannot accurately determine whether revenue is actually being generated for the school trust.</p>	<p>Itemized cost accounting involves many unknown variables and is conducted at the programmatic level, rather than on a project-by-project basis. In this EIS, project costs are estimated based on the most recent annual programmatic revenue to cost ratios (see <i>CHAPTER III – ECONOMIC ANALYSIS</i>). A more detailed review of programmatic costs is available in the <a href="#">DNRC Trust Land Management Division Fiscal Year 2022 Annual Report</a> in the Return on Assets section.</p>
<p>The EIS should consider and incorporate science regarding thinning and mountain pine beetle.</p>	<p>Management practices to address mountain pine beetle are incorporated in the process of developing and writing silvicultural prescriptions for each proposed treatment unit during project development. Forest insects and diseases present in the project area and associated effects of each Alternative on forest insects and diseases are listed in the <i>INSECTS and DISEASES</i> section of the <i>VEGETATION ANALYSIS</i> in <i>CHAPTER III – EXISTING ENVIRONMENT AND ENVIRONMENTAL IMPACTS</i>.</p>
<p>Commenter encouraged: smaller clear cuts with feathered borders. islands of trees, peninsulas of</p>	<p>ARM 36.11.415 directs DNRC to emulate spatial patterns of patch size and shape to the extent practicable. Feathering edges along harvest unit boundaries,</p>

<p>trees, leave travel corridors alone, no big squares or rectangles!</p>	<p>avoidance of straight lines and hard edges, and creating naturally shaped cutting units are strategies DNRC encourages and employs to comply with the rule. Existing conditions and anticipated effects on patch size and shape, fragmentation, and connectivity are described in the <i>VEGETATION ANALYSIS</i> and <i>WILDLIFE ANALYSIS</i> in <i>CHAPTER III – EXISTING ENVIRONMENT AND ENVIRONMENTAL IMPACTS</i>.</p>
<p>Will re-planting of trees be part of the process?</p>	<p>Both natural regeneration and planting following harvesting are proposed in this project. DNRC also conducts regeneration monitoring to ensure successful regeneration of harvested stands, and stands with inadequate natural regeneration or seedling survival are planted to achieve desired stocking levels. Changes to cover type and age class as a result of regeneration harvests are described in the <i>VEGETATION ANALYSIS</i>.</p>
<p>What is the method being used for timber harvesting this area? Are these lands going to be clear cut? I have major concerns about clearing 10-30% of that area. Selective harvesting would be much less disruptive to the local area and I would have no major objections.</p>	<p>Proposed harvest treatment types are described in <i>CHAPTER II</i> and in the <i>VEGETATION ANALYSIS</i> in <i>CHAPTER III – EXISTING ENVIRONMENT AND ENVIRONMENTAL IMPACTS</i>. 1,877 acres of commercial thinning and individual tree selection (or selective harvesting methods) are proposed under Action Alternative B, and 2,219 acres of commercial thinning and individual tree selection harvesting are proposed under Action Alternative C.</p>
<p>The EIS must also reconcile the difference between streamside buffers in the HCP and streamside buffers on the former Plum Creek lands.</p>	<p>Former industrial timber lands in the Swan River State Forest were incorporated into the HCP in 2018 (<i>USFWS and DNRC 2018</i>). All HCP commitments for aquatics will be applied to classified waterbodies as described in the HCP and SMZ Law, regardless of past ownership or past management.</p>
<p>Montana Environmental Policy Act (MEPA) alternatives must fully examine other viable economic options.</p>	<p>As state trust land managers, DNRC is charged with the responsibility of generating the largest measure of reasonable and legitimate revenue to the trust beneficiaries while protecting the revenue-generating capacity of state trust lands for future generations (1972 Montana Constitution, Article X, Section 11; Montana Code Annotated [MCA] 77-1-202). According to the SFLMP, DNRC has determined that the best way to produce long-term income for the trust beneficiaries from forested state trust lands is to manage those lands intensively for healthy and biologically diverse forests through the use of timber management activities.</p>

	<p>However, the SFLMP also states that DNRC would “pursue other income opportunities as guided by changing markets for new and traditional uses. These uses may replace timber production when their revenue exceeds long-term timber production revenue potential” (DNRC 1996). It is in the best interest of the trust beneficiaries for DNRC to consider other profitable revenue generating opportunities where appropriate, and DNRC has a long history of exploring and implementing a diversity of revenue generating uses and project types. At this time, DNRC has determined that forest management continues to be the best use of these project area lands in producing revenue over the long-term for the trust beneficiaries.</p>
<p>A short-term cash flow analysis is not adequate if DNRC must conduct another timber sale to clean up damage from past sales.</p>	<p>Cash flow analyses for timber sales and other trust land projects use a nominal interest rate of 5.4 percent which promotes a more long-term valuation of future cash flows as compared to private enterprise. Long-term project remediation costs are not commonly modeled, because they are not expected to occur. Appropriate development and maintenance improvements are contracted into DNRC timber sales at the time of sale, ensuring that any standalone timber sale project remain a value adding project for the trust beneficiaries.</p>
<p>The process of road obliteration does not immediately stop severely elevated soil erosion from roads.</p>	<p>DNRC is not proposing any road obliteration of existing roads as part of this project. Potential sediment delivery to streams is disclosed in the <i>HYDROLOGY ANALYSIS</i>.</p>

**RELEVANT AGREEMENTS, LAWS, PLANS, PERMITS, LICENSES AND OTHER REQUIREMENTS**

Management activities on the lands within the proposed project area must comply with the following agreements, laws, plans, permits, licenses, and other authorizations. Individual resource analyses in *CHAPTER III* may either expand on the following information or include other relevant agreements.

***ENABLING ACT (1889) AND 1972 MONTANA CONSTITUTION***

By the Enabling Act approved February 22, 1889, the United States Congress granted certain lands to the State of Montana for the support of common schools and other public institutions. These lands are held in trust for the specific trust beneficiaries to which they were assigned and ultimately for the people of the State of Montana (1972 Montana Constitution Article X, Section 11). The lands involved in the proposed project area are designated to generate revenue for the Public Buildings and School of Mines. The Land Board and DNRC are required by law to

administer these lands to produce the largest measure of reasonable and legitimate return over the long run for this beneficiary institution (MCA 771202).

### **STATE FOREST LAND MANAGEMENT PLAN**

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

### **DNRC FOREST MANAGEMENT RULES**

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

### **MONTANA FORESTED STATE TRUST LANDS HABITAT CONSERVATION PLAN**

In December 2011, the Land Board approved the Record of Decision for the Montana DNRC Forested State Trust Lands HCP. Approval of the Record of Decision was followed by the issuance of an Incidental Take Permit by the U.S. Department of Interior, 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 conducts forest management activities on select forested state trust lands while implementing specific mitigation requirements for managing the habitats of grizzly bear, Canada lynx, and three fish species: bull trout, westslope cutthroat trout, and Columbia redband trout.

### **SUSTAINABLE YIELD CALCULATION**

DNRC is required to recalculate the annual sustainable yield for forested trust lands at least every 10 years (MCA 775221 through 223). DNRC defines the Annual Sustainable Yield as:

*“the quantity of timber that can be harvested from forested state lands each year in accordance with all applicable state and federal laws, including but not limited to the laws pertaining to wildlife, recreation and maintenance of watersheds and in compliance with water quality standards that protect fisheries and aquatic life and*

*that are adopted under the provisions of Title 75, Chapter 5, taking into account the ability of state forests to generate replacement tree growth (MCA 775221)."*

Programmatic environmental commitments related to biodiversity, forest health, threatened and endangered species, riparian buffers, old growth, and desired species mix and cover types are incorporated into the calculation of the annual sustainable yield. The current annual sustainable yield is 60.0 MMBF statewide and was calculated and adopted by the Land Board in 2020.

#### **MONTANA ENVIRONMENTAL POLICY ACT AND DNRC ADMINISTRATIVE RULES FOR MEPA**

DNRC's management activities on state school trust lands are subject to the planning and environmental assessment requirements of MEPA (MCA 75-1-101 through 324). MEPA and its implementing rules (ARM 36.2.521 through 543) provide a public process that assures Montana's citizens that a deliberate effort is made to identify impacts before the state government decides to permit or implement an activity that could have significant impacts on the environment.

MEPA requires DNRC and other state agencies to inform the public and other interested parties about proposed projects, the potential environmental impacts associated with proposed projects, and alternative actions that could achieve the proposed project objectives.

#### **MONTANA BEST MANAGEMENT PRACTICES FOR FORESTRY**

DNRC's BMPs for forestry consist of forest stewardship practices that reduce forest-management impacts to water quality and forest soils. The implementation of BMPs by DNRC is required under ARM 36.11.422. Key forestry BMP elements include:

- streamside management;
- road design and planning;
- timber harvesting and site preparation;
- stream-crossing design and installation;
- winter logging; and
- storing, handling, and application of hazardous substances.

#### **MONTANA/IDAHO AIRSHED GROUP**

DNRC is a member of the Montana/Idaho Airshed Group, which was formed to minimize or prevent smoke impacts while using fire to accomplish land-management objectives and/or fuel-hazard reduction (Montana/Idaho Airshed Group 2006). As a member, DNRC must submit a list of planned burns to the Smoke Monitoring Unit describing the type of burn in acres, and the location and elevation of each burn site. The Smoke Monitoring Unit provides timely restriction messages by airshed. DNRC is required to abide by those restrictions and burn only when conditions are conducive to good smoke dispersion.

#### **AIR QUALITY MAJOR OPEN BURNING PERMIT**

DEQ issues permits to entities that are classified as major open burners (ARM 17.8.610). DNRC is permitted to conduct prescribed wildland open burning activities in Montana that are either deliberately or naturally ignited. Planned prescribed burn descriptions must be submitted to DEQ and the Smoke Monitoring Unit of the Montana/Idaho Airshed Group. All burns must be conducted in accordance with the major open burning permit.

***STREAM PRESERVATION ACT PERMIT***

Department of Fish, Wildlife, and Parks, (DFWP) has jurisdiction over the management of fisheries and wildlife in the project area. A Stream Preservation Act Permit (124 Permit) is required for activities that may affect the natural shape and form of any stream or its banks or tributaries.

***SHORT-TERM EXEMPTION FROM MONTANA'S WATER QUALITY STANDARDS***

Department of Environmental Quality (DEQ) has jurisdiction over water-quality standards in the project area. A Short-Term Exemption from Montana Surface Water Quality and Fisheries Cooperative Program (318 Authorization) may be required if temporary activities would introduce sediment above natural levels into streams or if DFWP deems a permit is necessary after reviewing the mitigation measures in the 124 Permit.



## **CHAPTER II - ALTERNATIVES**

### **INTRODUCTION**

This chapter describes in detail the No-Action Alternative and Action Alternatives B and C of the proposed action. This chapter will focus on the:

- ID Team;
- development of the Action Alternatives;
- description of each alternative;
- summary comparison of project activities associated with each alternative;
- summary comparison of how each alternative achieved the proposed project objectives and summary comparison of the predicted environmental impacts of each alternative; and
- stipulations and specifications common to all Action Alternatives.

### **INTERDISCIPLINARY TEAM**

An ID Team was formed to work on the proposed action in the winter of 2022. The ID Team consisted of a project leader and resource specialists from various disciplines, including fisheries, wildlife biology, hydrology, geology and soils, policy, economics, and forestry. The role of the ID Team was to summarize issues and concerns, develop alternatives of the proposed action in the project area, and analyze the potential environmental impacts of the alternatives on the human and natural environments.

The ID Team began reviewing resources in the proposed project area soon after the initial scoping period began. Field reviews were conducted and data was collected in the project area to aid in the analyses for affected resources, including vegetation, watersheds and hydrology, fisheries, wildlife, geology and soils, economics, air quality, recreation, and aesthetics. The ID Team conducted in-depth quantitative and qualitative analyses of the data to assess the existing environment for each affected resource and determine the potential environmental impacts of each alternative on the affected resources.

### **DEVELOPMENT OF ALTERNATIVES**

Based on data collected from the field and issues received from the public and internally, the ID Team developed a range of alternatives designed to meet project objectives described under *PROJECT OBJECTIVES* in *CHAPTER I – PURPOSE AND NEED*. The action alternatives incorporate harvest unit design, prescriptions, mitigations, and road activities that allow DNRC to conduct forest management activities consistent with direction contained in the SFLMP, Forest Management Rules, and the HCP.

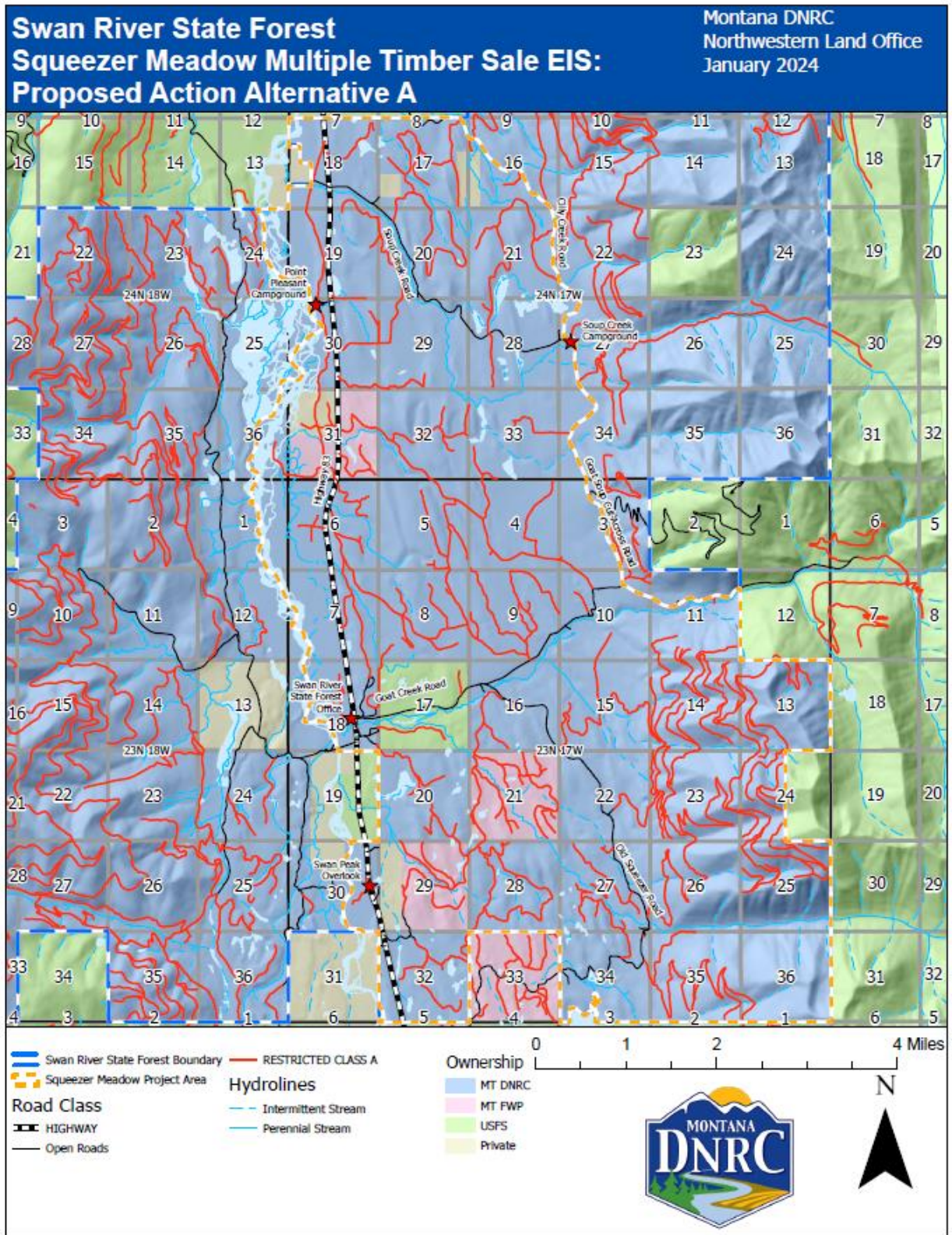
The estimated timber volume produced by each alternative is based on ocular estimates obtained during stand reconnaissance, timber cruise data, professional knowledge of the area, and other available data used in the analysis. Advertised volumes may vary from the preliminary estimated volumes due to the increased statistical accuracy of measured data obtained during sale layout. While the estimated log volume may be different, the environmental impacts are based on acres treated and postharvest stand conditions.

## **DESCRIPTION OF ALTERNATIVES**

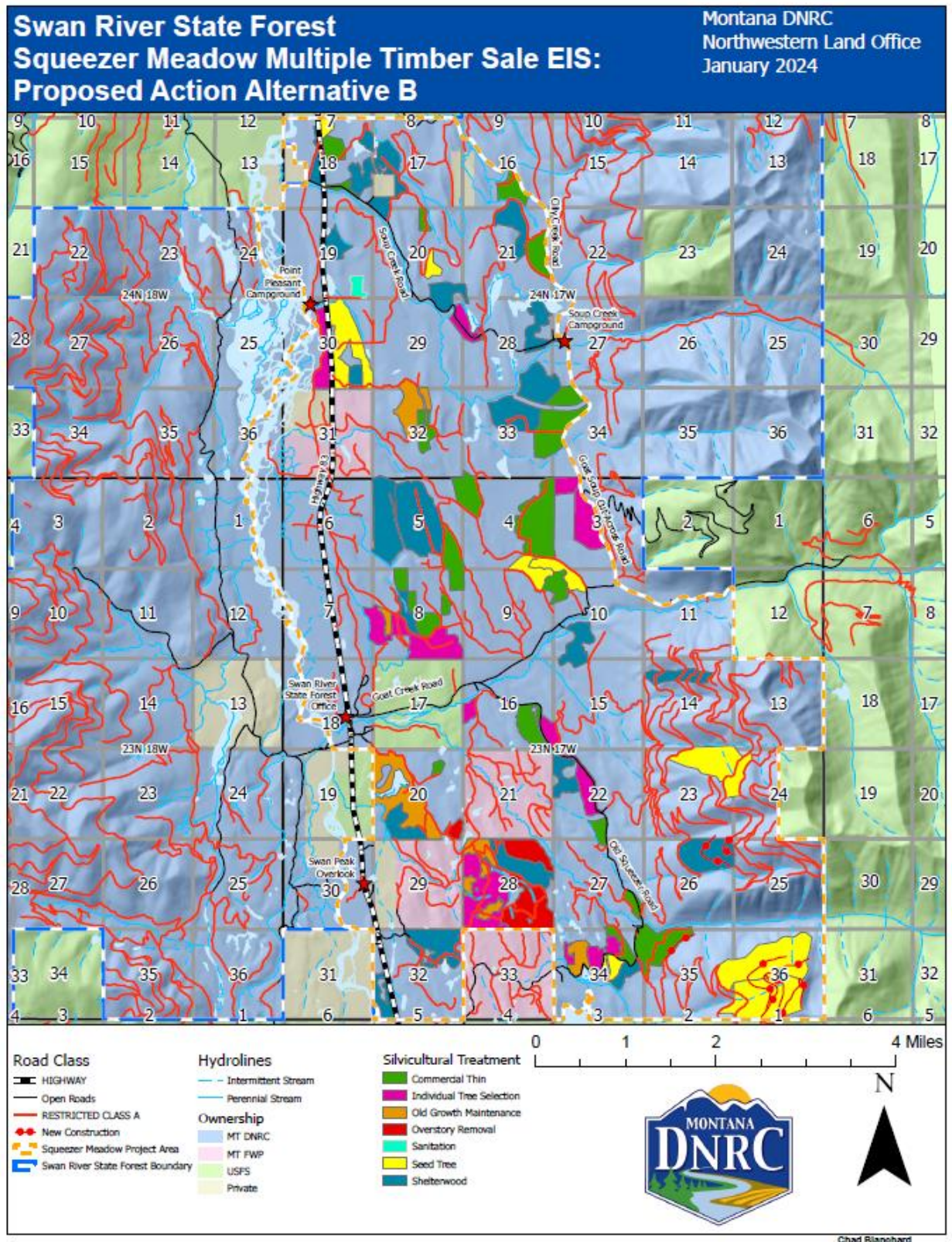
This section describes the No-Action Alternative A and Action Alternatives B and C. All alternatives are considered viable alternatives for selection (see *FIGURE II-1*, *FIGURE II-2*, *FIGURE II-3*, *TABLE II-1* and *TABLE II-3*).

For definitions of prescriptions see the *GLOSSARY*.

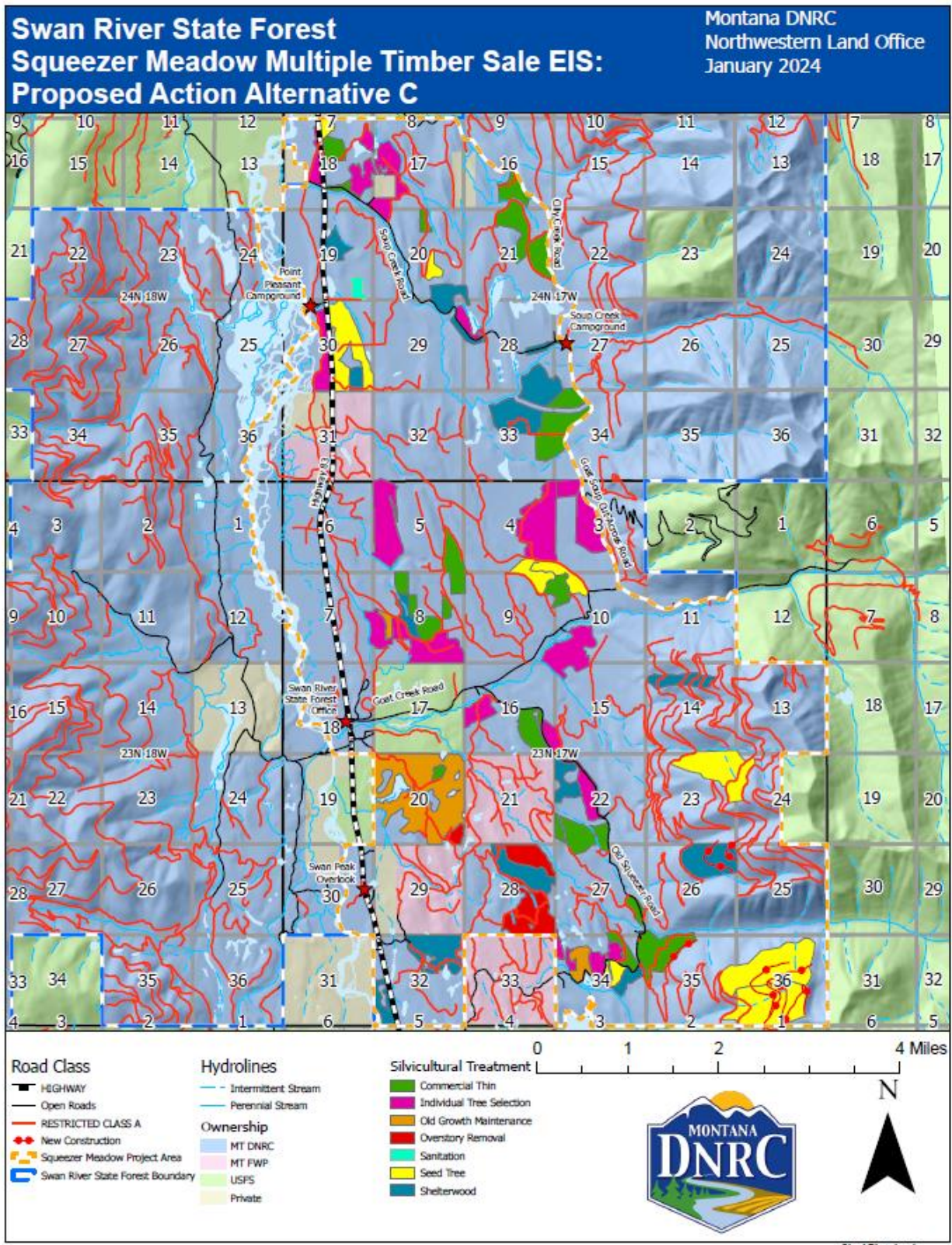
**FIGURE II - 1 – NO-ACTION ALTERNATIVE A.** Proposed activities under No-Action Alternative A.



**FIGURE II - 2 - ACTION ALTERNATIVE B.** Proposed activities under Action Alternative B.



**FIGURE II - 3 - ACTION ALTERNATIVE C.** Proposed actions under Action Alternative C.



**TABLE II - 1 - COMPARISON OF ACTIVITIES.** Summary comparison of project activities of the No-Action and Action Alternatives.

ALTERNATIVE	VOLUME (MMBF)	TOTAL ACRES	TREATED OLD GROWTH ACRES	SILVICULTURAL PRESCRIPTION (ACRES)	HARVEST METHOD	STREAM CROSSINGS	MILES OF ROADWORK	GRAVEL PITS
<b>A</b>	0	0	0	None	None	None	None	None
<b>B</b>	39.9	5,236	760	Commercial Thin (1,110) Sanitation (22) Individual Tree Selection (767) Old-growth Maintenance (417) Overstory Removal (228) Seedtree (967) Shelterwood (1,725)	Ground-based yarding (4,276) Cable yarding (960)	Squeezer Creek: Replacement of 1 stream crossing Goat Creek: Replacement of 2 stream crossing, removal and reconstruction of <del>5</del> 3 failed native crossings Swan River drainages: replacement of <del>4</del> 2 existing stream crossings, removal and restoration of 1 failed native crossing	80 miles of road maintenance 1.5 miles of road reconstruction 5.3 miles of new road construction 7.2 miles of road reclamation	None
<b>C</b>	35.5	4,861	717	Commercial Thin (972) Sanitation (22) Individual Tree Selection (1,247) Old-Growth Maintenance (498) Overstory Removal (228) Seedtree (967) Shelterwood (927)	Ground-based yarding (3901) Cable yarding (960)	Squeezer Creek: Replacement of 1 stream crossing Goat Creek: Replacement of 2 stream crossing, removal and reconstruction of <del>5</del> 3 failed native crossings Swan River drainages: replacement of <del>4</del> 2 existing stream crossings, removal and restoration of 1 failed native crossing	80 miles of road maintenance 1.5 miles of road reconstruction 5.3 miles of new road construction 7.2 miles of road reclamation	None

## **ACHIEVEMENT OF PROJECT OBJECTIVES**

The following is a list of project objectives with brief identifiers that summarizes how each alternative would achieve the project objectives set forth under *PROJECT OBJECTIVES* in *CHAPTER I – PURPOSE AND NEED*. Listed after each objective is an indicator that will be used to measure how, and to what extent, each alternative meets or measures up to each project objective.

- **Biodiversity** – Promote biodiversity by moving forest stands towards historic cover type conditions and species composition.

*Indicator* - Proportional change in cover type acres toward desired future conditions.

- **Insect and disease** – Improve forest health and productivity by addressing insect and disease issues.

*Indicator* – Number of acres treated that are at moderate to high risk of insect and disease problems.

- **Revenue and sustained yield** – Generate revenue to the Common School trust for funding K-12 public education and benefit local economies. Contribute sufficient volume towards DNRC’s annual sustained-yield target of 60.0 MMBF.

*Indicator* - Volume harvested and revenue generated.

- **Transportation** – Develop and improve the transportation system and infrastructure for long-term management, fire suppression and public access.

*Indicator* – Miles of new road construction, reconstruction, and maintenance along with their associated development costs.

- **Water quality** – Improve water quality by removing and rehabilitating sediment-point sources, and meet BMPs on all project roads, including haul routes to Highway 83.

*Indicator* – Miles of road reconstructed, improved, or maintained to reduce potential sediment delivery to streams.

- **Fuel loads** – Reduce fuel loads and wildfire hazards by decreasing ground and ladder fuel loads.

*Indicator* – Acres treated with seed tree and shelterwood prescriptions in the project area. Additionally, treating stands adjacent to private landowners.

**TABLE II - 2 - ACHIEVEMENT OF OBJECTIVES.** Summary comparison of predicted achievement of project objectives for the No-Action and Action Alternatives.

PROJECT OBJECTIVES	ALTERNATIVES		
	A	B	C
Biodiversity (cover type) <i>change in acreage</i> percentages of increase or decrease by project area/Swan River State Forest	No changes in acreages from existing cover type.	<p>Western larch/Douglas-fir <i>plus 786 acres</i> 3.6/1.4 percent increase</p> <p>Western white pine <i>plus 492 acres</i> 2.3/0.9 percent increase</p> <p>Lodgepole pine <i>minus 220 acres</i> 1/0.4 percent decreases</p> <p>Mixed Conifer <i>minus 1044 acres</i> 4.8/1.9 percent decrease</p> <p>Subalpine fir <i>minus 40 acres</i> 0.2/0.007 percent decrease</p> <p>Ponderosa pine <i>plus 281 acres</i> 1.3/0.5 percent increases</p> <p>Douglas-fir <i>minus 254 acres</i> 1.2/0.5 percent decrease</p>	<p>Western larch/Douglas-fir <i>plus 417 acres</i> 1.9/0.8 percent increase</p> <p>Western white pine <i>plus 320 acres</i> 1.4/0.6 percent increase</p> <p>Lodgepole pine <i>minus 198 acres</i> 0.9/0.4 percent decrease</p> <p>Mixed Conifer <i>minus 703 acres</i> 3.2/1.3 percent decrease</p> <p>Subalpine fir <i>minus 40 acres</i> 0.2/0.007 percent decrease</p> <p>Ponderosa pine <i>plus 267 acres</i> 1.2/0.5 percent increases</p> <p>Douglas-fir <i>minus 62 acres</i> 0.3/0.1 percent decreases</p>
Biodiversity (age class) <i>Change in acres</i>	No changes in acreages from existing age class.	No age <i>0 acres</i>	No age <i>0 acres</i>



PROJECT OBJECTIVES	ALTERNATIVES		
	A	B	C
percentages of increase or decrease by project area/Swan River State Forest		0 to 39 years <i>plus 1,155 acres</i> 5.3/2.1 percent increases  40 to 99 years <i>minus 637 acres</i> 2.9/1.2 percent decreases  100 to 149 <i>minus 285 acres</i> 1.3/0.5 percent decreases  150-plus years <i>plus 202 acres</i> 0.9/0.4 percent increases  Old growth <i>minus 435 acres</i> 2.0/0.8 percent decreases	0 to 39 years <i>plus 1,155 acres</i> 5.3/2.1 percent increases  40 to 99 years <i>minus 637 acres</i> 2.9/1.2 percent increases  100 to 149 <i>minus 285 acres</i> 1.3/0.5 percent decreases  150-plus years <i>plus 63 acres</i> 0.3/0.1 percent increases  Old growth <i>minus 296 acres</i> 1.4/0.5 percent decreases
Insect and disease	0 acres	3,137 acres of moderate to high levels of insect and disease problems would be treated but become lower risk post-harvest.	2,838 acres of moderate to high levels of insect and disease problems would be treated but become lower risk post-harvest.
Yield and trust revenue	0 MMBF and \$0	39.9 MMBF and \$1,346,433	35.5 MMBF and \$1,197,955
Transportation	0 miles	6.8 miles of new road construction/reconstruction and 80 miles of maintenance at a cost of approximately \$2,749,824	6.8 miles of new road construction/reconstruction and 80 miles of maintenance at a cost of approximately \$2,749,824
Water Quality	0 replacements and improvements	Approximately 88.7 miles of road would be reconstructed, improved, or maintained to reduce potential sediment delivery.	Approximately 88.7 miles of road would be reconstructed, improved, or maintained to reduce potential sediment delivery.

PROJECT OBJECTIVES	ALTERNATIVES		
	A	B	C
Fuels loads	0 acres	2,692 acres treated with seedtree or shelterwood prescriptions followed by piling and burning of slash.	1,894 acres treated with seedtree or shelterwood prescriptions followed by piling and burning of slash.

**ALTERNATIVE COMPARISON OF ENVIRONMENTAL IMPACTS**

**TABLE II - 3 - COMPARISON OF IMPACTS.** Summarizes the existing environmental and the predicted environmental impacts of each alternative. The impacts are categorized by resource area and further subdivide by an abbreviated version of the issues listed in CHAPTER 1.

RESOURCE ISSUE	EXISTING ENVIRONMENT	DIRECT AND INDIRECT IMPACTS	CUMULATIVE IMPACTS
<b>VEGETATION</b>			
Cover type representation  The proposed activities may affect forest cover types through species removal or changes in species composition.	Mixed-conifer stands are currently overrepresented compared to historic data and desired future conditions. Western larch/ Douglas-fir and western white pine cover types are currently underrepresented on Swan River State Forest.	<b><i>No-Action Alternative A</i></b>	
		No effects are anticipated.	Shade-tolerant species would continue to regenerate, leading to an increase in the mixed-conifer cover type and a gradual loss of the seral-dominated cover types, such as western larch/Douglas-fir and western white pine.
		<b><i>Action Alternative B</i></b>	
		In the project area, the most significant changes are the western larch/Douglas-fir cover type, which would increase from 19.2 to 22.8 percent, western white pine cover type would increase from 4.8 to 7.0 percent, and Lodgepole pine cover type would decrease from 3.4 to 2.4 percent. The mixed-conifer cover type would	Cumulative effects would result in a trend of increasing seral cover types across areas where management has occurred.

RESOURCE ISSUE	EXISTING ENVIRONMENT	DIRECT AND INDIRECT IMPACTS	CUMULATIVE IMPACTS
		<p>decrease from 49.2 to 44.4 percent and the subalpine fir cover type would decrease from 5.6 to 5.4 The ponderosa pine cover type would increase from 9.0 to 10.3 and the Douglas-fir cover type would decrease from 8.2 to 7.0 percent.</p>	
		<p><i>Action Alternative C</i></p> <p>In the project area, the most significant changes are the western larch/Douglas-fir cover type would increase from 19.2 to 21.1 percent, western white pine cover type would increase from 4.8 to 6.2 percent. Lodgepole pine cover type would decrease from 3.4 to 2.5 percent. The mixed-conifer cover type would decrease from 49.2 to 46.0 percent and the subalpine fir cover type would decrease from 5.6 to 5.4. The ponderosa pine cover type would increase from 9.0 to 10.2 percent. The Douglas-fir cover type would decrease from 8.2 to 7.9 percent.</p>	<p>Cumulative effects would result in a trend of increasing seral cover types across areas where management has occurred.</p>

<b>RESOURCE ISSUE</b>	<b>EXISTING ENVIRONMENT</b>	<b>DIRECT AND INDIRECT IMPACTS</b>	<b>CUMULATIVE IMPACTS</b>
<p>Age class representation</p> <p>The proposed activities may affect forest age classes through tree removal.</p>	<p>Comparison of the current age class distribution across the entire Swan River State Forest to historical data for <i>Section M333C</i> demonstrates lower proportionate amounts in the seedling-sapling and mature (100 years plus) age classes and an increased proportionate amount of the poletimber age class.</p>	<b><i>No-Action Alternative A</i></b>	
		<p>No immediate change in the proportion of existing age classes is expected unless a large disturbance, such as wildfire, occurs.</p>	<p>There is a trend of increases in the 0 to 39 year age class and decreasing older age classes across areas where management occurs.</p>
		<b><i>Action Alternative B</i></b>	
		<p>Regeneration treatments and the subsequent planting or natural regeneration would increase the 0 to 39 year age class by 2.1 percent on Swan River State Forest and by 5.3 percent, or 1,155 acres, in the project area. The 150-year-plus age class would be reduced by 0.3 percent on Swan River State Forest and by 0.8 percent in the project area. The old growth age class would be reduced by 0.8 percent on Swan River State Forest and by 1.9 percent, or 435 acres, in the project area.</p>	<p>Cumulative effects would result in a trend of reducing the acres in the older age classes while increasing the acres in the younger age classes.</p>
<b><i>Action Alternative C</i></b>			
<p>Regeneration treatments and the subsequent planting or natural regeneration would increase the 0 to 39 year age</p>	<p>Cumulative effects would result in a trend of reducing the acres in the older age classes while increasing the acres in the younger age classes.</p>		

RESOURCE ISSUE	EXISTING ENVIRONMENT	DIRECT AND INDIRECT IMPACTS	CUMULATIVE IMPACTS
		<p>class by 2.1 percent on Swan River State Forest and by 5.3 percent, or 1,155 acres, in the project area. The 150-year-plus age class would be reduced by 0.1 percent on Swan River State Forest and by 0.2 percent in the project area. The old growth age class would be reduced by 0.5 percent on Swan River State Forest and by 1.3 percent, or 296 acres, in the project area.</p>	
<p>Old growth representation</p> <p>The proposed activities may affect old growth amounts and quality through tree removal.</p>	<p>Swan River State Forest currently has 6,639 acres of old growth, which is equal to 12.23 percent of its total acreage. The project area contains 2,743 acres of old growth, which is equal to 12.55 percent of the project area.</p>	<b><i>No-Action Alternative A</i></b>	
		<p>No immediate change in the amounts of old growth is expected unless a large disturbance, such as wildfire, occurs. Over time, old growth seral cover types (such as western larch/Douglas-fir) could shift to late-seral cover types (such as mixed conifer), old growth risk rating could increase, and old growth attributes (<i>Full Old Growth Index [FOGI]</i> classification) could change.</p>	<p>Current levels of old growth acres would not change in the short term. As stands continue to mature and large trees eventually die, some stands may no longer meet the old growth definition.</p>
		<b><i>Action Alternative B</i></b>	

<b>RESOURCE ISSUE</b>	<b>EXISTING ENVIRONMENT</b>	<b>DIRECT AND INDIRECT IMPACTS</b>	<b>CUMULATIVE IMPACTS</b>
		<p>The old-growth amount on Swan River State Forest would decrease to 6,204 acres, which is equal to 11.43 percent of the total acreage. The project area would contain 2,308 acres of old growth, which is equal to 10.56 percent of the project area.</p>	<p>Cumulative effects would result in a trend of reducing the acres in old growth.</p>
<b><i>Action Alternative C</i></b>			
		<p>The old growth amount on Swan River State Forest would decrease to 6,343 acres, which is equal to 11.69 percent of the total acreage. The project area would contain 2,447 acres of old growth, which is equal to 11.20 percent of the project area.</p>	<p>Cumulative effects would result in a trend of reducing the acres in old growth.</p>

RESOURCE ISSUE	EXISTING ENVIRONMENT	DIRECT AND INDIRECT IMPACTS	CUMULATIVE IMPACTS
<p>Patch size and shape</p> <p>The proposed activities may affect patch size and shape through tree removal.</p>	<p>Current project area mean patch sizes by age class:</p> <p>Nonforested - 0 acres  0 to 39 years - 29 acres  40 to 99 years – 128 acres  100 to old stand - 73 acres  Old stand - 21 acres  Overall - 84 acres</p> <p>Current project area mean old growth patch size - 46 acres</p> <p>Current project area mean patch sizes by cover type:</p> <p>Douglas-fir - 85 acres  Hardwood - 23 acres  Lodgepole pine - 41 acres  Mixed conifer - 239 acres  Nonforested – 0 acres  Nonstocked - 12 acres  Ponderosa pine - 36 acres  Subalpine fir - 244 acres  Western larch/Douglas-fir – 65 acres  Western white pine - 37 acres  Overall - 90 acres</p>	<p><i>No-Action Alternative A</i></p> <p>Age class, old growth, and cover type patch sizes would not be immediately affected. Over time, the forest would tend to homogenize, leading to larger patches of older stands, especially in the absence of significant fires or disturbance events. Over time, the effects to the old growth patch size would be uncertain. If existing large trees remain alive and new large trees develop in old-age stands, the mean patch size of old growth would likely increase. If existing large trees continue to die and new large trees fail to develop, the mean patch size of old growth would likely decrease. Over time, diversity of habitats in terms of cover type patches would likely be reduced through forest succession, resulting in an increase in mean size of patches dominated by shade-tolerant species.</p>	<p>Overall, age patches are reduced from historic conditions and active management has cumulatively increased the overall patch size of younger age classes. Old growth patches are likely reduced from historic conditions as well. Cover type patch sizes have been reduced from historic conditions. Active management of forested lands suggests an increase in early seral species such as western larch and ponderosa pine. However, the result may also be the retention of a mixed-conifer cover type postharvest.</p>

RESOURCE ISSUE	EXISTING ENVIRONMENT	DIRECT AND INDIRECT IMPACTS	CUMULATIVE IMPACTS
		<i><b>Action Alternatives B and C</b></i>	
		<p>The mean patch size of all age classes, except the 0 to 39-year-old age class, would decrease under both Action Alternatives B and C. The 0 to 39-year-old age class would increase slightly under both Action Alternatives B and C. The mean old growth patch size would decrease from 46 acres to 40 acres under Action Alternative B and 41 acres under Action Alternative C. The mean post-harvest patch size for all cover types is expected to decrease under Action Alternatives B and C, with the overall mean patch size reduced to 33 acres under Action Alternative B and 53 acres under Action Alternative C.</p>	<p>Overall, age class patches are reduced from historic conditions and active management has cumulatively increased the overall patch size of younger age classes. Old growth patches and cover type patch sizes have been reduced from historic conditions. Active management of forested lands suggests an increase in early seral species such as western larch and ponderosa pine.</p>
<p>Fragmentation The proposed activities may affect forest fragmentation through tree removal.</p>	<p>The majority of the project area is a matrix or mosaic of well-stocked stands interspersed with past regeneration harvesting activities.</p>	<i><b>No-Action Alternative A</b></i>	
		<p>No direct effects to forest fragmentation would occur. A reduction in fragmentation would occur if additional harvesting is not imposed by</p>	<p>Cumulative effects would result in an increase in fragmentation in areas where regeneration harvest units occur and in a decrease in areas where regeneration harvest units do not occur and existing patches of immature forest grow to maturity.</p>



<b>RESOURCE ISSUE</b>	<b>EXISTING ENVIRONMENT</b>	<b>DIRECT AND INDIRECT IMPACTS</b>	<b>CUMULATIVE IMPACTS</b>
	Some man-made patches in harvest units range from 10 to 640 acres, while some areas have not been previously entered and represent a continuous forest of stands uninfluenced by human activities, but of various stocking levels due to past insect infestation.	management and existing patches of immature forest grow to maturity.	
		<i><b>Action Alternatives B and C</b></i>	
		For the areas proposed for seed tree, shelterwood, or salvage harvesting, the primary effects would be a reduction in mature forest. The areas proposed for other harvesting prescriptions would leave greater than 40-percent crown cover and would be more similar to adjacent mature stands of timber and would not contribute to fragmentation.	An overall increase in the size of younger age class patches and a decrease in the size of older age classes would occur where regeneration harvest units are proposed.
Stand Vigor  The proposed activities may affect forest stand vigor through tree removal.	In terms of vigor classifications, the project area consists of 1,216 acres of full vigor (6 percent), 13,948 acres of good to average vigor (68 percent), 6,565 acres of just below average to poor vigor (30 percent), and 65 acres of poor vigor (0.3 percent).	<i><b>No-Action Alternative A</b></i>	
		No direct effects for stand vigor would occur. Vigor may decrease as insect infestations and disease infections continue to affect stands or if a large disturbance, such as a wildfire, occurs.	Current stand vigor would remain the same across the forest. Mortality and aging of trees or groups of trees would reduce vigor in localized areas. Large reductions in vigor would occur if a large fire came through the area.
		<i><b>Action Alternative B</b></i>	
		Vigor classifications as a result of Action Alternative	Areas where harvesting has occurred would have increased vigor. Areas where harvesting has not

<b>RESOURCE ISSUE</b>	<b>EXISTING ENVIRONMENT</b>	<b>DIRECT AND INDIRECT IMPACTS</b>	<b>CUMULATIVE IMPACTS</b>
		B would consist of 2,411 acres of full vigor (11 percent), 14,273 acres of good to average vigor (65 percent), 5050 acres of just below average to poor vigor (23 percent), and 60 acres of poor vigor (0.3 percent).	occurred would have decreased vigor and the trees would no longer perform to their highest potential and would become susceptible to insects and diseases, etc.
		<b><i>Action Alternative C</i></b>	
		Vigor classifications as a result of Action Alternative C would consist of 2,411 acres of full vigor (11 percent), 14,107 acres of good to average vigor (65 percent), 5,217 acres of just below average to poor vigor (24 percent), and 60 acres of poor vigor (0.3 percent).	Areas where harvesting has occurred would have increased vigor. Areas where harvesting has not occurred would have decreased vigor and the trees would no longer perform to their highest potential and would become susceptible to insects and diseases, etc.
Stand structure The proposed activities may affect the forest stand structure through tree removal.	Current stand structure classifications and percentages in the project area: Single-storied - 17 percent Two-storied - 20 percent	<b><i>No-Action Alternative A</i></b>	
		No immediate change in the proportion of stand structure is expected unless a large disturbance, such as wildfire, occurs.	The cumulative effects to stand-structure distributions due to previous activities are represented in descriptions of the current conditions. Those effects have been to reduce the acres in multistoried stand structures while increasing the acres in the single-storied stand structure through even-aged management.

<b>RESOURCE ISSUE</b>	<b>EXISTING ENVIRONMENT</b>	<b>DIRECT AND INDIRECT IMPACTS</b>	<b>CUMULATIVE IMPACTS</b>
	Multistoried - 49 percent Non-Forested - 14 percent	<b><i>Action Alternative B</i></b>	
		The following stand structure proportions would change: The single-storied stand would increase 1,283 acres (5 percent), while the two-storied stand would increase 989 acres (4 percent), and the multistoried stand would decrease 2,272 acres (9 percent).	The cumulative effects to stand-structure distributions due to previous activities are represented in descriptions of the current conditions. Those effects have been to reduce the acres in multistoried stand structures while increasing the acres in the single-storied stand structure through even-aged management.
		<b><i>Action Alternative C</i></b>	
		The following stand structure proportions would change: The single-storied stand would increase 561 acres (2 percent), while the two-storied stand would decrease 1,423 acres (6 percent), and the multistoried stand would decrease 1,984 acres (8 percent).	The cumulative effects to stand-structure distributions due to previous activities are represented in descriptions of the current conditions. Those effects have been to reduce the acres in multistoried stand structures while increasing the acres in the single-storied stand structure through even-aged management.

<b>RESOURCE ISSUE</b>	<b>EXISTING ENVIRONMENT</b>	<b>DIRECT AND INDIRECT IMPACTS</b>	<b>CUMULATIVE IMPACTS</b>
<p>Crown Cover</p> <p>The proposed activities may affect the forest crown cover through tree removal.</p>	<p>In terms of overall crown cover in the project area, 45.2 percent of stands are well-stocked, 25.9 percent show medium stocking, 18.2 percent are poorly stocked, and 0.3 percent are non-stocked.</p>	<b><i>No-Action Alternative A</i></b>	
		<p>Overall crown cover and stocking would likely increase over time in the absence of disturbances. Were large fires to occur, overall crown cover would be reduced. Ongoing insect and disease issues would reduce crown cover and sawtimber stocking in some areas prior to understory regeneration.</p>	<p>Current crown cover would remain the same across the forest. Over time, crown cover would be expected to increase in the absence of disturbance. Mortality of trees or groups of trees would reduce the crown cover in localized areas. Large reductions in crown cover would occur if a large fire came through the area.</p>
		<b><i>Action Alternative B</i></b>	
		<p>The project area would consist of approximately 36.4 percent well-stocked stands, 40.9 percent medium-stocked stands, 22.4 percent poorly-stocked stands, and 0.3 percent non-stocked.</p>	<p>Overall reductions of crown cover in well-stocked stands would be dispersed across the landscape. Representation of medium-stocked stands would increase following harvesting, as would poorly stocked stands. As stands regenerate, crown cover would increase.</p>
<b><i>Action Alternative C</i></b>			
<p>The project area would consist of approximately 33.8 percent well-stocked stands, 44.2 percent medium-stocked stands, 21.8 percent poorly-stocked stands, 0.3 percent non-stocked stands.</p>	<p>Overall reductions of crown cover in well-stocked stands would be dispersed across the landscape. Representation of medium-stocked stands would increase following harvesting, as would poorly stocked stands. As stands regenerate, crown cover would increase.</p>		

<b>RESOURCE ISSUE</b>	<b>EXISTING ENVIRONMENT</b>	<b>DIRECT AND INDIRECT IMPACTS</b>	<b>CUMULATIVE IMPACTS</b>
<p>Insects and diseases</p> <p>The proposed activities may affect forest insect and disease levels through tree removal (both suppressed/ stressed and infested/ infected).</p>	<p>The major forest insects and diseases currently affecting forest productivity on Swan River State Forest include Armillaria root disease, larch dwarf mistletoe, white pine blister rust, Indian paint fungus, cedar laminated root and butt rot, red-brown butt rot, Douglas-fir bark beetle, fir engraver, mountain pine beetle, and western spruce budworm.</p>	<b><i>No-Action Alternative A</i></b>	
		<p>Sawlog volume, and the corresponding revenue, would continue to be lost from the project area due to insect and disease effects in inaccessible stands with large trees. Salvage harvesting would continue in areas where stands are accessible without building roads.</p>	<p>Some salvage harvesting of insect-infested and disease-infested trees would occur, but at a slower, less effective rate and not in association with this project. Forest stands would maintain dense stocking levels, which contribute to the spread of insects, diseases, and fuel loading, which could lead to high-intensity fires, unnatural forest structures, and overall poor stand health. Current forest conditions would continue.</p>
		<b><i>Action Alternatives B and C</i></b>	
<p>Harvest treatments would remove trees affected by insects and diseases. Action Alternative B would treat stands with various levels of insect and disease risk: low risk 2,099 acres; moderate risk 2,313 acres; and high risk 824 acres. Action Alternative C would treat stands with various levels of insect and disease risk: low risk 2,023 acres; moderate risk 2,053 acres; and high risk 785 acres.</p>	<p>Timber-management activities generally implemented prescriptions that reduce losses and recover mortality due to insects and diseases. Stand-regeneration treatments are producing stands with species compositions more resilient to the impacts of forest insects and diseases. Thinning treatments have further reduced the percentage of infected or infested trees.</p>		

<b>RESOURCE ISSUE</b>	<b>EXISTING ENVIRONMENT</b>	<b>DIRECT AND INDIRECT IMPACTS</b>	<b>CUMULATIVE IMPACTS</b>
<p>Fire effects</p> <p>The proposed activities may affect forest fuels and fire behavior through tree removal.</p>	<p>The fire regime across Swan River State Forest is variable in frequency and intensity and is creating a mosaic pattern of age classes and cover types.</p>	<b><i>No-Action Alternative A</i></b>	
		<p>Wildfire hazards would not change substantially in the short term. With continued fuel accumulation from down woody debris, the potential for wildfire increases. Large-scale, stand-replacing fires may be the outcome.</p>	<p>The risk of wildfires would continue to increase as a result of long-term fire suppression.</p>
		<b><i>Action Alternatives B and C</i></b>	
		<p>Immediately following timber harvesting, the amount of fine fuels would increase. Hazards would be reduced through various fuel-treatment measures such as piling and burning.</p>	<p>Fuel loadings would be reduced in treated stands, decreasing wildfire risks in these specific areas.</p>
<p>Sensitive plants</p> <p>Harvest activities may affect sensitive plant populations through ground disturbance or influence their abundance due to changes in water yield or nutrient levels.</p>	<p>The majority of sensitive plants and their related habitat features were found in wetland areas that are not normally classified as forest stands or considered for timber harvesting. The survey identified 24 species of concern and 6 potential species of concern within the project area, and 11 additional species within one mile of the project</p>	<b><i>No-Action Alternative A</i></b>	
		<p>No effects are anticipated.</p>	<p>No effects are anticipated.</p>
		<b><i>Action Alternatives B and C</i></b>	
		<p>Most sensitive plants in the project area are found in wet areas where harvesting will not occur. Of the three species within proposed harvest units, effects of harvesting would likely be beneficial for two species, and mitigations would be applied to avoid negative impacts to the other species.</p>	<p>If changes occur in the water-yield or nutrient level, sensitive plant populations may, in turn, be affected. Given the level of the proposed and Active harvesting on Swan River State Forest and other land in the project area, no measurable changes in water yield or nutrient levels are anticipated from any of the proposed action alternatives.</p>

<b>RESOURCE ISSUE</b>	<b>EXISTING ENVIRONMENT</b>	<b>DIRECT AND INDIRECT IMPACTS</b>	<b>CUMULATIVE IMPACTS</b>
	area. Three species occur withing proposed harvest units in both Action Alternatives B and C.	As a result, no negative impacts to sensitive plants are expected under Action Alternatives B and C.	
Noxious weeds  Harvest activities may affect noxious weeds through ground disturbance.	Spotted knapweed, orange hawkweed, yellow hawkweed, Canada thistle, Bull thistle, oxeye daisy, and common St. John's-wort have become established along road edges in the project area.	<b><i>No-Action Alternative A</i></b>	
		Weed seed would continue to be introduced by recreational use of the forest, log hauling, and other logging activities on adjacent land ownerships. Swan River State Forest may initiate spot spraying to reduce noxious weed spread along its roads under the Forest Improvement (FI) program.	Current population levels would continue to exist and may increase over time.
		<b><i>Action Alternative B and C</i></b>	
Log hauling and equipment movement would introduce seeds from other sites. Weed establishment and spread would be reduced by grass seeding new and disturbed roads and landings, spot spraying of new infestations, requiring contractors to wash and have machinery inspected	The action alternatives, together with other management and recreational activities on Swan River State Forest, would provide an opportunity for the transfer of weed seeds and increased establishment of noxious weeds. Preventative actions facilitated by the Lake County Weed Board and active weed- management activities performed by Swan River State Forest would reduce the spread and establishment of noxious weeds, as well as the impacts resulting from the replacement of native species.		

<b>RESOURCE ISSUE</b>	<b>EXISTING ENVIRONMENT</b>	<b>DIRECT AND INDIRECT IMPACTS</b>	<b>CUMULATIVE IMPACTS</b>
		prior to entering the project area, and roadside herbicide spraying.	
Forest Carbon  Harvest activities may affect forest carbon amounts.	1,106,939 metric tons of total forest carbon and 344,209 metric tons of above ground forest carbon in the project area.	<b><i>No-Action Alternative A</i></b>	
		No effect on forest carbon.	Other projects currently in various stages of harvesting under the <i>Wood Lion</i> and <i>Lost Napa Multiple Timber Sales</i> projects would be expected to remove carbon at a similar rate of approximately 1.1 tons of carbon removed per thousand board feet harvested.
		<b><i>Action Alternative B and C</i></b>	
Under Action Alternative B, total forest carbon would be reduced by 3.9%, and above ground forest carbon would be reduced by 12.6% in the project area.  Under Action Alternative C, total forest carbon would be reduced by 3.5% and above ground forest carbon would be reduced by 11.2% in the project area.	Other projects currently in various stages of harvesting under the <i>Wood Lion</i> and <i>Lost Napa Multiple Timber Sales</i> projects would be expected to remove carbon at a similar rate of approximately 1.1 tons of carbon removed per thousand board feet harvested.		



RESOURCE ISSUE	EXISTING ENVIRONMENT	DIRECT AND INDIRECT IMPACTS	CUMULATIVE IMPACTS
<b>WATERSHED AND HYDROLOGY</b>			
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.	Existing annual water yield increase for watersheds in the Squeezer Meadow Project Area: Cilly Creek – 10.2 percent  Soup Creek – 6.2 percent  Goat Creek – 3.9 percent  Squeezer Creek – 2.8 percent	<b><i>No-Action Alternative A</i></b>	
		No direct or indirect increase in annual water yields would occur because no timber harvesting and road construction activities would occur.	No change in cumulative annual water yields would occur. The cumulative annual water yields would be the same as the existing annual water yields for each watershed. All watersheds would remain below the recommended threshold for annual water-yield increases.
		<b><i>Action Alternative B</i></b>	
		Direct and indirect increases to annual water yields in each watershed:  Cilly Creek – 1.2 percent Soup Creek – 1.1 percent Goat Creek – 1.1 percent Squeezer Creek – 1.7 percent	All watersheds would remain below recommended threshold for annual water-yield increases. Cumulative annual water-yield increases for each watershed:  Cilly Creek – 11.4 percent Soup Creek – 7.3 percent Goat Creek – 5.0 percent Squeezer Creek – 4.5 percent
<b><i>Action Alternative C</i></b>			
Direct and indirect increases to annual water yields in each watershed:  Cilly Creek – 0.7 percent Soup Creek – 0.9 percent Goat Creek – 1.1 percent	All watersheds would remain below the recommended threshold for annual water-yield increases. Cumulative annual water-yield increases for each watershed:  Cilly Creek – 10.9 percent Soup Creek – 7.1 percent Goat Creek – 5.0 percent		

RESOURCE ISSUE	EXISTING ENVIRONMENT	DIRECT AND INDIRECT IMPACTS	CUMULATIVE IMPACTS
		Squeezer Creek – 1.7 percent	Squeezer Creek – 4.5 percent
Timber harvesting and road construction may increase sediment delivery into streams/lakes and affect water quality.	Sediment sources in each watershed and along the proposed haul route in each watershed were modeled using a procedure adapted from the <i>Washington Forest Practices Board</i> . The following list is the estimated potential tons per year sediment delivery into streams in each watershed in the project area (tons per year):  Cilly Creek – 0.79 Soup Creek – 0.84 Goat Creek – 0.26 Squeezer Creek – 0.06	<b><i>No-Action Alternative A</i></b>	
		No direct or indirect increase or reduction in sediment delivery would occur as part of this project.	No change in cumulative sediment delivery would occur. The sediment delivery would change as funding for road maintenance is available.
		<b><i>Action Alternative B</i></b>	
		Road maintenance, reconstruction, and new road construction would result in the following net changes to the sediment delivery in each watershed:  Cilly Creek – 0.0 tons per year net change Soup Creek – 0.02 tons per year reduction Goat Creek – 0.08 tons per year reduction Squeezer Creek – 0.0 tons per year net change	Road maintenance, reconstruction, and new road construction would result in the following net post-project modeled potential cumulative sediment delivery from roads:  Cilly Creek – 0.79 tons per year Soup Creek – 0.82 tons per year Goat Creek – 0.18 tons per year Squeezer Creek – 0.06 tons per year
		<b><i>Action Alternative C</i></b>	
Road maintenance, reconstruction and new road construction would result in the following net changes to the sediment delivery in each watershed:	Road maintenance, reconstruction and new road construction would result in the following net post-project modeled potential cumulative sediment delivery from roads:  Cilly Creek – 0.79 tons per year		

RESOURCE ISSUE	EXISTING ENVIRONMENT	DIRECT AND INDIRECT IMPACTS	CUMULATIVE IMPACTS
		Cilly Creek – 0.0 tons per year net change Soup Creek – 0.02 tons per year reduction Goat Creek – 0.08 tons per year reduction Squeezer Creek – 0.0 tons per year net change	Soup Creek – 0.82 tons per year Goat Creek – 0.18 tons per year Squeezer Creek – 0.06 tons per year
<b>FISHERIES</b>			
Populations	Existing impacts to fisheries populations and genetics are high in the Swan River Drainages, Squeezer Creek, Goat Creek and Soup Creek analysis areas, and are moderate in the Cilly Creek analysis area. Continued presence of non-native fish threatens native species directly through competition, predation, and hybridization.	<b><i>No-Action Alternative A</i></b>	
		No impacts would occur beyond those already described in <i>EXISTING ENVIRONMENT</i> .	See <i>CUMULATIVE EFFECTS</i> summary below.
		<b><i>Action Alternatives B and C</i></b>	
		No direct or indirect impacts to fisheries populations (including species presence or absence and genetics) are expected to occur in any of the analysis areas as a result of the proposed actions.	See <i>CUMULATIVE EFFECTS</i> summary below.
Connectivity	There is no existing impact to connectivity in the Squeezer Creek, Soup Creek and Cilly Creek analysis areas and	<b><i>No-Action Alternative A</i></b>	
		No impacts would occur beyond those already described in <i>EXISTING ENVIRONMENT</i> .	See <i>CUMULATIVE EFFECTS</i> summary below.

<b>RESOURCE ISSUE</b>	<b>EXISTING ENVIRONMENT</b>	<b>DIRECT AND INDIRECT IMPACTS</b>	<b>CUMULATIVE IMPACTS</b>
	moderate existing impacts to connectivity in Goat Creek and Swan River Drainages analysis areas.	<p style="text-align: center;"><i><b>Action Alternatives B and C</b></i></p> No additional impacts to connectivity are anticipated in Squeezer Creek, Soup Creek, and Cilly Creek under either Action Alternative, no perennial stream crossings are to be installed on fish-bearing reaches within these analysis areas. Positive impacts to connectivity are anticipated in Swan River Drainages and Goat Creek analysis areas due to replacement of existing stream crossings to allow full fish passage.	See CUMULATIVE EFFECTS summary below.
Flow regime	Low existing impacts due to water-yield increases in the Squeezer, Goat, Soup, and Cilly creek analysis areas; existing impacts to seasonal peak flow volume, timing, and duration are expected to be within the range of natural variability.	<p style="text-align: center;"><i><b>No-Action Alternative A</b></i></p> No impacts would occur beyond those already described in EXISTING ENVIRONMENT.	See CUMULATIVE EFFECTS summary below.
		<p style="text-align: center;"><i><b>Action Alternative B</b></i></p> Low to moderate increases in water yield are anticipated in all analysis areas.	See CUMULATIVE EFFECTS summary below.
		<i><b>Action Alternative C</b></i>	

RESOURCE ISSUE	EXISTING ENVIRONMENT	DIRECT AND INDIRECT IMPACTS	CUMULATIVE IMPACTS
		Low increases in water yield are anticipated in all analysis areas	See CUMULATIVE EFFECTS summary below.
Sediment	Spawning and rearing habitat sediment impacts in Squeezer Creek and Cilly creek analysis areas are low. Existing sediment effects on spawning and rearing habitat in Soup Creek, Goat Creek and Swan River Drainages are moderate.	<b><i>No-Action Alternative A</i></b>	
		No impacts would occur beyond those already described in EXISTING ENVIRONMENT.	See CUMULATIVE EFFECTS summary below.
		<b><i>Action Alternative B and C</i></b>	
		Sediment delivery resulting from upland timber harvest, road construction and maintenance, and timber hauling are expected to result in low risk of low impact to spawning and rearing habitat.	See CUMULATIVE EFFECTS summary below.
Channel forms	Based on the existing flow regime, LWD loading rates, and the presence of spatially heterogenous stream habitat units, there is a low existing impact to channel form.	<b><i>No-Action Alternative A</i></b>	
		No impacts would occur beyond those already described in EXISTING ENVIRONMENT.	See Cumulative Effects summary below.
		<b><i>Action Alternative B</i></b>	
		Due to increased water yield compared to the existing condition, there is potential for low impacts to channel form.	See CUMULATIVE EFFECTS summary below.
		<b><i>Action Alternative C</i></b>	
Due to increased water yield compared to the	See CUMULATIVE EFFECTS summary below.		

RESOURCE ISSUE	EXISTING ENVIRONMENT	DIRECT AND INDIRECT IMPACTS	CUMULATIVE IMPACTS
		existing condition, there is potential for low impacts to channel form.	
Riparian condition	Existing riparian stand in non-stock or seedling-sapling size: Swan River Drainages: <1.0% Squeezer: 0.0% Goat: 0.0% Soup: 1.0% Cilly: 1.2%  Previous RMZ harvest (1997-2022) Swan River Drainages: 11.1 acres Squeezer: 0.1 acre Goat: 0.0 acres Soup: 8.6 acres Cilly: 8.0 acres	<b><i>No-Action Alternative A</i></b>	
		No impacts would occur beyond those already described in <i>EXISTING ENVIRONMENT</i> .	See <i>CUMULATIVE EFFECTS</i> summary below.
		<b><i>Action Alternatives B and C</i></b>	
		No RMZ harvest is anticipated to occur in the project area, thus no impacts would occur beyond those already described in <i>EXISTING ENVIRONMENT</i> .	See <i>CUMULATIVE EFFECTS</i> summary below.
Large woody debris	Existing impacts to LWD are low. LWD loading rates are within the range of historic loading rates ( <i>DNRC 2012c</i> ). Squeezer: 101 pieces/1000' Goat: 112 pieces/1000' Soup: 125 pieces/1000' Cilly: 91 pieces/1000'	<b><i>No-Action Alternative A</i></b>	
		No impacts would occur beyond those already described in <i>EXISTING ENVIRONMENT</i> .	See <i>CUMULATIVE EFFECTS</i> summary below.
		<b><i>Action Alternatives B and C</i></b>	
		No RMZ harvest is anticipated to occur in the project area, thus no impacts would occur beyond those already	See <i>CUMULATIVE EFFECTS</i> summary below.

RESOURCE ISSUE	EXISTING ENVIRONMENT	DIRECT AND INDIRECT IMPACTS	CUMULATIVE IMPACTS
		described in <i>EXISTING ENVIRONMENT</i> .	
Stream temperature	Existing impacts to stream temperature are low in the Squeezer Creek, Goat Creek and Cilly Creek analysis areas, and moderate in the Soup Creek analysis area.	<b><i>No-Action Alternative A</i></b>	
		No impacts would occur beyond those already described in <i>EXISTING ENVIRONMENT</i> .	See <i>CUMULATIVE EFFECTS</i> summary below.
		<b><i>Action Alternatives B and C</i></b>	
		No RMZ harvest is anticipated to occur in the project area, thus no impacts would occur beyond those already described in <i>EXISTING ENVIRONMENT</i> .	See <i>CUMULATIVE EFFECTS</i> summary below.
Cumulative effects to fisheries resources	High cumulative effects are currently present in Swan River drainages, Squeezer, Goat, and Soup creek assessment areas, Moderate cumulative effects are currently present in Cilly Creek as a result of likely emigration from Cilly Creek to the Swan River where similar effects to the native fish community would occur as described above.	<b><i>No-Action Alternative A</i></b>	
		Not applicable	Considering all impacts collectively, cumulative impacts are expected to continue to occur as described in the <i>EXISTING CONDITION</i> . Although the anticipated moderate to high cumulative effect is a function of all potentially related impacts, the elevated cumulative effect in the analysis areas is primarily due to adverse impacts from non-native fish species.
		<b><i>Action Alternatives B and C</i></b>	
Not applicable	Using the cumulative effects described for No-Action Alternative A as a baseline, the anticipated collective direct and indirect effects due to implementing either Action Alternative B or C is expected to contribute additional low impacts to		

RESOURCE ISSUE	EXISTING ENVIRONMENT	DIRECT AND INDIRECT IMPACTS	CUMULATIVE IMPACTS
			fisheries resources. Consequently, moderate to high cumulative impacts to fisheries resources are expected in all analysis areas, similar to the effect described in the Existing Conditions. Compared to the No-Action Alternative A, (1) low additional cumulative effects to fisheries resources would be expected, (2) the additional cumulative effects may be measurable or detectable, but not expected to be detrimental, (3) cumulative effects would remain elevated primarily due to the presence and consequent adverse impacts from nonnative fish species, and would be expected to occur regardless of whether or not this Action Alternative is selected.
<b>GEOLOGY AND SOILS</b>			
Physical Soil Properties	Up to 2,889 acres are proposed for treatment re-entry. Detrimental soil disturbance was estimated to occur on less than 20 percent of these acres. Low levels of existing impacts to physical soil properties occur within the analysis area.	<b><i>No-Action Alternative A</i></b>	
		No impact, improving trend.	
		<b><i>Action Alternatives B and C</i></b>	
		A high probability of low-to moderate-level impacts to soil properties for moderate durations (stand rotation) would be expected.	Action Alternative B presents a low risk of moderate cumulative effects to soil physical properties that would be expected to ameliorate within a stand rotation. Action Alternative B presents more risk for cumulative effects to soil function than Alternative C.
Erosion	Soils are erosively stable with no rill or gully erosion observed outside of road prisms in the analysis area.	<b><i>No-Action Alternative A</i></b>	
		No impacts would be expected; the trend would remain stable.	
		<b><i>Action Alternatives B and C</i></b>	
		A moderate probability of low level effects to soil	No cumulative effects from erosion within the analysis area are expected



RESOURCE ISSUE	EXISTING ENVIRONMENT	DIRECT AND INDIRECT IMPACTS	CUMULATIVE IMPACTS
		productivity resulting from off-site erosion is expected.	
Site Nutrients	Site nutrients vary spatially, dependent on aspect, elevation, habitat type, duff depth, and amount of fine woody debris. In general, no existing impacts from previous entries exist within the analysis area.	<b><i>No-Action Alternative A</i></b>	
		No impacts would be expected; the trend would continue to increase.	
		<b><i>Action Alternatives B and C</i></b>	
		A low probability of low-level impacts would be expected for a short duration (15 to 20 years).	Action Alternative B presents a moderate probability of low level cumulative effects to nutrient pools and Action Alternative C presents a high probability of low level cumulative effects to site nutrients in the 2,889 and 2,756 acres proposed for re-entry, respectively.
Long-term Productivity	Soils are high in productivity due to ash-capped soils, climate, and high precipitation. No existing impacts were observed to long-term productivity from prior entries within the analysis area.	<b><i>No-Action Alternative A</i></b>	
		No impacts would be expected; the trend would continue to increase.	
		<b><i>Action Alternatives B and C</i></b>	
		A low probability of low-level impacts would occur for a short duration (15 to 20 years).	Actions within Action Alternatives B and C present a low probability of low level cumulative effects to soil productivity in the 2,889 and 2,756 acres proposed for re-entry, respectively.
Slope Stability	Both the <i>Flathead National Forest Land System Inventory</i> and DNRC soil surveys do not identify specific landtypes in the project area with a high risk of mass failure. During field review, small areas adjacent to locations of new road	<b><i>No-Action Alternative A</i></b>	
		No impacts would be expected; the trend would continue to increase.	
		<b><i>Action Alternatives B and C</i></b>	
		There would be a moderate risk for actions proposed under both action alternatives to increase the risk of slope instability	No cumulative effects to slope stability are expected under both alternatives within the project area.

<b>RESOURCE ISSUE</b>	<b>EXISTING ENVIRONMENT</b>	<b>DIRECT AND INDIRECT IMPACTS</b>	<b>CUMULATIVE IMPACTS</b>
	construction were identified as sensitive areas where management actions may affect slope equilibrium and the possibility of slope failure if not adequately mitigated.	during and after project implementation. This risk would be short in duration measured by the time it would take for a harvest unit and/or road cut or fill slope to revegetate.	
<b>ECONOMICS</b>			
Income	Three-county area economy relies on income in the forestry, logging, and wood-product-manufacturing sectors. State forest timber sales generate approximately 10 percent of income in the statewide timber market as measured by volume supplied.	<b><i>No-Action Alternative A</i></b>	
		\$0 total income earned.	Cumulative income effects are limited by the scale of the initial project. Measuring cumulative income effects with any certainty is difficult.
		<b><i>Action Alternative B</i></b>	
		\$15,960,000 total delivered log value would be created in the harvest and delivery of logs.	Cumulative income effects are limited by the scale of the initial project. Measuring cumulative income effects with any certainty is difficult.
		<b><i>Action Alternative C</i></b>	
		\$14,200,000 total delivered log value would be created in the harvest and delivery of logs.	Cumulative income effects are limited by the scale of the initial project. Measuring cumulative income effects with any certainty is difficult.
Employment	The 3-county area economy relies on employment in the forestry, logging, and wood-product-manufacturing sectors.	<b><i>No-Action Alternative A</i></b>	
		0 annual jobs supported by the proposed alternative	Cumulative employment effects are limited as more timber sales in the region are required to maintain employment in the forestry, logging, and wood-products-manufacturing sectors.
		<b><i>Action Alternative B</i></b>	

<b>RESOURCE ISSUE</b>	<b>EXISTING ENVIRONMENT</b>	<b>DIRECT AND INDIRECT IMPACTS</b>	<b>CUMULATIVE IMPACTS</b>
	State forest timber sales support approximately 14-18 percent of employment in the statewide timber and lumber market as measured by volume supplied. The number of jobs available in these sectors in the 5-county area are unknown. State labor statistics identify over 280 jobs in the wood-product-manufacturing sector, and 263 jobs in the forestry and logging in the analysis area.	344 annual jobs supported by the proposed alternative.	Cumulative employment effects are limited as more timber sales in the region are required to maintain employment in the forestry, logging, and wood-products-manufacturing sectors.
		<b><i>Action Alternative C</i></b>	
		306 annual jobs supported by the proposed alternative.	Cumulative employment effects are limited as more timber sales in the region are required to maintain employment in the forestry, logging, and wood-products-manufacturing sectors.
<b>AIR QUALITY</b>			
Dust	Air quality in the analysis area is generally excellent and has limited local emission sources and consistent wind dispersion throughout most of the year. Emissions do not affect local population centers, impact zones, or class 1 Areas beyond U.S. <i>Environmental Protection</i>	<b><i>No-Action Alternative A</i></b>	
		No effects anticipated.	
		<b><i>Action Alternatives B and C</i></b>	
		Direct and indirect effects to air quality are expected to be localized to the roadways and areas directly adjacent to the roadways. Vegetative barriers and abatement measures are expected to greatly limit the dispersion	Cumulative effects to air quality are not expected to exceed EPA and DEQ standards.

<b>RESOURCE ISSUE</b>	<b>EXISTING ENVIRONMENT</b>	<b>DIRECT AND INDIRECT IMPACTS</b>	<b>CUMULATIVE IMPACTS</b>
	Agency (EPA) and DEQ standards.	of particulate matter beyond those areas.	
Smoke	Air quality in the analysis area is generally excellent and experiences localized, seasonal decreases in air quality due to smoke from wildfires and prescribed burning.	<b><i>No-Action Alternative A</i></b>	
		No effects anticipated.	
		<b><i>Action Alternatives B and C</i></b>	
		Burning days would be controlled and monitored by DEQ and the smoke monitoring unit of the Montana/Idaho Airshed Group and would meet EPA standards; thereby, the direct and indirect effects of burning activities would be minimized.	Cumulative effects to air quality are not expected to exceed EPA and DEQ standards.
Carbon Emissions	Air quality in the analysis area is generally excellent and has limited local carbon emissions sources. Existing carbon emission sources include operation of private and commercial fuel-burning vehicles and machinery.	<b><i>No-Action Alternative A</i></b>	
		No effects anticipated	
		<b><i>Action Alternatives B and C</i></b>	
		Implementation of Action Alternatives B and C would result in 3098 and 2806 metric tons of carbon emissions, respectively, from harvest and road-related activities.	Project-related carbon emissions are expected to contribute to overall private and commercially produced emissions within the Swan River State Forest.
<b>RECREATION</b>			
Public recreational use and revenue generation	Several miles of open, seasonally restricted, and closed to public motorized access exist throughout the area. Big	<b><i>No-Action Alternative A</i></b>	
		No effects anticipated.	
		<b><i>Action Alternatives B and C</i></b>	
		No changes in open roads or motorized access would	Cumulative effects would result in increases in nonmotorized public access and further

<b>RESOURCE ISSUE</b>	<b>EXISTING ENVIRONMENT</b>	<b>DIRECT AND INDIRECT IMPACTS</b>	<b>CUMULATIVE IMPACTS</b>
	<p>game species are currently abundant throughout both analysis areas, affording many hunting opportunities. Ongoing forest-management activities temporarily displace recreationists to areas free of management. Revenue is generated by a number of recreational licenses throughout the area.</p>	<p>occur. A 1.9 percent decrease available for public nonmotorized recreation and denning period motored recreation in the project area. Moderate negative direct or indirect effects to hunting are expected. As a result of forest-management activities, direct and indirect effects to recreationists during the work week are expected to be moderate to high, while direct and indirect effects to those who recreate during the weekend are expected to be minimal. No changes in revenue-producing recreational licenses are expected.</p>	<p>displacement of recreationists from active harvesting areas during typical business hours. Adverse cumulative effects are expected to be minor since recreationists would continue to have recreational opportunities throughout inactive subunits.</p>
<b>AESTHETICS</b>			
Visual Quality	Several acres previously harvested and road miles are potentially visible from specific observation points, yet currently are inhibited by existing vegetative barriers in the foreground. The existing landscape has various	<b><i>No-Action Alternative A</i></b>	
		No effects anticipated.	
		<b><i>Action Alternatives B and C</i></b>	
Direct and indirect effects to visual quality as a result of harvest units and roads associated with the action alternatives are expected to be minor if viewed from the	The contribution of visible harvested acres and new road miles under each action alternative as seen from each observation point would be minor in comparison to what exists currently throughout the landscape.		

<b>RESOURCE ISSUE</b>	<b>EXISTING ENVIRONMENT</b>	<b>DIRECT AND INDIRECT IMPACTS</b>	<b>CUMULATIVE IMPACTS</b>
	modifications of vegetative textures, forms, lines, and colors affecting the visual quality of the area.	immediate foreground and moderate if viewed from a distance.	
Noise levels	Traffic, harvesting operations, road building, rock blasting, and gravel crushing produce noise throughout the area. Noise generated from these activities coincides with the rotational schedule required under the HCP.	<b><i>No-Action Alternative A</i></b>	
		No effects anticipated.	
		<b><i>Action Alternatives B and C</i></b>	
		Direct and indirect effects to noise levels as a result of harvesting operations, harvest-related traffic, and gravel-pit operations associated with the action alternatives are expected to be moderate during the work week and minor during the weekend.	Except during periods of rock blasting and gravel crushing, cumulative effects to noise would not be expected to increase beyond current levels found in the cumulative-effects analysis area.
<b>WILDLIFE</b>			
Old Growth  The proposed activities could affect wildlife species associated with old-growth forests by reducing the acreage of available	The project area contains 2,743 acres of old growth, which represents about 12.6 percent of forested DNRC lands within the project area. The average patch size in the project	<b><i>No-Action Alternative A</i></b>	
		In the short term no changes to the amounts, quality, or spatial arrangement of old growth would occur. In the long term and in the absence of natural disturbance, the availability and connectivity of old-growth wildlife habitat may increase as stands mature. No adverse direct, indirect, or cumulative effects to old-growth-associated wildlife species would be anticipated.	
		<b><i>Action Alternative B</i></b>	

<b>RESOURCE ISSUE</b>	<b>EXISTING ENVIRONMENT</b>	<b>DIRECT AND INDIRECT IMPACTS</b>	<b>CUMULATIVE IMPACTS</b>
<p>habitat and by increasing fragmentation.</p>	<p>area is 46 acres and there are 9 old-growth patches ≥80 acres. The Cumulative Effects Analysis Area (hereafter CEAA) contains 6,639 acres of old growth, representing 12.2 percent of forested DNRC lands within the CEAA. Average patch size in the CEAA is 56 acres and there are 21 old-growth patches ≥80 acres.</p>	<p>Approximately 760 acres (327.7 percent) of the existing old growth in the project area would be affected by the proposed activities. Of these acres, 325 acres would continue to provide old-growth habitat, although stand density would be reduced. The remaining 435 acres would not provide old-growth habitat for wildlife post-harvest. Average patch size would decrease to 40 acres and the number of old-growth patches ≥80 acres would be reduced to 7. Moderate adverse direct and indirect effects to old-growth-associated wildlife species would be anticipated.</p>	<p>Approximately 760 acres (11.4 percent) of the existing old growth in the CEAA would be affected by the proposed activities. Of these acres, 325 acres would continue to provide old-growth habitat, although stand density would be reduced. The remaining 435 acres would not provide old-growth habitat for wildlife post-harvest. Average patch size would decrease to 56 acres and the number of old-growth patches ≥80 acres would be reduced to 20. Low adverse cumulative effects to old-growth-associated wildlife species would be anticipated.</p>
		<b><i>Action Alternative C</i></b>	
		<p>Approximately 717 acres (26.1 percent) of the existing old growth in the project area would be affected by the proposed activities. Of these acres, 421 acres would continue to provide old</p>	<p>Approximately 717 acres ( 10.8percent) of the existing old growth in the CEAA would be affected by the proposed activities. Of these acres, 421 acres would continue to provide old-growth habitat, although stand density would be reduced. The remaining 296 acres would not provide old-growth habitat for wildlife post-</p>

<b>RESOURCE ISSUE</b>	<b>EXISTING ENVIRONMENT</b>	<b>DIRECT AND INDIRECT IMPACTS</b>	<b>CUMULATIVE IMPACTS</b>
		<p>growth habitat, although stand density would be reduced. The remaining 296 acres would not provide old-growth habitat for wildlife post-harvest. Average patch size would decrease to 40 acres and the number of old growth patches <math>\geq 80</math> acres would be reduced to 7 acres. Moderate adverse direct and indirect effects to old-growth-associated wildlife species would be anticipated.</p>	<p>harvest. Average patch size would decrease to 53 acres and the number of old growth patches <math>\geq 80</math> acres would be reduced to 20. Low adverse cumulative effects to old-growth-associated wildlife species would be anticipated.</p>
<p>Habitat Connectivity and Fragmentation</p> <p>The proposed activities could result in disturbance or alteration of forested corridors and connectivity, which could inhibit wildlife movements.</p>	<p>In the project area existing patch connectivity is moderate and 14,228 acres provide habitat that would facilitate movement of wildlife. The average patch size is 187 acres and approximately 232 miles of edge are present. In the CEAA, 33,958 acres provide habitat that would facilitate movement of wildlife. The average patch size is 181 acres and</p>	<b><i>No-Action Alternative A</i></b>	
		<p>No changes from existing conditions regarding forest connectivity or habitat fragmentation would be anticipated.</p>	
		<b><i>Action Alternative B</i></b>	
		<p>Tree density would be reduced on 4,502 acres of upland connective forest, of which 2,620 acres would be removed. There would be a 10.3 percent reduction in forest acres that provide habitat connectivity. Average patch size would be reduced to 132 acres, representing a 29.5 percent</p>	<p>Forest connectivity would be maintained along major drainages, ridges and riparian areas in the CEAA. Forest acres providing connectivity would be reduced on 2,623 acres. Average patch size would be reduced to 155 acres representing a 14.1 percent reduction from existing conditions. Forest edge would decrease by 3 miles (0.6 percent). Minor adverse cumulative effects to wildlife habitat connectivity or fragmentation would be anticipated.</p>



<b>RESOURCE ISSUE</b>	<b>EXISTING ENVIRONMENT</b>	<b>DIRECT AND INDIRECT IMPACTS</b>	<b>CUMULATIVE IMPACTS</b>
	approximately 539 miles of edge are present.	reduction from existing conditions. Forest edge would decrease by 5 miles (2.1 percent). A moderate degree of adverse effects to wildlife habitat connectivity would be anticipated.	
		<b><i>Action Alternative C</i></b>	
		Tree density would be reduced on 4,188 acres of upland connective forest, of which 1,924 acres would be removed. There would be a 7.5 percent reduction in forest acres that provide habitat connectivity. Average patch size would be reduced to 145 acres, representing a 22.7-percent reduction from existing conditions. Forest edge would decrease by 5 miles (1.4 percent). A moderate degree of adverse effects to wildlife habitat connectivity would be anticipated.	Forest connectivity would be maintained along major drainages, ridges and riparian areas in the CEAA. Forest acres providing connectivity would be reduced by 1,927 acres. Average patch size would be reduced to 162 acres representing a 10.4 percent reduction from existing conditions. Forest edge would decrease by 2 miles (0.3 percent). Minor adverse cumulative effects to wildlife habitat connectivity or fragmentation would be anticipated.
Linkage  The proposed activities could increase open road densities, increase human developments, and reduce forested cover, which	Project area lands contribute to high quality linkage habitat. In the project area, 19,356 acres (76.1 percent) of vegetative hiding cover	<b><i>No-Action Alternative A</i></b>	
		No effects to important linkage attributes, or wildlife linkage habitat would be anticipated.	
		<b><i>Action Alternative B</i></b>	
		Open roads would not increase. Restricted roads	Open roads would not increase. Restricted roads would increase by 5.3 miles, however 7.2 miles of

<b>RESOURCE ISSUE</b>	<b>EXISTING ENVIRONMENT</b>	<b>DIRECT AND INDIRECT IMPACTS</b>	<b>CUMULATIVE IMPACTS</b>
could adversely affect linkage habitat for wildlife.	exist. Open road density within the project area is 1.1 linear miles per square mile. The CEAA contains approximately 44,104 acres (70.8 percent) of vegetative hiding cover. Highway 83 bisects the CEAA, but the density of open roads in the CEAA is relatively low at 0.9 linear miles per square mile. Existing human development is low in this area. Riparian areas and hiding cover are abundant.	would increase by 5.3 miles, however 7.2 miles of existing restricted road would be permanently reclaimed and closed. No additional human development would occur. Cover would be reduced on 2,691 acres (10.6 percent of the project area); however, 65.5 percent would remain across the project area and ample cover would be retained in riparian areas. Moderate short-term and minor long-term negative effects to linkage habitat would be anticipated.	existing restricted road would be permanently reclaimed and closed. No additional human development would occur. Cover would be reduced on 2,693 acres; however, 66.5 percent would remain across the CEAA and ample cover would be retained in riparian areas. Minor short-term and minor long-term negative effects to linkage habitat would be anticipated.
		<b><i>Action Alternative C</i></b>	
		Open roads would not increase. Restricted roads would increase by 5.3 miles, however 7.2 miles of existing restricted road would be permanently reclaimed and closed. No additional human development would occur. Cover would be reduced on 2,082 acres (8.2 percent of the project area); however, 67.9 percent would remain	Open roads would not increase. Restricted roads would increase by 5.3 miles, however 7.2 miles of existing restricted road would be permanently reclaimed and closed. No additional human development would occur. Cover would be reduced on 2,085 acres; however, 67.5 percent would remain across the CEAA area and ample cover would be retained in riparian areas. Minor short-term and minor long-term negative effects to linkage habitat would be anticipated.

<b>RESOURCE ISSUE</b>	<b>EXISTING ENVIRONMENT</b>	<b>DIRECT AND INDIRECT IMPACTS</b>	<b>CUMULATIVE IMPACTS</b>
		across the project area and ample cover would be retained in riparian areas. Moderate short-term and minor long-term negative effects to linkage habitat would be anticipated.	
<p>Grizzly Bear</p> <p>The proposed activities could result in reduction of hiding cover important for grizzly bears, which could result in: 1) increased displacement of grizzly bears, 2) avoidance of otherwise suitable habitat, and or 3) increased risk of bear-human conflicts.</p>	<p>Hiding cover exists on 68.8 percent of the DNRC managed state lands in the project area. Presently, hiding cover is fairly abundant (&gt;40 percent) in each of the subunits within the CEAA.</p>	<b><i>No-Action Alternative A</i></b>	
		No effects on hiding cover would be anticipated.	
		<b><i>Action Alternative B</i></b>	
		<p>The proposed harvesting would remove 2,691 acres of hiding cover from the existing 19,356 acres of hiding cover in the project area. Proposed seed tree and some shelterwood harvest units would be laid out to ensure that no point in a harvest unit would be greater than 600 feet to cover. Thus, minor adverse direct and indirect effects would be anticipated.</p>	<p>Proposed activities within the CEAA would reduce the amount of hiding cover by 4.6 percent. Adequate hiding cover exceeding 67 percent would persist within the CEAA. Thus, minor adverse cumulative effects would be anticipated.</p>
<b><i>Action Alternative C</i></b>			
<p>The proposed harvesting would remove 2,082 acres of hiding cover from the existing 19,356 acres of hiding cover in the project area. Proposed seed tree</p>	<p>Proposed activities within the CEAA would reduce the amount of hiding cover by 3.5 percent. Adequate hiding cover exceeding 68percent would persist within the CEAA. Thus, minor adverse cumulative effects would be anticipated.</p>		

<b>RESOURCE ISSUE</b>	<b>EXISTING ENVIRONMENT</b>	<b>DIRECT AND INDIRECT IMPACTS</b>	<b>CUMULATIVE IMPACTS</b>
		and some shelterwood harvest units would be laid out to ensure that no point in a harvest unit would be greater than 600 feet to cover. Thus, minor adverse direct and indirect effects would be anticipated.	
The proposed activities could result in an increase in the density of open roads, which could result in increased displacement of grizzly bears and increased risk of bear-human conflicts.	Presently, the project area has roughly 38.2 miles of open roads and another 4.0 miles of seasonally open road. At the larger scale, 67.7 miles of open or seasonally open road are present within the CEAA and open-road density is 0.7 miles per square mile.	<b><i>No-Action Alternative A</i></b>	
		No effects would be anticipated.	
		<b><i>Action Alternatives B and C</i></b>	
		No new open roads would be constructed; thus, no changes in open-road densities would be anticipated.	No changes in open-road amounts or densities would be anticipated; thus, no changes in open-road densities would be anticipated.
The proposed activities could result in a decrease in secure areas for grizzly bears, which could result in increased displacement of grizzly bears and increased risk of bear-human conflicts.	Secure habitat currently exists on approximately 4.6 percent of the project area, much of which are included in larger blocks of secure habitats that extend beyond the project-area boundary. The CEAA is approximately 27.4 percent secure habitat. Grizzly Bear BMU Subunits included in the	<b><i>No-Action Alternative A</i></b>	
		No effects would be anticipated.	
		<b><i>Action Alternative B</i></b>	
		Approximately 262 acres of secure habitat would be removed, and 5.3 miles of new restricted roads would be built. However, 7.2 miles of existing road would be reclaimed and closed to all motorized use. An overall decrease in total road densities and increase	Harvesting and associated road building in the CEAA would reduce secure habitat by 2.0 percent. Proposed road construction and reclamation would decrease the total road density in the CEAA to 3.8 miles per square mile. Harvesting would not occur during the spring period, which would limit potential disturbance to grizzly bears during this important time. Thus, moderate adverse cumulative effects would be anticipated.

<b>RESOURCE ISSUE</b>	<b>EXISTING ENVIRONMENT</b>	<b>DIRECT AND INDIRECT IMPACTS</b>	<b>CUMULATIVE IMPACTS</b>
	<p>CEAA have between 34 and 50 percent in secure habitat. In the project area and CEAA total road density is 5.6 miles and 3.9 miles per square mile, respectively.</p>	<p>in disturbance levels associated with commercial timber harvesting would be anticipated. Secure habitat would be reduced to 3.6 percent of the project area. Harvesting would not occur during the spring period, which would limit potential disturbance to grizzly bears during this important time. Thus, minor adverse direct and indirect effects would be anticipated.</p>	
		<b><i>Action Alternative C</i></b>	
		<p>Approximately 262 acres of secure habitat would be removed, and 5.3 miles of new restricted roads would be built. However, 7.2 miles of existing road would be reclaimed and closed to all motorized use. An overall decrease in total road densities and increase in disturbance levels associated with commercial timber harvesting would be anticipated. Secure habitat would be reduced to 3.6 percent of the project area. Harvesting would not occur</p>	<p>Harvesting and associated road building in the CEAA would reduce secure habitat by 2.0 percent. Proposed road construction and reclamation would decrease the total road density in the CEAA to 3.8 miles per square mile. Harvesting would not occur during the spring period, which would limit potential disturbance to grizzly bears during this important time. Thus, moderate adverse cumulative effects would be anticipated.</p>

RESOURCE ISSUE	EXISTING ENVIRONMENT	DIRECT AND INDIRECT IMPACTS	CUMULATIVE IMPACTS
		during the spring period, which would limit potential disturbance to grizzly bears during this important time. Thus, minor adverse direct and indirect effects would be anticipated.	
<p>Canada Lynx</p> <p>The proposed activities could reduce landscape connectivity and the availability of suitable Canada lynx habitat, reducing the capacity of the area to support Canada lynx.</p>	<p>Approximately 16,785 acres of Canada lynx habitat occur on DNRC lands within the project area. The majority of this habitat is winter foraging habitat (59.8 percent of available habitat).</p> <p>Approximately 2,756 acres of temporarily unsuitable habitat occurs in the project area. Similar habitat trends occur in the Lynx CEAA, which contains 40,014 acres of suitable habitat and 11,275 acres of temporarily unsuitable habitat on DNRC lands.</p>	<b><i>No-Action Alternative A</i></b>	
		<p>Lynx habitat availability and habitat connectivity would not change in the short term. In the longer term, natural succession would increase the availability of winter foraging habitat and other suitable habitat; however, in the absence of natural disturbance, the availability of summer foraging habitat would decrease. Connectivity may also increase in the long term due to increasing canopy cover over time.</p>	
		<b><i>Action Alternative B</i></b>	
<p>Proposed activities would affect 4,639 acres (24.9 percent) of suitable lynx habitat in the project area. Post-harvest, 5,808 of these acres would be temporarily unsuitable for lynx use until canopy cover in the understory and overstory develops. Approximately 29.7 percent of the project area would be temporarily unsuitable for lynx use post-harvest. Thus, moderate adverse direct</p>	<p>Proposed activities would affect 4,639 acres (10.4 percent) of suitable lynx habitat in the Lynx CEAA. Habitat availability in the Lynx CEAA would be reduced by 6.0 percent. Landscape connectivity would remain high due to relatively abundant suitable habitat and the retention of travel corridors. Thus, minor adverse cumulative effects would be anticipated.</p>		

RESOURCE ISSUE	EXISTING ENVIRONMENT	DIRECT AND INDIRECT IMPACTS	CUMULATIVE IMPACTS
		and indirect effects would be anticipated.	
		<b><i>Action Alternative C</i></b>	
		Proposed activities would affect 4,328 acres (25.423.2 percent) of suitable lynx habitat in the project area. Post-harvest, 5,497 of these acres would be temporarily unsuitable for lynx use until canopy cover in the understory and overstory develops. Approximately 28.1 percent of the project area would be temporarily unsuitable for lynx use post-harvest. Thus, moderate adverse direct and indirect effects would be anticipated.	Proposed activities would affect 4,328 acres (9.7 percent) of suitable lynx habitat in the Lynx CEAA. Habitat availability in the Lynx CEAA would be reduced by 5.3 percent, but landscape connectivity would remain high due to relatively abundant suitable habitat and the retention of travel corridors. Thus, minor adverse cumulative effects would be anticipated.
Fisher The proposed activities could reduce the availability and connectivity of suitable fisher habitat and increase human access, which could reduce habitat suitability and increase trapping mortality.	The project area contains approximately 11,877 acres of suitable fisher habitat (46.7 percent of project area), including 1,038 acres of riparian fisher habitat. The CEAA contains approximately 22,967 acres of suitable fisher	<b><i>No-Action Alternative A</i></b>	
		The level of motorized access would not change and no additional risk associated with trapping would be expected. Little change to fisher habitat availability or connectivity would be anticipated in the short term. In the long term and in the absence of natural disturbance, fisher habitat suitability and connectivity may increase as stands age, the availability of large-diameter at breast height (dbh) trees increases, and mature canopy cover increases.	
		<b><i>Action Alternative B</i></b>	
		Approximately 2,840 acres of fisher habitat would be	The availability of fisher habitat on DNRC managed lands in the CEAA would be reduced

<b>RESOURCE ISSUE</b>	<b>EXISTING ENVIRONMENT</b>	<b>DIRECT AND INDIRECT IMPACTS</b>	<b>CUMULATIVE IMPACTS</b>
	habitat (39.2 percent of CEAA), including 2,002 acres of riparian fisher habitat.	<p>affected. Of these acres 1,682 (14.2 percent) of habitat in the project area would not be suitable for fisher use post-harvest, including 18 acres of riparian habitat. Motorized public access would not change, but 5.3 miles of restricted roads would be constructed, increasing accessibility of the area. Thus, minor adverse direct and indirect effects would be anticipated.</p>	<p>by 2.8 percent and 18 acres of riparian fisher habitat would be removed. Landscape connectivity would be reduced, but riparian corridors would remain intact. Thus, minor adverse cumulative effects would be anticipated.</p>
		<b><i>Action Alternative C</i></b>	
		<p>Approximately 2,546 acres of fisher habitat would be affected. Of these acres 1,351 (11.4 percent) of habitat in the project area would not be suitable for fisher use post-harvest, including 19 acres of riparian habitat. Motorized public access would not change, but 5.3 miles of restricted roads would be constructed, increasing accessibility of the area. Thus, minor adverse direct</p>	<p>The availability of fisher habitat on DNRC managed lands in the CEAA would be reduced by 2.3 percent and 19 acres of riparian fisher habitat would be removed. Landscape connectivity would be reduced, but riparian corridors would remain intact. Thus, minor adverse cumulative effects would be anticipated.</p>



RESOURCE ISSUE	EXISTING ENVIRONMENT	DIRECT AND INDIRECT IMPACTS	CUMULATIVE IMPACTS
		and indirect effects would be anticipated.	
<p>Flammulated Owl</p> <p>The proposed activities could alter the structure of flammulated owl preferred habitat types, which could reduce habitat suitability for flammulated owls</p>	<p>The project area contains approximately 2,698 acres (10.6 percent) of suitable habitat types preferred by flammulated owls. Of these acres, 2,127 acres are comprised of forest stand structures currently suitable for use by flammulated owls. The CEAA is comprised of 5,028 acres (8.6 percent of the CEAA) of potential flammulated owl habitat, including 3,045 acres on DNRC lands.</p>	<b><i>No-Action Alternative A</i></b>	
		<p>In the short term, no changes to flammulated owl habitat would occur. In the long term and in the absence of natural disturbance, timber stocking density would increase over time, potentially decreasing the suitability of stands for flammulated owl use.</p>	
		<b><i>Action Alternatives B and C</i></b>	
		<p>Action Alternatives B and C would affect 475 acres and 414 acres of preferred flammulated owl cover types, respectfully. Harvest prescriptions would convert 243 acres (9.0 percent of available habitat types, Alternative B) or 260 acres (9.6 percent of available habitat types, Alternative C) to temporary unsuitable habitat by rendering stands too open. Treatments on 36 acres (both alternatives) would likely improve habitat suitability for flammulated owls by decreasing stand density and favoring seral tree species. Thus, minor direct and indirect effects</p>	<p>The proposed alternatives would affect 475 acres (9.4 percent) or 414 acres (8.2 percent) of the 5,028 acres of potential flammulated owl habitat available in the CEAA under Action Alternatives B and C, respectively. Action Alternatives B and C would increase flammulated owl habitat suitability on 36 acres. Approximately 3,918 acres (6.7 percent of CEAA) or 3,901 acres (6.7 percent of CEAA) of suitable habitat would remain in the CEAA under Action Alternatives B and C, respectively. Thus, minor cumulative effects would be anticipated under either alternative.</p>

RESOURCE ISSUE	EXISTING ENVIRONMENT	DIRECT AND INDIRECT IMPACTS	CUMULATIVE IMPACTS
		would be anticipated under either alternative.	
<p>Pileated Woodpecker</p> <p>The proposed activities could reduce tree density and alter the structure of mature-forest stands, which could reduce habitat suitability for pileated woodpeckers</p>	<p>The project area contains approximately 6,196 acres of suitable pileated woodpecker habitat (24.4 percent of the project area) and the CEAA contains approximately 15,387 acres of suitable pileated woodpecker habitat (26.3 percent of CEAA).</p>	<b><i>No-Action Alternative A</i></b>	
		<p>None of the proposed forest-management activities would occur. In the short term no changes to pileated woodpecker habitat would be anticipated. However, in the long term and in the absence of natural disturbance, pileated woodpecker habitat availability and connectivity may increase due to natural succession and aging of timber stands.</p>	
		<b><i>Action Alternative B</i></b>	
		<p>The proposed activities would affect 1,798 acres of pileated woodpecker habitat. Of these acres, 1,713 acres would not be suitable for pileated woodpecker use post-harvest (27.6 percent of pileated woodpecker habitat in the project area). Important habitat attributes including snags and coarse woody debris would be retained according to (ARM 36.11.411); Thus, moderate adverse direct and indirect effects would be anticipated.</p>	<p>Approximately 1,798 acres of pileated woodpecker habitat would be affected by timber harvest. Of these acres, 1,713 acres would not be suitable for pileated woodpecker use post-harvest (11.1 percent of pileated woodpecker habitat in the CEAA). Suitable habitat would be reduced to 13,674 acres (23.3 percent) of the CEAA. Important habitat attributes including snags and coarse woody debris would be retained according to (ARM 36.11.411); Thus, minor adverse cumulative effects would be anticipated.</p>
<b><i>Action Alternative C</i></b>			
<p>The proposed activities would affect 1,529 acres of pileated woodpecker habitat. Of these acres,</p>	<p>Approximately 1,529 acres of pileated woodpecker habitat would be affected by timber harvest. Of these acres, 1,483 acres would not be suitable for pileated woodpecker use post-harvest</p>		

RESOURCE ISSUE	EXISTING ENVIRONMENT	DIRECT AND INDIRECT IMPACTS	CUMULATIVE IMPACTS
		1,483 acres would not be suitable for pileated woodpecker use post-harvest (23.9 percent of pileated woodpecker habitat in the project area). Important habitat attributes including snags and coarse woody debris would be retained according to (ARM 36.11.411); thus, moderate adverse direct and indirect effects would be anticipated.	(9.6 percent of pileated woodpecker habitat in the CEAA). Suitable habitat would be reduced to 13,904 acres (23.8 percent) of the CEAA. Important habitat attributes including snags and coarse woody debris would be retained according to (ARM 36.11.411); thus, minor adverse cumulative effects would be anticipated.
Big Game Winter Range  The proposed activities could remove forest cover on important winter ranges, which could lower their capacity to support elk, mule deer, and white-tailed deer.	In the project area, elk winter range occurs on 23,519 acres (92.5 percent of the project area), mule deer winter range occurs on 6,143 acres (24.2 percent of the project area), and white-tailed winter range occurs on 20,706 acres (81.4 percent of the project area). Dense forest thermal cover is present on 4,418 acres, 434 acres, and 4,291 acres of elk, mule deer, and white-tailed deer winter range, respectively. In the	<b><i>No-Action Alternative A</i></b>	
		None of the proposed forest-management activities would occur. No changes in disturbance levels would occur. In the short term, no change in the availability of thermal cover would occur. In the long term and in the absence of natural disturbance, thermal cover may increase as stands age and canopy cover increases.	
		<b><i>Action Alternative B</i></b>	
The availability of thermal cover in the project area would be reduced by 4.5 percent, 0.2 percent, and 5.0 percent within elk, mule deer, and white-tailed deer winter ranges, respectively. Mature-forest cover patches would remain moderately connected. Road density would decrease from 5.6 to	The availability of thermal cover in the CEAA would be reduced by 2.8 percent, 0.1 percent, and 3.6 percent within elk, mule deer, and white-tailed deer winter ranges, respectively. Mature-forest cover patches would remain well connected. Road density would decrease from 3.9 to 3.8 miles per square mile within the CEAA. . The proposed activities may occur concurrently with the USFS Mid-Swan Project. Thus, moderate adverse cumulative effects would be anticipated.		

RESOURCE ISSUE	EXISTING ENVIRONMENT	DIRECT AND INDIRECT IMPACTS	CUMULATIVE IMPACTS
	<p>CEAA, elk winter range occurs on 38,537 acres (65.9 percent of CEAA), mule deer winter range occurs on 14,177 acres (24.2 percent of CEAA), and white-tailed winter range occurs on 29,752 acres (50.8 percent of CEAA). Dense, forest cover is present on 9,198 acres, 2,716 acres, and 7,751 acres of elk, mule deer, and white-tailed deer winter range, respectively.</p>	<p>5.5 miles per square mile. Thus, moderate adverse direct and indirect effects would be anticipated.</p>	
		<b><i>Action Alternative C</i></b>	
		<p>The availability of thermal cover in the project area would be reduced by 4.3 percent, 0.4 percent, and 4.9 percent within elk, mule deer, and white-tailed deer winter ranges, respectively. Mature-forest cover patches would remain well connected. Road density would decrease from 5.6 to 5.5 miles per square mile. Thus, moderate adverse direct and indirect effects would be anticipated.</p>	<p>The availability of thermal cover in the CEAA would be reduced by 2.7 percent, 0.2 percent, and 3.4 percent within elk, mule deer, and white-tailed deer winter ranges, respectively. Mature-forest cover patches would remain well connected. Road density would decrease from 3.9 to 3.8 miles per square mile within the CEAA. The proposed activities may occur concurrently with the USFS Mid-Swan Project. Thus, moderate adverse cumulative effects would be anticipated.</p>
<p>Elk Security Habitat</p> <p>The proposed activities could remove elk security cover, which could affect hunter opportunity and the quality of recreational hunting in the local area.</p>	<p>In the project area, 3,840 acres of security habitat are present (15.1 percent of project area). In the CEAA 14,457 acres of security habitat are present (24.7 percent of CEAA), which falls below the recommended amount (<i>Hillis et al. 1991</i>).</p>	<b><i>No-Action Alternative A</i></b>	
		<p>No changes in elk security cover would be expected. No changes to accessibility of the project area for hunters would occur. Existing cover would continue to provide security habitat. In the long term and in the absence of natural disturbance, elk security habitat availability may increase due to natural succession of timber stands.</p>	
		<b><i>Action Alternative B</i></b>	
		<p>Approximately 1,598 acres of security habitat would be affected by the proposed activities. Of these acres, 1,354 acres would not</p>	<p>Approximately 1,598 acres of security habitat would be affected by the proposed activities and 1,354 of these acres would not provide security habitat post-harvest. Security habitat availability in the CEAA would decrease from 24.7 percent to</p>

RESOURCE ISSUE	EXISTING ENVIRONMENT	DIRECT AND INDIRECT IMPACTS	CUMULATIVE IMPACTS
		<p>provide security habitat post-harvest, reducing security habitat availability in the project area from 15.1 percent to 9.5 percent. Approximately 20.85.3 miles of permanent restricted road would be constructed, however 7.2 miles of existing restricted road would be permanently reclaimed. Thus, moderate adverse direct and indirect effects would be anticipated.</p>	<p>22.4 percent, which would further decrease availability of security habitat below recommended levels. Approximately 5.3 miles of permanent restricted road would be constructed, and 7.2 miles of existing restricted road permanently reclaimed. Thus, minor cumulative effects would be anticipated.</p>
<b><i>Action Alternative C</i></b>			
		<p>Approximately 1,547 acres of security habitat would be affected by the proposed activities. Of these acres, 1,196 acres would not provide security habitat post-harvest, reducing security habitat availability in the project area from 15.1 percent to 10.4 percent. Approximately 5.3 miles of permanent restricted road would be constructed, however 7.2 miles of existing restricted road would be permanently</p>	<p>Approximately 1,547 acres of security habitat would be affected by the proposed activities and 1,196 of these acres would not provide security habitat post-harvest. Security habitat availability in the CEAA would decrease from 24.7 percent to 22.7 percent, which would further decrease availability of security habitat below recommended levels. Approximately 5.3 miles of permanent restricted road would be constructed, and 7.2 miles of existing restricted road permanently reclaimed. Thus, minor cumulative effects would be anticipated.</p>

<b>RESOURCE ISSUE</b>	<b>EXISTING ENVIRONMENT</b>	<b>DIRECT AND INDIRECT IMPACTS</b>	<b>CUMULATIVE IMPACTS</b>
		reclaimed. Thus, moderate adverse direct and indirect effects would be anticipated.	

## **PROPOSED DECISION**

This portion of the FEIS presents the proposed decision by Dave Marx, Unit Manager, Swan River State Forest, DNRC.

The scope of this proposed decision is limited to actions associated with the Squeezer Meadow Multiple Timber Sale Project proposal. The proposed decision is site-specific and is neither programmatic nor a general management plan for Swan River State Forest.

The ID Team has completed the DEIS and prepared the FEIS for the Squeezer Meadow Multiple Timber Sale Project proposal. The FEIS presents an adequate analysis of a reasonable range of alternatives. The ID Team provided sufficient opportunities for external and internal review and comment. The ID Team thoroughly identified issues and concerns and used them to develop alternative approaches that appreciably accomplish project objectives. The ID Team thoroughly and accurately presented the existing condition and unique effects associated with each alternative and displayed the information needed to make a decision.

## **ALTERNATIVES CONSIDERED**

Two action alternatives were developed and are presented in this FEIS, along with the No-Action alternative:

- ***No-Action Alternative A***

Under No-Action Alternative A, no roadwork or large-scale timber harvest would take place. Salvage logging, firewood gathering, road maintenance, fire-suppression activities, and recreational use would likely continue. In the absence of natural or human disturbance, forest community types would likely continue to shift to those dominated by shade-tolerant tree species.

- ***Actions Common to Action Alternatives B and C***

Both action alternatives would replace 1 stream crossing in Squeezer Creek, replace 2 stream crossings, as well as remove and restore 5 failed native crossings in Goat Creek watershed, and replace 1 stream crossing, as well as remove and restore 1 failed native crossing in Swan River drainage.

- ***Action Alternative B***

Management activities and potential environmental effects would be extended over a slightly broader geographic area that encompasses portions of 32 sections. Approximately 39.9 MMBf of timber would be harvested from an estimated 5,236 acres over a 5 to 7 year period. A combination of regeneration and variable thin harvests would be implemented. This alternative would attempt to address project objectives while harvesting more acres of old growth forests with fewer acres of regeneration harvesting. Treatments within old growth would focus harvests in fewer acres of high-risk old growth. This alternative would harvest in 760 acres of old growth. Of the 760 acres of old growth, 324 acres would continue to meet the Department's definition of old growth post-harvest, while the remaining 435 acres would not. Approximately 80 miles of existing roads would require various levels of improvements and maintenance. Approximately 5.3 miles of new road construction and 1.5

miles of road reconstruction would be needed to access all of the proposed harvest units. This alternative would earn approximately \$1,389,474 for the Common School trust fund.

- **Action Alternative C**

Management activities and potential environmental effects would be concentrated over a smaller geographic area. Approximately 35.5 MMbf of timber would be harvested from an estimated 4,861 acres from portions of 31 sections over a 5 to 7 year period. A combination of regeneration and variable thin harvests would be implemented. Stands in the project area with the highest concentration of insect and disease activity have been proposed for harvesting under this alternative. This alternative would harvest in 717 acres of old growth. Of the 717 acres of old growth, 421 acres would continue to be classified as old growth post-harvest, while the remaining 296 acres would no longer meet the Department's old growth definition. Approximately 80 miles of existing roads would require various levels of improvements and maintenance. Approximately 5.3 miles of new road construction and 1.5 miles of road reconstruction would be needed to access all of the proposed harvest units. This alternative would provide the highest revenue return per acre by limiting development and logging costs. This alternative would earn approximately \$1,220,408 for the Common School trust fund.

A more detailed description of alternatives A through C is presented in the *FEIS, CHAPTER II* page 5.

## 1. PROPOSED ALTERNATIVE SELECTION

### ACTION ALTERNATIVE B

To varying degrees, each action alternative meets the project's objectives and could be chosen. Mr. Marx proposes the selection of Action Alternative B after a thorough review of the DEIS, project file, public correspondence, corrections and additions made by DNRC that were reflected in this FEIS, Department policies, the *SFLMP, Administrative Rules for Forest Management, and the DNRC Forested Trust Lands Habitat Conservation Plan*. The proposed decision would implement Action Alternative B without modification and would include all recommended mitigations within this Squeezer Meadow Multiple Timber Sale Project FEIS.

## 2. RELATIONSHIP OF THE OBJECTIVES TO THE PROPOSED DECISION

Seven objectives were identified for the Squeezer Meadow Multiple Timber Sale Project. Each objective is summarized below followed by how the proposed decision relates to and meets each project objective. The complete, detailed project objective statements and compliance indicators are presented in the *FEIS* in *CHAPTER II* pages 47 through 50.

- **BIODIVERSITY**

Concepts implemented by Action Alternative B are designed to promote biodiversity by managing for appropriate stand structures, compositions, and age classes. Treatments trend timber stands toward a desired future condition that is more representative of average historical conditions and distribution patterns within the project area. This alternative would meet the project objective for biodiversity using the approach described in *Administrative Rules for Forest Management (ARM 36.11.401 to 450)*.



- **INSECT AND DISEASE**

Action Alternative B proposes harvest treatments that target specific species or individual trees affected by insects and diseases, as well as the salvage of recently killed trees. Treatments are focused on stands with the greatest amounts of mortality and potential economic value loss. Action Alternative B would meet the objective by recovering this value and reducing insect and disease problems through replacing infested and infected trees with more resistant mixed-seral species that would exhibit better growth and vigor, as directed by *Administrative Rule for Forest Management 36.11.420.6*.

- **YIELD AND REVENUE**

Action Alternative B would harvest approximately 39.9 MMbf of sawtimber to contribute to DNRC's sustained yield, as mandated by *State Statute 77-5-222, MCA*. This proposed timber sale volume falls within the range of the project's harvest objective. This project would consist of several sales spread over approximately a 5-year period, averaging 8 MMbf per year. This would represent approximately 13 percent of the state's harvest during FY 2025 through FY 2029.

Action Alternative B would earn an estimated \$1,346,433 for the Common School Trust. This revenue would contribute to the purpose of the proposed action to produce the largest measure of reasonable and legitimate return over the long run (*77-1-2-2, MCA*). Approximately, \$143,640 would be earned for FI activities such as planting, thinning, road maintenance, and disposal of logging slash. FI activities help maintain or increase the condition and income potential of forested trust lands through improvements.

Action Alternative B would support local economies by generating 344 full-time annual logging and forest product jobs if the entire project were to be completed in one year.

- **TRANSPORTATION**

Action Alternative B would replace 1 stream crossing in Squeezer Creek. This alternative would replace 2 stream crossings and remove and restore of 5 failed native crossings in Goat Creek watershed. This alternative would replace 1 stream crossing and remove and restore 1 failed native crossing in Swan River drainage. Approximately 80 miles of existing roads would require various levels of improvements and maintenance. All improvements on existing roads are designed to reduce the risk of sediment delivery to surface water. Approximately 5.3 miles of new road along with 1.5 miles of road reconstruction would be constructed to access all of the harvest units. All improvements contribute to better meeting long-term *BMPs* and safety standards while providing additional access for management and fire suppression activities.

- **FUEL LOADS**

Action Alternative B would reduce the risk of destructive stand-replacing wildfires by reducing stand densities, ground, and ladder fuels across 2,692 acres using seed tree and shelterwood harvest treatments.

- **WATER QUALITY**

Action Alternative B would reduce the risk of sediment delivery to local streams by maintaining or improving *BMPs* to several stream crossings and surface drainage on 80 miles of existing road within the Goat Creek, Squeezer Creek, Cilly Creek and Soup Creek drainages. This work is estimated to reduce the sediment load in these 4 drainages by 0.1 tons per year over the long term.

**3. RELATIONSHIP OF THE ISSUES AND PUBLIC COMMENT TO THE PROPOSED DECISION**

**A. VEGETATION** (*FEIS, CHAPTER I* page 7, and *VEGETATION ANALYSIS, CHAPTER III* pages 108 through 176)

Harvest treatments are focused on those stands with the greatest amounts of mortality and economic value loss. The old growth stands proposed for harvesting exhibit poor health and vigor. Many of the large trees within these stands are dead or dying due to insect- and disease-induced mortality. Over time, many of these old growth stands may not meet DNRC's minimum requirements for old growth, even without harvesting. Planned harvest treatments are designed to thin or regenerate the majority of the area within these current old growth stands. Post-harvest treatments include mechanical site preparation and burning, followed by the planting of western white pine, western larch, and ponderosa pine seedlings within regeneration harvest areas. These shade-intolerant species are well-suited for these sites, are longer-lived, and are generally less susceptible than shade-tolerant species to many insects and decay fungi, and are currently underrepresented on Swan River State Forest. Overall, vigor and resistance to insects and diseases would be improved with the establishment of younger and more vigorous stands.

Following harvesting, approximately 1,124 acres of mixed-conifer cover types would be converted (a 2.1-percent decrease on Swan River State Forest) and reclassified to the ponderosa pine, Douglas-fir, western larch/Douglas-fir, and western white pine cover types. The representation of western larch, ponderosa pine, lodgepole pine, Douglas-fir, and western white pine is likely to increase in harvest units after regeneration establishes. The representation of the 0-to-39-year age class on Swan River State Forest would increase by 2.5 percent (1,156 acres). The representation of the 40-to-99-year age class would decrease by 1.3 percent (637 acres). The representation of the 100-to-149-year age class would slightly decrease by 0.2 percent (285 acres), and the representation of the 150 plus-year-old age class (old stands not considered old growth) would increase by 0.5 percent (177 acres). Harvesting activities would occur within 760 acres of old growth. Of the 760 acres of old growth proposed for harvest, 435 acres would no longer meet the Department's old-growth definition post-harvest. Ninety-five acres of these stands are considered high risk. These stands are exhibiting poor health and vigor with significant mortality of large trees. As large trees continue to die, these stands may no longer be considered old growth due to an insufficient number of live trees of a certain size and age as defined by *Green et al (1992)*. The remaining 325 acres would continue meet the Department's definition. Restoration and maintenance treatments would focus on

retaining old growth attributes on these 325 acres while still meeting DNRC's definition of old growth by retaining at least 10 large, live, old trees per acre, which would continue to contribute to stand structure and benefit a variety of old growth-associated species. While harvesting would fragment older stands and reduce existing patch sizes in old growth forests, the action alternative would increase patch sizes of younger stands. The alternative does not appreciably alter riparian mature forest connectivity. Overall, some localized connectivity would be reduced as cover is altered in harvest areas.

**B. WATERSHED AND HYDROLOGY** (*FEIS, CHAPTER I* page 8, *CHAPTER III* pages 197 through 223)

With the implementation of Action Alternative B, several planned *BMP* and erosion-control improvements on 80 miles of existing road would reduce the long-term risk of sediment delivery to some local streams and prevent increased risk to others.

While new road construction and improvement to stream crossing sites and *BMPs* on existing roads may result in short-term impacts, these projects would reduce the long-term annual sediment delivery to Goat Creek by 0.9 tons per year and Soup Creek by 0.2 ton per year. Cumulative annual water yield would increase 1.2 percent in the Cilly Creek, 1.1 percent in Goat Creek, and 1.1 percent in the Soup Creek watersheds. This alternative leaves all watersheds below established thresholds of concern for adverse effects to channel stability from increases in stream flows.

**C. FISHERIES** (*FEIS, CHAPTER I* page 8, *CHAPTER III* pages 224 through 258)

Action Alternative B is expected to have no direct or indirect impacts on fish presence, genetics, or connectivity within any of the analysis areas. The adverse effects of non-native fish species on native populations would continue to occur at the same levels as the No-Action Alternative A. Elevated cumulative effects would be expected to occur regardless of whether or not this alternative is implemented. Although the anticipated moderate to high cumulative effect is a function of all potentially related impacts, the elevated cumulative effect in all analysis areas is primarily due to adverse impacts from non-native fish species.

**D. WILDLIFE** (*FEIS, CHAPTER I* pages 8 through 10, *CHAPTER III* pages 259 through 327)

Under Action Alternative B, some disturbance and displacement to wildlife in the project area would occur during harvesting activities. After completing harvesting activities, motorized restrictions would be implemented to minimize long-term disturbance and displacement. Wildlife species that use more open-canopied forests with shade-intolerant tree species would benefit, while wildlife species that prefer interior forest conditions primarily associated with late successional timber stands that are dominated by shade-tolerant tree species would be more negatively affected. Harvesting in mature forests would create gaps causing fragmentation and altering connectivity and linkage. Approximately 2,620 acres of connective forest would be removed resulting in a 10.3 percent reduction of connective forest in the project area.

Project design would maintain good connectivity along riparian areas and overall mature forest cover and connectivity would generally remain abundant and connected within the project area. Average patch size of moderate to dense forest would be reduced to 132 acres within the project area, a 29.5 percent decrease. Forest edge would be decreased by 5 miles, or 2.1 percent from existing levels. Proposed reductions in the amount of moderate to dense forest and reduced patch sizes would be expected to inhibit movement of interior forest species in some localized areas in the project area. With no increase in open road densities, a 3- to 4-year increase in activity, and a 10.3 percent decrease in vegetative cover, moderate short-term and minor long-term negative effects to linkage habitat would be expected within the project area.

Mitigation measures such as retaining large snags, cull trees, and down woody material, retaining cover and riparian habitat for connectivity, and maintaining and implementing motorized-use restrictions are expected to reduce adverse effects and maintain habitat for wildlife species that use the project area.

The effects of implementing Action Alternative B are entirely within the allowable limits defined under the *HCP*. Within the project area, postharvest hiding cover on DNRC-managed lands would be maintained between 50 and 52 percent, which is well above the 40-percent minimum set by the *HCP*. Harvesting and road construction activities reduces secure habitat only within the project area by 262 acres. Unit design retains 100-foot vegetative screens along open roads and maintains distance-to-cover that does not exceed 600 feet. With these mitigations in place, the risk of long-term area avoidance and human-caused bear mortality would be minimized.

**E. SOILS** (*FEIS, CHAPTER I* page 9, *CHAPTER III* pages 177 through 196)

Following harvesting and post-harvesting activities under Action Alternative B, soil impacts are expected to remain under 20 percent of the harvested area as recommended by the *SFLMP*. Mitigation measures would include restricting the season of use, utilizing maximum corridor spacing for skid trails, minimizing the size and number of landings, installing needed erosion-control devices, retaining woody debris, and following all applicable *BMPs*. These mitigation measures would maintain long-term soil productivity.

Soil nutrient pools would be retained through postharvest slash treatments and retention of 10 to 25 tons per acre of coarse and fine woody material.

No harvest units or new road would be located on landtypes prone to mass failure. Action Alternative C would stabilize new road prisms through proper installation of drainage features, full-bench construction, and prompt revegetation of cut and fill slopes.

**F. ECONOMICS** (*FEIS, CHAPTER I* page 11, *CHAPTER III* pages 328 through 335)

The estimated stumpage revenue from implementing Action Alternative B is \$5,026,602 with an additional \$143,640 in FI collections. Net revenue for the Common School Trust

is estimated at \$1,489,303. Additional economic benefits of implementing this project include the generation of 344 local jobs for 1 year.

**G. AIR QUALITY** (FEIS, CHAPTER I page 11, CHAPTER III pages 336 through 342)

Dust production from harvest-related traffic on gravel roads is expected to be minor and localized provided that dust abatement is applied during dry periods. Smoke and particulate emissions caused by the burning of logging slash, should not exceed allowable levels defined by the *State of Montana Smoke Management Plan* as managed by the *Montana Airshed Group*.

**H. RECREATION** (FEIS, CHAPTER I page 12, CHAPTER III pages 343 through 350)

Long-term recreational use is not expected to change as a result of implementing Action Alternative B. Recreationists may be inconvenienced or temporarily displaced by project-related activities. Road restrictions associated with the *HCP* would continue to limit access to nonmotorized travel in some areas.

**I. AESTHETICS** (FEIS, CHAPTER I page 12, CHAPTER III pages 351 through 362)

Under Action Alternative C, seed tree, shelterwood, and variable thinning treatments would alter views from selected observation points, which are the Wildlife Viewing area, Swan Peak Overview, the Napa Point Trailhead, and the portion of Highway 83 within the project area. Action Alternative B would result in a 0 percent increase in visible harvested acres in the project area from the Wildlife Viewing Area, a 3 percent increase from Swan Peak Overview, a 13 percent increase from Napa Point trailhead, and a 2 percent increase from Highway 83. Visual barriers would partially obstruct many of the harvest units in the foreground. Most of the harvest units and associated roads would be visible in the middle ground and background. Middle ground harvest units would appear altered, more open, and have fewer residual trees. Background views would show new patterns of a variety of tree densities remaining on the landscape. Seed tree treatments would result in stands with approximately 10-percent canopy cover, appear lighter in color, and have hard, distinctive perimeter lines. Shelterwood salvage treatments would result in stands with approximately 20-percent canopy cover, appear lighter in color, and have slightly less distinctive perimeter lines. Variable thinning treatments would result in stands with approximately 40-percent canopy cover; have darker color with perimeter lines that are harder to distinguish.

Harvest-activity road construction and haul traffic would generate noise during the workweek in active operational periods for the next 3 to 5 years.

**J. IRRETRIEVABLE AND IRREVERSIBLE COMMITMENTS** (FEIS, CHAPTER III page 256)

Harvesting timber will cause live and insect- and disease-killed trees to be irretrievably lost. Harvested trees will no longer contribute to snag and woody-debris recruitment, stand structure and composition, aesthetics, wildlife habitat, nutrient cycling, and other important ecosystem functions. However, the loss of trees is not irreversible. Site preparation combined with natural regeneration and planting will promote the

establishment of new trees, some of which will eventually become equivalent in size and ecosystem function to those harvested.

Action Alternative B includes new road construction and gravel pit development. New roads represent a commitment of resources by removing them from forest production and ecosystem function; however, they could, over time, be reclaimed and once again produce timber and function as forested land. As gravel material is mined and exhausted, portions of the proposed gravel pit would be reclaimed and once again produce timber and function as forested land.

#### **4. RATIONALE FOR THE PROPOSED DECISION**

The lands involved in this project are held by the State of Montana in trust for the support of the Common School Trust. DNRC is required by law to administer these trust lands to produce the largest reasonable and legitimate return over the long run (*Enabling Act of February 22, 1889; 1972 Montana constitution, Article X, Section 11; and 77-1-20, MCA*).

Through careful evaluation of project design, I have determined that Action Alternative B provides for a healthy and stable forest within the philosophy and framework of the *SFLMP* and complies with applicable standards and commitments set forth in the *Administrative Rules for Forest Management* and the *DNRC Forested Trust Lands Habitat Conservation Plan*, while producing a reliable and high long-term revenue stream in the following ways:

- A. A large number of stands within the project area are affected by a variety of insects and diseases. These stands are experiencing mortality and economic value loss. Of both action alternatives, treatments in Action Alternative B focus on treating the most acres (5,236) with site-intensive management-type treatments to address insect and disease problems in the project area (*FEIS CHAPTER III-53*). It rehabilitates stands with the greatest amounts of mortality and loss of economic value. Action Alternative B treats 824 acres of stands identified with high levels of risk for insect and disease activity and 2,313 acres with moderate levels of risk for insect and disease activity. The majority of the units would be treated with regeneration harvests. Regeneration harvests provide a greater opportunity for the establishment of a full complement of species that provides greater resilience and stability against damaging agents including insects, diseases, wildfire, and climate (*ARM 36.11.420*). Of all the alternatives analyzed, Action Alternative B would result in the greatest decrease in insect and disease problems and the greatest value recovery within the project area.
- B. Action Alternative B would contribute 39.9 MMbf to the statewide sustained yield mandated by state statute over the next 3 to 5 years (*MCA 77-5-222*). If considered over a 3-year period, this project would consist of several timber sales averaging 8.5 MMbf per year. This represents approximately 13 percent of the state's harvest during FY 2025 through FY 2029. For the past several years the Swan River State Forest has been slightly below the long-term sustained-yield target.
- C. The *HCP* identifies rest/rotation periods for designated subunits. This allows 3 years of activity during the non-denning period, followed by a minimum of 6 years of rest, as stated in *Section GB-ST2* of the *HCP*. Subzone 2 and 3 of the project area is scheduled to

become active during the 2027 through 2029 period. All other harvest activities in other subunits occur in the winter during the denning period. Action Alternative B provides for better retention of secure habitat as it constructs fewer miles of new road. Action Alternative B complies with all parameters set within the *HCP*.

- D. Action Alternative B harvests in 435 acres of stands that meet the Department's old growth definition. Desirable old growth attributes are being lost through insect and disease mortality and in-growth of late successional tree species. The Common School Trust is losing revenue by not recovering dead and dying trees. To achieve a desired future condition on the landscape and meet project objectives, harvesting in these particular old growth stands is necessary. In harvesting within old growth stands, the following elements were considered at the project level:

The project complies with DNRC's *Administrative Rules for Forest Management (ARM 36.11.401 to 450)* by considering a variety of factors at the project level, including current and historic timber stand age-class amounts and distributions, successional stage, forest cover type amounts and distributions, stand structure, vigor, connectivity, fragmentation, disturbance regimes, patch size, stand characteristics, etc. Within old growth stands, the analysis collectively evaluated effects on attributes associated with old growth stands including numbers or amounts of large live trees, snags, woody debris, crown cover, stand decadence, stand vigor, structure, and density, each of which are accounted for by DNRC's *Full Old-Growth Index (FOGI)*. The old growth stands proposed for harvesting with Action Alternative B were included in this consideration. The rules state that the decision to treat specific stands of old growth will be made at the project level. Pursuant to 77-5-116, *MCA*, DNRC is prohibited from temporarily or permanently setting aside 'old growth' unless the full market value is obtained for the trust beneficiaries from such a deferral. *ARM 36.11.418* indicates that the "amounts and distribution of all age classes will shift and change over time" and that "no stands would be permanently deferred from management...". This recognizes and provides for the inherent variability that occurs on the landscape over time and the fiduciary responsibilities of DNRC. The proposed stand-treatment concepts are designed to promote biodiversity and trend timber stands toward desired future conditions.

The primary reasons for harvesting within old growth with this proposed project are to reduce the effects and presence of damaging insects and diseases in stands with the greatest amounts of mortality and recover economic value loss. Action Alternative B focuses on treating 15 percent (824 acres) of the high-risk old growth stands in the project area that are severely affected by a variety of insects and diseases, 39 acres more than Action Alternative C. Many of these old growth stands exhibit poor health and vigor with significant mortality of the large trees. As the large trees continue to die, these stands may no longer be considered old growth due to an insufficient number of live trees of a certain size and age as defined by *Green et al (1992)*.

Some old growth stands proposed for harvesting are adjacent to younger regenerating harvest units. The juxta positioning of some of the proposed old growth regeneration

harvest units near other younger regenerating units will allow development of larger patches of similarly aged stands into the future.

In many areas where old growth is proposed for harvesting, western white pine was once a substantial component of the overstory. Over time, white pine blister rust and mountain pine beetles have killed a large percentage of western white pine in this area and throughout northwestern Montana. Currently, only 7.0 percent of Swan River State Forest is maintained in the western white pine cover type. However, western white pine is the desired future condition on 24.8 percent of Swan River State Forest, and this would also emulate more closely historic proportions. Aggressive planting of blister rust-resistant western white pine is seen as the best, if not only, way to increase the presence of western white pine on appropriate sites (*Fins et al. 2002, Fins et al. 2001, Neuenschwander et al. 1999*). The proposed planting of blister rust-resistant western white pine following treatments under Action Alternative B would contribute to increasing the western white pine cover type representation on the forest in the long term.

Approximately 47.1 percent of stands on Swan River State Forest exist as mixed-conifer cover types. In regard to desired future conditions, the mixed-conifer cover type is considered overrepresented while the western larch/Douglas-fir and western white pine cover types are underrepresented at the coarse-filter analysis level. Of the stands proposed for harvesting, approximately 44 percent are in the mixed-conifer cover type. Action Alternative B moves 1,124 acres of mixed-conifer cover type (overrepresented) to: 680 acres of western larch/Douglas-fir, 151 acres of ponderosa pine and 291 acres of western white pine cover types (all underrepresented). This would be accomplished by retaining western larch and Douglas-fir within harvest units and planned regeneration (natural or planted) of the same species and by planting rust-resistant western white pine. Action Alternative B converts the most acres of mixed-conifer cover type into western white pine cover type.

Postharvest, 417 acres of the treated old growth would continue to meet the *Green et al. (1992)* minimum criteria for the numbers of large live trees that the Department uses to classify stands as old growth. Attribute levels commonly associated with old growth within these stands will be reduced, but restoration and maintenance treatments would focus on retaining higher levels of old growth character and function within these acres.

Following harvesting under Action Alternative B, the amount of old growth remaining on Swan River State Forest (including recently acquired lands) would be 6,311 acres, or 11.21 percent of the area. Various researchers have used a multitude of diverse old growth definitions to estimate historical amounts of old growth that could have occurred in Swan Valley. These estimates range from 15 to 60 percent. The estimates above are primarily age-based estimates that do not consider the other attributes, such as number of snags or coarse woody debris, often deemed necessary to call a stand old growth. The lack of additional old growth attributes in many of the old growth definitions results in overestimated amounts of old growth compared to other old growth definitions that include additional attribute thresholds. The amount of old



growth after harvesting would be within the historic range for amounts of old growth that would be expected to occur on Swan River State Forest (*VEGETATION, HISTORIC ESTIMATES OF OLD GROWTH, CHAPTER III* pages 122 through 136).

Action Alternative B increases the proportion of stands in the 150-year and greater age class by 0.8 percent within the project area, while young stands (0-to-39-year age class) are increased by 5 percent. Overall, age-class distributions would move toward expected average historical conditions for the project area based on age-class distributions for *Climatic Section M333C (FEIS, TABLE III-4, CHAPTER III* page 119)

- E. DNRC's management activities are guided by the philosophy of the *SFLMP*, DNRC's *Administrative Rules for Forest Management (ARM 36.11.401 to 450)*, and other relevant rules and laws including the requirement to calculate an annual sustainable yield:

As defined in 77-5-221 MCA and pursuant to 77-5-222 and 223, MCA, the Department is required to recalculate the annual sustained yield at least once every 10 years. The sustained yield calculation is done to determine the amount of timber that can be sustainably harvested on an annual basis from forested state trust lands in accordance with all applicable state and federal laws. The most recent sustained yield calculation was adopted by the *Land Board* in 2020.

This sustained yield calculation fully incorporated the philosophy of the *SFLMP* and all applicable laws, rules, and regulations. Biodiversity, forest health, and threatened and endangered species considerations and desired future conditions are important aspects of state forest land management, including old growth management. These factors were modeled in the recent sustained yield calculation and are reflected in the various constraints applied to the model that included management constraints in old growth stands, *SFLMP* constraints, and implementation constraints.

The biodiversity and old growth administrative rules that were incorporated into the sustained yield model were developed with public input. The managed old growth concept means that harvest treatments in old growth stands contributed to the calculated sustainable yield. For example, maintenance and restoration treatments were allowed to occur periodically in some old growth stands, while the model also allowed old growth removal treatments to be applied to other stands. Given the concerns expressed by some of the public regarding old growth, the sustained yield model made provisions for tracking old growth amounts over the planning horizon in order to determine whether landscape-level biodiversity objectives in the *SFLMP* and *ARM 36.11.401 to 450* were met. At the initiation of the model runs, approximately 11 percent of DNRC's forested lands met the Department's old growth definition. After incorporating the Department's old growth management regimes and all relevant constraints into the model, approximately 8 percent of the landscape was intended to be in an old growth condition at model year 100. The model clearly demonstrates that this is achievable at the current sustained yield of 60.0 MMBf given current management practices, rules, and laws.

This project's effects to old growth amounts result in postharvest quantities (11.21 percent for Swan River State Forest) that are within the natural range of variability presented in the FEIS.

- F. Action Alternative B does not exceed the allowable water yields for any watershed where treatments occur. Predicted water-yield increases would produce a low risk of creating unstable channels in any of the project area streams.
- G. Action Alternative B attempts to strike an important balance between economic and ecologic values by addressing insect and disease problems while recovering economic value. It utilizes efficient silvicultural and logging systems while using less miles of road. Action Alternative B provides for the highest total trust revenue (\$1,489,303), and the highest trust income per acre (\$284/acre) as compared to (\$251/acre) Action Alternative C.

### **SUMMARY OF THE PROPOSED DECISION**

Overall, Action Alternative B strikes the best balance between protection of ecological values and addressing insect and disease problems with revenue generation for the Common School Trust. Action Alternative B earns about \$17 more per acre treated than Action Alternative C. Stands with the greatest amounts of mortality are identified for harvest with treatments that focus on providing for the best long-term forest health and vigor. Action Alternative B treats 260 more acres of stands that are moderate risk to insect and disease than does Action Alternative C. Action Alternative B captures potential value loss by treating 824 acres of high-risk old growth more intensively than Action Alternative C. In addition, the proposed project and harvest treatments move Swan River State Forest toward desired future conditions while limiting effects to other valuable resources such as watersheds, wildlife, and soils. Action Alternative B moves 212 acres into the 0- to 39-year age class, and 118 more acres of mixed-conifer cover type into western white pine, western larch/Douglas fir, and ponderosa pine cover types than does Action Alternative C. This moves Swan River State Forest towards how age classes and cover types were historically represented on the general landscape. Action Alternative B and C build the same miles of new and temporary road. Action Alternative B and C maintains the same amount of grizzly bear secure habitat.

Because of the above-mentioned reasons, Action Alternative B best complies with the Department's legal requirement to manage these lands to produce the largest measure of reasonable and legitimate return over the long run for the beneficiary institutions.

## **CHAPTER III - EXISTING ENVIRONMENT AND ENVIRONMENTAL EFFECTS**

### **INTRODUCTION**

This chapter is a summary of resource conditions as they relate to the proposed Squeezer Meadows Multiple Timber Sale Project. The current, or existing, condition can be viewed as a baseline to compare changes resulting from the selection of any alternative. How each alternative may affect the environment is also described. For more complete assessments and analyses related to the resources for both scientific and judicial review, refer to the appropriate section of this FEIS.

## **VEGETATION ANALYSIS**

### **INTRODUCTION**

This analysis describes current vegetative conditions on Swan River State Forest and discloses the potential direct, indirect, and cumulative environmental effects that may result under each alternative associated with the proposed action.

### **ISSUES AND MEASUREMENT CRITERIA**

Issues regarding the effects of harvesting activities on the various vegetation components were identified through public and internal scoping. These issues are listed in *TABLE I-1* and are reiterated at the beginning of each topic section (cover type, age class, etc.). Various measurement criteria were utilized to evaluate the effects of the alternatives, depending on the vegetative component. The criteria used for evaluation are described under *ANALYSIS AREAS* and *ANALYSIS METHODS*, below.

### **ANALYSIS AREAS**

#### ***DIRECT AND INDIRECT EFFECTS***

Direct and indirect effects were examined at the nested scales of the entire Swan River State Forest and the project area (see *PROJECT AREA MAP* located before *CHAPTER I – PURPOSE AND NEED*).

Effects were considered at each nested scale because activities within one scale can influence all scales and may be unapparent or misleading in representation of effects at another scale.

#### ***CUMULATIVE EFFECTS***

The analysis area used to assess cumulative effects includes all ownerships within the perimeter of Swan River State Forest. Lands adjacent to or within the perimeter of Swan River State Forest, such as the USFS, DFWP, and private lands will be addressed to the extent possible. While DNRC does not have adequate data to quantitatively discuss conditions or ownership changes on other lands in the analysis area, we acknowledge that management actions on these other lands can have ecological effects to resources on DNRC managed lands; thus, these effects will be discussed qualitatively.

### **ANALYSIS METHODS**

Effects to forest vegetation are described and analyzed in terms of cover type representation, age class distributions, old-growth amounts and attribute levels, patch dynamics, forest fragmentation, stand structure and vigor, crown cover, fire effects, the role of insects and diseases, sensitive plants, noxious weeds, and carbon stocks. Specific methods used to analyze each of those attributes are further described in the following effects analyses.

#### ***DIRECT AND INDIRECT EFFECTS***

Direct and indirect effects analyses for both the entire Swan River State Forest and project-level

analysis area are presented throughout the FEIS. Much of the analysis uses data from DNRC's SLI. The SLI quantifies stand characteristics for all forest stands in the Swan River State Forest and is incorporated into DNRC's Geographic Information System (GIS). The SLI is updated annually to account for harvesting activities and periodically through re-inventory. This process provides DNRC foresters with current data for use in analyses of proposed management activities.

### ***CUMULATIVE EFFECTS***

Since ongoing and future timber sales have not undergone postharvest inventory, effects of these sales are estimated in order to address cumulative effects under each analysis section. The timber sales listed in *RELEVANT PAST, PRESENT, AND REASONABLY FORESEEABLE ACTIONS* under *SCOPE OF THIS EIS* in *CHAPTER I* were considered along with the SLI database.

Activities on adjacent lands, such as USFS, DFWP, and private land will also be addressed to the extent possible.

## **FOREST ECOLOGY AND PAST MANAGEMENT**

### ***PAST MANAGEMENT***

The first known harvest in the Swan River State Forest took place in the early 1900s. All residual signs of the activities indicate that the harvest was very minimal in scope and acreage. Timber harvesting on a larger scale began in and adjacent to the project area during the 1960s. Most of the harvesting in the 1960s were regeneration harvests. Seed tree and clearcut harvesting between 1970 and 1992 have created 10 to 380 acre openings with dense regeneration. Signs of individual tree-selection harvests, skid trails, and stumps from logging that took place in the era from the 1960s to the 1980s are scattered throughout many of the stands. Several salvage projects have taken place in the project area since the 1990s, with several permits having been completed in the areas immediately within and adjacent to the project area. The Scout Lake Multiple Timber Sale project during 2012 through 2017 was the latest large timber sale project in the project area. Most harvested stands have been site prepped and planted successfully with good seedling survival and additional natural regeneration. USFS and other privately held lands adjacent to the project area have also had timber harvesting within the cumulative effects analysis area (CEAA).

### ***STAND DEVELOPMENT***

Natural processes of stand development and disturbance are influenced by environmental conditions and site characteristics, including landform, soil type, aspect, elevation, growing season (climate), and moisture availability. The interaction of these factors determines, in part, the plant species assemblage, productivity, and the disturbance regimes affecting a site.

Most stands typically follow a repeated pattern of development, known as succession, where stand structure and species composition change through time. For example, the development of even-aged stands can be described in 4 stages (*Oliver and Larson, 1996*), beginning with a

disturbance that initiates the development of a new stand of trees that colonize the site for several years (stand initiation). Following stand initiation, the new stand will enter a stem-exclusion stage where existing individual trees and species begin to express dominance over other trees and species in terms of height and diameter growth and new trees do not readily establish in the stand. Eventually, understory plants and shrubs will appear underneath the main forest canopy, including tree species tolerant of growing in shaded conditions (understory reinitiation). Following understory reinitiation, the forest eventually reaches a steady-state phase where some overstory trees die and create canopy gaps, allowing trees growing in the understory to advance into the main forest canopy. At any point in stand development, a disturbance, such as wildfire, insects and diseases, windthrow, or human-caused activities, such as timber harvesting, may modify the existing stand's structure and species composition, interrupting the progression of stand development and returning the stand to a previous stage. Disturbance generally creates conditions favorable to shade-intolerant species, such as western larch, and the absence of disturbance generally promotes shade-tolerant species such as grand fir, western red cedar, and western hemlock. As such, shade-intolerant species typically dominate the early stages of stand development; therefore, in the absence of disturbance, shade-tolerant species typically dominate the later stages of stand development.

Many of the stands proposed for harvesting in the project area follow this model of stand development and are in the understory reinitiation and steady-state phases. Proposed treatments would attempt to emulate naturally occurring disturbance patterns and, in most cases, would retain stands in or return stands to earlier stages of succession dominated by shade-intolerant species.

### **FOREST HABITAT TYPES**

Similar sites will often share similar plant communities, succession, and disturbance patterns. Repeated patterns of similar site conditions and plant species assemblages have been used to develop classifications of forest habitat types (*Pfister et al. 1977*) that describe the potential vegetation communities, patterns of succession (stand development), and potential productivity of similar sites. Forest habitat types do not necessarily describe the current vegetation on a site because they describe the potential vegetation community that could develop and perpetuate itself on a site in the absence of disturbance. For that reason, the habitat type identified for a given site will not change following disturbance, including timber harvesting.

While minor differences in plant communities and site productivity exist among similar forest habitat types, many share similar naturally occurring disturbance patterns, such as the way fire behaves and affects those habitat types, and, as such, can be arranged into broad groups (*Fischer and Bradley 1987*). Swan River State Forest is dominated by warm and moist (approximately 63 percent) and cool and moist (approximately 21 percent), with significantly lesser amounts of the other groups. *TABLE III-1* shows the distribution of habitat type groups across Swan River State Forest and within the project area.

**TABLE III - 1 - ACRES BY HABITAT-TYPE GROUP**

<b>HABITAT TYPE GROUP</b>	<b>SWAN RIVER STATE FOREST</b>		<b>PROJECT AREA</b>	
	<b>ACRES</b>	<b>PERCENT OF TOTAL</b>	<b>ACRES</b>	<b>PERCENT OF TOTAL</b>
Cold	90.4	0.2	0.0	0.0
Moderately warm and dry	3,012.5	5.6	2,296.5	10.5
Moderately cool and dry	433.3	0.8	329.1	1.5
Warm and moist	34,353.5	63.3	13,679.0	62.6
Cool and moist	11,629.0	21.4	3317.4	15.2
Wet	1,190.7	2.2	900.7	4.1
Moderately cool and moist	676.1	1.2	407.0	1.9
Cool and moderately dry	2,103.6	3.9	863.7	4.0
Cold and moderately dry	759.7	1.4	59.1	0.3
No Habitat Type	21.7	0.0	0.0	0.0
<i>Totals</i>	<b>54,270.6</b>	<b>100</b>	<b>21,852.5</b>	<b>100</b>
Non-forested	2,036	N/A	3,583.5	N/A

**ELEVATION AND ASPECT**

Elevation and aspect interact to influence the moisture and temperature of a stand, and, therefore, the plant species capable of growing there. The project area ranges in elevation from 3,320 to 7,200 feet. The project area has a mix of steep and broken topography, as well as flat or gently rolling terrain; consequently, a wide range of sites of both moisture and temperature gradients (from wet to dry and cool to warm) are found in the project area. Cooler, wetter stands typically develop overstories of western white pine, western larch, Douglas-fir, grand fir, western red cedar, Engelmann spruce, lodgepole pine, and subalpine fir, while warmer and dryer sites are likely to have components of ponderosa pine, Douglas-fir, western larch, and lodgepole pine.

**FOREST COVER TYPES AND DESIRED FUTURE CONDITIONS**

*Issue:* The proposed activities may affect forest cover types through tree species removal and subsequent changes in species composition of treated stands.

**EXISTING ENVIRONMENT**

Cover types describe the species composition of forest stands. Cover type representation often varies according to the frequency of disturbances. Some early seral species dominated types, such as ponderosa pine, reflect a frequent low-intensity disturbance that helps perpetuate the shade-intolerant ponderosa pine. Other cover types, such as mixed conifer, are indicative of infrequent and more severe disturbance regimes, and are typically found in the later stages of

stand development.

The protocol used to assign cover types on DNRC managed forest lands, including Swan River State Forest, is explained in detail in *Forest Management Rules (36.11.401 through 406 ARM)*. The methods used to analyze current and desired stand conditions are described below.

This cover type analysis compares current stand conditions and desired future conditions in terms of forest-species composition. Tracking expected changes in the amount of preharvest and postharvest acreage in specific cover types helps to describe project effects to forest vegetation and track movement toward or away from desired future conditions. Where appropriate, the climatically and physiographically defined “*Upper Flathead Section*” (M333C) of the larger, vegetation-defined “*Northern Rocky Mountain Forest-Steppe-Coniferous Forest–Alpine Meadow Province*” (Province M333) (Bailey et al. 1994) was utilized as a reference for the historical conditions in Swan River State Forest and the project area. Historic conditions of age classes and cover types were quantified by Losensky (1997), who used forest inventory data from the 1930s to estimate the historic proportion of age classes by forest cover type for Montana. This provided an estimate of age class distribution and stand composition prior to Euro/American settlement and the effects of fire suppression, selective logging, cattle and sheep grazing, and the full impact of white pine blister rust.

Current conditions and desired future conditions are defined using DNRC’s site-specific model (ARM 36.11.405) and recorded in DNRC’s SLI (FMB\_TimberInventory). The DNRC site-specific model assigns a desired future condition in terms of cover type for each stand identified in the SLI and was used to evaluate potential direct, indirect, and cumulative effects. At the administrative unit level, the aggregate acreage of each desired future cover type describes a broad picture of the desired future conditions for that unit. This provides a basis for comparison of current and desired future conditions at both the project and landscape (administrative unit) levels. Field observations and tree data collected between the spring of 2021 through the fall of 2022 were used to verify and further refine descriptions of specific forest stand characteristics in the project area.

TABLE III-2 indicates that mixed-conifer stands are substantially over-represented compared to the desired future conditions. Douglas-fir, lodgepole pine, and subalpine cover types are also over-represented compared to desired future conditions.

Compared to desired future conditions, the western larch/Douglas-fir and western white pine cover types are underrepresented on Swan River State Forest and in the project area. Western larch and Douglas-fir are preferred timber species that were often removed by partial or selective harvest methods that failed to provide suitable conditions for regenerating those species. Additionally, a lack of natural disturbances, particularly in the dense old stands common throughout the project area, has prevented regeneration of western larch across much of Swan River State Forest, resulting in a shift in dominance through forest succession from shade-intolerant species like western larch and Douglas-fir toward shade-tolerant species like grand fir and western red cedar.

Data for Swan River State Forest indicates that the extent of the western white pine cover type is considerably lower than that which occurred historically. White pine blister rust has reduced



the representation of western white pine to less than 10 percent of its historical range (*Fins et al. 2001*). The number of healthy western white pine that occupy the canopy as overstory dominants has been on the decline across its range for several decades despite multi-organization cooperative efforts to restore this species on the landscape.

**TABLE III - 2 - CURRENT COVER TYPE AND DESIRED FUTURE CONDITIONS FOR SWAN RIVER STATE FOREST AND THE SQUEEZER MEADOW PROJECT AREA**

COVER TYPE	SWAN RIVER STATE FOREST				
	CURRENT (ACRES)	PERCENT OF TOTAL	DESIRED FUTURE CONDITION (ACRES)	PERCENT OF TOTAL	DIFFERENCE (PERCENT)
Ponderosa pine	2,369.9	4.4	3,807.6	7.0	-2.6
Douglas-fir	3,504.4	6.5	1,109.8	2.0	4.5
Western larch/ Douglas-fir	10,143.0	18.7	20,799.9	38.3	-19.6
Western white pine	3,790.8	7.0	13,452.6	24.8	-17.8
Lodgepole pine	2,222.2	4.1	1,832.0	3.4	0.7
Mixed conifer	25,585.1	47.1	8,906.4	16.4	30.7
Subalpine fir	5,613.3	10.3	4,228.7	7.8	2.5
Nonstocked	847.1	1.6	0	0	1.6
Hardwoods	194.7	0.4	133.7	0.2	0.2
<b>Totals</b>	<b>54,271</b>		<b>54,271</b>		N/A
Non-forested	2,036.4	N/A	2,036.4	N/A	N/A

SQUEEZER MEADOW PROJECT AREA					
COVER TYPE	CURRENT (ACRES)	PERCENT OF TOTAL	DESIRED FUTURE CONDITION (ACRES)	PERCENT OF TOTAL	DIFFERENCE (PERCENT)
Ponderosa pine	1,968.0	9.0	3,214.9	14.7	-5.7
Douglas-fir	1,781.6	8.2	725.4	3.3	4.9
Western larch/ Douglas-fir	4,190.6	19.2	8,885.9	40.7	-21.5
Western white pine	1,044.0	4.8	4,434.7	20.3	-15.5
Lodgepole pine	744.6	3.4	312.4	1.4	2
Mixed conifer	10,754.5	49.2	3,404.5	15.6	33.6
Subalpine fir	1,218.3	5.6	820.0	3.8	1.8
Non-stocked	57.7	0.3	0	0	0.3

Hardwoods	93.1	0.4	54.3	0.2	0.2
<i>Totals</i>	<i>21,852.2</i>	<i>100.0</i>	<i>21,852.2</i>	<i>100.00</i>	<i>N/A</i>

## **ENVIRONMENTAL EFFECTS**

### **Direct and Indirect Effects**

- ***Direct and Indirect Effects of No-Action Alternative A to Cover Types***

The amount of western larch/Douglas-fir and western white pine cover types would remain lower than DNRC's identified desired future conditions amounts. Shade-tolerant species would continue to regenerate under closed-canopied forests. Over time, early seral-dominated cover types, such as western larch/Douglas-fir and western white pine, would be expected to decrease, and shade-tolerant cover types, such as mixed conifer, would increase.

Forest succession, driven by the impacts of forest insects and diseases when fires are being suppressed, would reduce the variability of cover types. As the forest ages and composition become more homogenous, biodiversity would be reduced.

- ***Direct and Indirect Effects of Action Alternative B to Cover Types***

- This alternative proposes using the following silvicultural treatments:
  - Commercial thin on 1,110 acres,
  - Old-growth maintenance on 417 acres,
  - Sanitation on 22 acres,
  - Individual tree selection on 767 acres,
  - Overstory removal on 228 acres,
  - Seed tree on 967 acres, and
  - Shelterwood on 1,725 acres
- Approximately 1,124 acres of the mixed-conifer cover type would be converted to the following cover types:
  - 152 acres of ponderosa pine and
  - 681 acres of western larch/Douglas-fir and
  - 291 acres of western white pine.
- Approximately 292 acres of Douglas-fir cover type would be converted to the following cover types:
  - 114 acres of western larch/Douglas-fir, and
  - 24 acres of lodgepole pine and
  - 80 acres of mixed-conifer and
  - 74 acres of ponderosa pine.
- Approximately 346 acres of the western larch/Douglas-fir cover type would be converted to the following cover types:
  - 202 acres of ponderosa pine, and

- 11 acres of sub-alpine fir and
  - 17 acres of lodgepole pine and
  - 38 acres of Douglas-fir and
  - 78 acres of western white pine.
- Approximately 58 acres of the subalpine cover type would be converted to the following cover types:
    - 5 acres of lodgepole pine,
    - 53 acres of western larch/Douglas-fir.
  - Approximately 0.5 acres of the western white pine cover type would be converted to western larch/Douglas-fir cover type.
  - Approximately 267 acres of the lodgepole pine cover type would be converted to the following cover types.
    - 231 acre of western larch/Douglas-fir and
    - 23 acres of western white pine and
    - 6 acres of ponderosa pine and
    - 7 acres of subalpine fir
  - Approximately 152 acres of ponderosa pine cover type would be converted to the following cover types.
    - 51 acres of western larch/Douglas-fir and
    - 100 acres of western white pine
  - Other minor amounts (less than 5 acres) of cover type conversions would also occur.
  - No change in cover type would be expected following harvesting on approximately:
    - 695 acres of western larch/Douglas-fir,
    - 1,180 acres of mixed conifer,
    - 27 acres of subalpine fir,
    - 274 acres of western white pine,
    - 635 acres of ponderosa pine,
    - 142 acres of lodgepole pine, and
    - 42 acres of Douglas-fir.
- ***Direct and Indirect Effects of Action Alternative C to Cover Types***
    - This alternative proposes using the following silvicultural treatments:
      - Commercial thin on 972 acres,
      - Old-growth maintenance on 498 acres,
      - Sanitation on 22 acres,
      - Individual tree selection on 1,247 acres,

- Overstory removal on 228 acres,
  - Seed tree on 967 acres, and
  - Shelterwood on 927 acres
- Approximately 704 acres of the mixed-conifer cover type would be converted to the following cover types:
    - 110 acres of ponderosa pine,
    - 450 acres of western larch/Douglas-fir, and
    - 144 acres of western white pine.
  - Approximately 101 acres of the Douglas-fir cover type would be converted to the following cover types:
    - 24 acres of lodgepole pine, and
    - 74 acres of ponderosa pine, and
    - 3 acres of western larch/Douglas-fir.
  - Approximately 327 acres of the western larch/Douglas-fir cover type would be converted to the following cover types:
    - 183 acres of ponderosa pine and,
    - 76 acres of western white pine and,
    - 11 acres of subalpine fir and
    - 17 acres of lodgepole pine and
    - 38 acres of Douglas-fir.
  - Approximately 58 acres of the subalpine fir cover type would be converted to the following cover types:
    - 5 acres of lodgepole pine, and
    - 53 acres of western larch/ Douglas-fir.
  - Approximately 244 acres of lodgepole pine cover type would be converted to the following cover types:
    - 231 acres of western larch/Douglas-fir, and
    - 6 acres of lodgepole pine and
    - 7 acres of subalpine fir.
  - Approximately 106 acres of ponderosa pine would be converted to the following cover types:
    - 6 acres of western larch/Douglas-fir, and
    - 100 acres of western white pine.
  - Other minor amounts (less than 5 acres) of cover type conversions would also occur.

- No change in cover type would be expected following harvesting on approximately:
  - 780 acres of western larch/Douglas-fir,
  - 1,422 acres of mixed conifer,
  - 121 acres of lodgepole pine,
  - 628 acres of ponderosa pine,
  - 254 acres of western white pine, and
  - 88 acres of Douglas-fir,
  - 27 acres of subalpine fir.

**TABLE III - 3 - COVER TYPE CHANGE BY ACTION ALTERNATIVES FOR THE PROJECT AREA AND SWAN RIVER STATE FOREST**

COVER TYPE	ACTION ALTERNATIVES					
	CHANGE IN ACREAGE	B		CHANGE IN ACREAGE	C	
		CHANGE IN PERCENT PROJECT AREA	CHANGE IN PERCENT SWAN RIVER STATE FOREST		CHANGE IN PERCENT PROJECT AREA	CHANGE IN PERCENT SWAN RIVER STATE FOREST
Western larch/Douglas-fir	786	3.6	1.4	417	1.9	0.8
Western white pine	492	2.3	0.9	320	1.4	0.6
Mixed Conifer	-1,044	-4.8	-1.7	-703	-3.2	-1.3
Lodgepole pine	-220	-1	-0.4	-198	-0.9	-0.4
Subalpine fir	-40	-0.2	-0.07	-40	-0.2	-0.07
Ponderosa pine	281	1.3	0.5	267	1.2	0.5
Douglas-fir	-254	-1.2	-0.5	-62	-0.3	-0.1

\*Change in percent for the project area and The Swan River State Forest were calculated using the forested acres.

**Cumulative Effects**

- **Cumulative Effects of No-Action Alternative A to Cover Types**

The cumulative effects of recent forest management on Swan River State Forest resulted in a trend of increasing early seral cover types across areas where management occurred. For example, planting in some harvest units on Three Creeks, White Porcupine, Scout Lake, Cilly Cliff and Wood Lion timber sale projects increased the western larch/Douglas-fir and western white pine cover type on Swan River State Forest. In areas where management has not occurred, proportions of shade-tolerant species and late-seral cover types tend to be increasing.

Some timber sales in the Lost Napa Multiple Timber Sale Project have been sold and are in the process of being harvested. These treatments will continue the trend of increasing seral cover types and decreasing late-successional cover types across areas where management occurred. The post-treatment cover types of these stands have been incorporated into the current cover type amounts.

Based on aerial-photograph interpretation on a landscape basis, the cumulative effects to cover type distributions trend typically is late seral species in old stands and a mosaic of early to late seral species in younger or treated stands, the results being dependent on the residual timber, harvest prescription, and postharvest treatments. Development plans on small, private landholdings could result in a decrease in cover types as forested land is converted to non-forested land.

- ***Cumulative Effects of Action Alternatives B and C to Cover Types***

The cumulative effects of the Action Alternatives would be similar to those seen in No-Action Alternative A; however, in general, the result would be a greater increase in early seral cover types across areas where management occurs.

## **AGE CLASS**

*Issue:* The proposed activities may affect forest age classes through tree removal.

### **EXISTING ENVIRONMENT**

The distribution of age classes delineates another characteristic important for determining trends on a landscape level. Age class distributions are tied to cover type representation and disturbance regimes, both of which vary over the landscape in relation to prevailing climatic conditions of temperature and moisture.

The climatically and physiographically defined “*Upper Flathead Section*” (M333C) of the larger, vegetation-defined “*Northern Rocky Mountain Forest-Steppe-Coniferous Forest-Alpine Meadow Province*” (Province M333) (Bailey et al. 1994) was utilized as a reference for the historical forest conditions in Swan River State Forest and the project area. Historic conditions of age classes and cover types were quantified by Losensky (1997), who used forest inventory data from the 1930s to estimate the historic proportion of age classes by forest cover type for Montana. This provided an estimate of age class distribution and stand composition prior to Euro/American settlement and the effect of fire suppression, selective logging, cattle and sheep grazing, and the full impact of white pine blister rust. Although the data was collected at a specific point in time, this data represents the best baseline available for assessing differences between the current and past age class distributions.

A comparison of the current age class distribution for the Swan River State Forest with the historical age class distribution of the *Upper Flathead Climatic Section* (M333C), is shown in TABLE III-4. The current seedling-sapling (0 to 39 year) age class has a lower proportion of acres compared to historic conditions, while the current pole timber (40 to 99 year) age class is greater compared to historic conditions. The mature (100 years plus) age classes are slightly less (40% vs. 51%) when compared to historic amounts for the climatic section (TABLE III-4).

**TABLE III - 4 - HISTORIC, CURRENT, AND POSTHARVEST AGE CLASS DISTRIBUTIONS FOR SWAN RIVER STATE FOREST**

	M333C (HISTORIC PERCENT)	CURRENT		ALTERNATIVE B (POSTHARVEST)		ALTERNATIVE C (POSTHARVEST)	
		ACRES	PERCENT	ACRES	PERCENT	ACRES	PERCENT
0 to 39	22	10,499	19	11,654	21.5	11,654	21.5
40 to 99	13	21,629	40	20,992	38.7	20,992	38.7
100 to 149	22	10,509	19	10,224	18.8	10,224	18.8
150 plus <sup>1</sup>	29	4,994	9	5,196	9.6	5,057	9.3
Old growth <sup>2</sup>	N/A	6,639	12	6,204	11.4	6,343	11.7
Nonstocked	14	0	0	0	0	0	0
<b>Totals</b>	<b>100</b>	<b>54,271</b>	<b>100</b>	<b>54,271</b>	<b>100</b>	<b>54,271</b>	<b>100</b>
Non-forested	N/A	2,036	N/A	2,036	N/A	2,036	N/A

<sup>1</sup> Losensky's (1997) report for Climatic Section M333C does not include 100 to 149 years, 150-years-plus, and old-growth categories, but instead categorizes mature stands in 2 categories: 100 year old stands and "old stands". Ponderosa pine, Douglas-fir, and western larch/Douglas-fir stands greater than 170 years, western white pine and mixed-conifer stands greater than 180 years, and lodgepole pine stands greater than 140 years were classified as "old stands".

<sup>2</sup>Current old-growth stands would be considered a subset of primarily the historical 150 plus age class, with small portions in the historical 100 to 149 age class.

Comparing the current distribution of age classes in the project area to the historical data for Section M333C demonstrates a lower proportion in the seedling-sapling (0 to 39 year) age class, and higher proportions in the pole timber (40 to 99 year) and mature (100 years plus) age classes (TABLE III-5).

**TABLE III - 5 - HISTORIC, CURRENT, AND POSTHARVEST AGE CLASS DISTRIBUTIONS FOR THE PROJECT AREA**

AGE CLASS	M333C (HISTORIC PERCENT)	CURRENT		ALTERNATIVE B (POSTHARVEST)		ALTERNATIVE C (POSTHARVEST)	
		ACRES	PERCENT	ACRES	PERCENT	ACRES	PERCENT
0 to 39	22	2,776	12.7	3,931	18.0	3,931	18.0
40 to 99	13	8,539	39.1	7,902	36.2	7,902	36.2
100 to 149	22	5,832	26.7	5,547	25.4	5,547	25.4
150 plus <sup>1</sup>	29	1,962	9.0	2,164	9.9	2,025	9.3
Old growth <sup>2</sup>	N/A	2,743	12.6	2,308	10.6	2,447	11.2
Nonstocked	14	0	0	0	0	0	0
<b>Totals</b>	<b>100</b>	<b>21,852</b>	<b>100</b>	<b>21,852</b>	<b>100</b>	<b>21,852</b>	<b>100</b>
Nonforested	N/A	862	N/A	862	N/A	862	N/A

<sup>1</sup> Losensky's (1997) report for Climatic Section M333C does not include 100 to 149 years, 150-years-plus, and old-growth categories, but instead categorizes mature stands in 2 categories: 100 year old stands and "old stands". Ponderosa pine, Douglas-fir, and western larch/Douglas-fir stands greater than 170 years, western white pine and mixed-conifer stands greater than 180 years, and lodgepole pine stands greater than 140 years were classified as "old stands".

<sup>2</sup>Current old-growth stands would be considered a subset of primarily the historical 150 plus age class, with small portions in the historical 100 to 149 age class.

## **ENVIRONMENTAL EFFECTS**

### **Direct and Indirect Effects**

- ***Direct and Indirect Effects of No-Action Alternative A to Age Classes***

No immediate change in the proportion of existing age classes is expected unless a large disturbance, such as a wildfire, occurs. Forest succession, driven by the impacts of forest insects and diseases when fires are being suppressed, would reduce the variability of age classes. As the forest ages and its composition becomes more homogenous, biodiversity would be reduced.

- ***Direct and Indirect Effects of Action Alternative B to Age Classes***

Age class would be expected to change on 1,429 acres treated with seed tree, shelterwood, and overstory removal treatments proposed under this alternative. The proposed seed tree and overstory removal treatments would convert approximately 1,155 acres to the 0 to 39 year age class. Of this, 135 acres would be converted from the old-growth age class, 98 acres from the 150 year plus age class, 285 acres from the 100 to 149 year age class, and 637 acres from the 40 to 99 year age class. These treatments and subsequent planting or natural regeneration would increase the proportion of the 0 to 39 year age class on Swan River State Forest by 2.2 percent, and in the project area by 5.4 percent. Other harvest treatments including shelterwood, individual tree selection, and commercial thinning treatments proposed in 300 acres of old growth would convert those acres to the 150+ age class. In total, older age classes (old growth and 150 year plus) would decrease by 233 acres, or 0.4 percent on Swan River State Forest and 1.1 percent in the project area (TABLE III-4 and TABLE III-5).

Age class would not be expected to change on 3,781 acres treated under this alternative. Approximately 325 acres would remain in the old-growth age class, 266 acres would remain in the 150 year plus age class, 645 acres would remain in the 100 to 149 year age class, 2,102 acres would remain in the 40 to 99 year age class, and 443 acres would remain in the 0 to 39 year age class following harvest treatments.

- ***Direct and Indirect Effects of Action Alternative C to Age Classes***

Age class would be expected to change on 1,307 acres treated with seed tree, shelterwood, and overstory removal treatments proposed under this alternative. The proposed seed tree and over story removal treatments would convert approximately 1,155 acres to the 0 to 39 year age class. Of this, 135 acres would be converted from the old-growth age class, 98 acres from the 150 year plus age class, 285 acres from the 100 to 149 year age class, and 637 acres from the 40 to 99 year age class. These treatments and subsequent planting or natural regeneration would increase the proportion of the 0 to 39 year age class on Swan River State Forest by 2.2 percent and in the project area by 5.4 percent. Individual tree selection treatment proposed in 9 acres of old growth would convert those acres to the 150+ age class. In total, older age classes (old growth and 150 year plus) would decrease by 233 acres, or 0.4 percent on Swan River State Forest and 11 percent in the project area (TABLE III-4 and TABLE III-5).

Age class would not be expected to change on 3,542 acres treated under this alternative.



Approximately 421 acres would remain in the old-growth age class, 275 acres would remain in the 150 year plus age class, 500 acres would remain in the 100 to 149 year age class, 1,923 acres would remain in the 40 to 99 year age class, and 425 acres would remain in the 0 to 39 year age class following harvest treatments.

### **Cumulative Effects**

- ***Cumulative Effects of No-Action Alternative A to Age Classes***

The cumulative effects to age class distributions due to previous forest management activities on Swan River State Forest are represented in descriptions of the current age class distribution. Generally, those effects have reduced the proportion of older age classes while increasing the proportion in younger age classes, particularly the 0 to 39-year age class. For example, the Three Creeks, White Porcupine, Scout Lake, Cilly Cliff and Wood Lion timber sale projects increased the 0 to 39-year age class on Swan River State Forest through timber harvesting and planting in selected units.

Some timber sales in the Lost Napa Multiple Timber Sale Project have been sold and are in the process of being harvested. The post treatment age classes of these stands have been incorporated into the current age class amounts. These treatments will continue the trend of increasing the 0 to 39-year age class and decreasing older age classes across areas where management occurs.

Based on aerial-photograph interpretation on a landscape basis, the cumulative effects to age class distributions due to previous activities on USFS, DFWP, as well as privately held ground adjacent to Swan River State Forest, have been a reduction in the acres of the older age classes and an increase in the acres of the younger age classes. Although the condition appears to be mostly 0 to 39-year-old and 40 to 99 year old age classes, a mix of older age classes is also apparent, mostly on the USFS lands and also on private lands in the floodplain of the Swan River.

- ***Cumulative Effects of Action Alternatives B and C to Age Classes***

The cumulative effects of the Action Alternatives would be similar to those seen under No-Action Alternative A; however, the result would be a greater increase in the 0 to 39 year-old age class across areas where even-aged management would occur.

### **OLD GROWTH**

*Issue:* The proposed activities may affect old-growth amounts and quality through tree removal.

#### ***OLD GROWTH DEFINITION***

DNRC defines old growth as stands that meet minimum criteria for number, size, and age of trees per acre for a given combination of cover type and forest habitat-type group. The definitions are adopted from those presented by *Green et al. (1992)*. DNRC's definition has

evolved over the years; previous analysis may appear to contradict the analysis presented in this FEIS because of that evolution.

### **HISTORIC ESTIMATES OF OLD GROWTH**

Many previous efforts have been made to estimate the historical amounts of old growth in the Swan Valley. The following approaches have been used:

- DNRC estimated the quantity of old growth that may have existed historically (*DNRC 2000b*). Results suggested that, given the definition used in the analysis, approximately 22 percent of Swan River State Forest represents the expected amount of naturally occurring old growth.
- *FNF Plan Amendment 21 (1998)* estimated that 29 percent of low-elevation forests on the *Flathead National Forest* was old growth, 8 percent of mid-elevation forest was old growth, and none of the high-elevation forest was old growth, as derived from historic surveys (*Ayers 1898, 1899*). Using various sources of information, the *FNF Amendment 21* also estimated that old growth in *Flathead National Forest* had a historical range of variability from 15 to 60 percent. Using a computer modeling process, *Flathead National Forest* estimated that approximately 36 percent of Swan Valley existed as late-seral forest; however, not all late-seral stands would qualify as old growth.
- *Lesica (1996)*, in an effort to use fire history to estimate the proportions of old-growth forests in Swan Valley, estimated that approximately 52 percent of the area was occupied by stands that were 180 years or older. *Lesica (1996)* used stand age as a surrogate for old growth in his mathematically derived estimations.
- Using cover type conditions and historical data from the 1930s (*Losensky 1997*), 29 percent of the forested acres in the *Upper Flathead Climatic Section* were estimated to have historically been occupied by stands 150 years and older and contained a minimum of 4 MBF/acre (*DNRC 1998b*).
- *Hart (1989)* indicated that approximately 48 percent of the area represented in the 1930s stand data for the Seeley and Swan valleys had forests with a significant component of trees older than 200 years.

Therefore, using a wide variety of old-growth definitions, the estimates of the historic amount of old growth on Swan River State Forest suggest a range from 15 to 60 percent. The estimates above are primarily age-based estimates that do not consider the other attributes, such as number of snags or coarse woody debris, often deemed necessary to call a stand old growth. The lack of additional old-growth attributes in many of the old growth definitions results in overestimated amounts of old growth compared to other old growth definitions that include additional attribute thresholds. For example, only DNRC's estimate has any criteria related to the size and number of large trees per acre, leading one to the conclusion that old growth would necessarily be lower than the other estimates provided because not all old stands, late-seral stands, or modeled stands would have sufficient numbers of large live trees to meet DNRC's old-growth definition.

Estimates presented define old growth in a variety of ways and none of them represent estimates based on the *Green et al. (1992)* definition that DNRC currently uses; most provide estimates that are higher than they would be if they included additional attribute criteria.

Based on available estimates, the amount of old growth on Swan River State Forest is currently on the low end of the historically occurring range.

### **RELATIONSHIP TO THE SUSTAINABLE YIELD CALCULATION**

State law directs the DNRC to sell a consistent amount of timber each year, as determined by a sustainable yield calculation. As defined in 77-5-221 MCA and pursuant to 77-5-222 and 223 MCA, DNRC, under the direction of the State Board of Land Commissioners (Land Board), is required to commission an independent third party to calculate the annual sustainable yield for forested trust lands at least once every 10 years. Sustainable yield is defined as “the quantity of timber that can be harvested from forested state trust lands each year in accordance with all applicable state and federal laws, including but not limited to the laws pertaining to wildlife, recreation, and maintenance of watersheds, and in compliance with water quality standards that protect fisheries and aquatic life and that are adopted under the provisions of Title 75, chapter 5, taking into account the ability of state forests to generate replacement tree growth.” The most recent sustainable yield calculation was completed by the natural resources consulting firm Mason, Bruce, and Girard and approved by the Land Board in July 2020.

On forested Trust Lands, DNRC’s management activities are guided by the standards and philosophy of the SFLMP, associated Administrative Rules (ARM), and DNRC’s Forested State Trust Lands Habitat Conservation Plan (HCP). In the context of calculating annual sustainable yield, the requirements set forth by SFLMP, ARM, and HCP were applied as management constraints in an optimization model used to calculate the annual sustainable yield. Constraints are limitations placed on the model that restrict when, where, which, and how often harvesting treatments may be applied. The 2020 calculation included constraints related to operability, wildlife habitat, water resources, and timber harvest and silviculture—including old growth.

The old growth constraint modeled in the 2020 calculation required that each administrative unit within the Northwestern and Southwestern Land Offices maintain at least 8% of their acres as old growth (4% for units in the Central Land Office). The model was constrained in a manner that required units below the target old growth percentage to be managed in a manner to meet the target percentage as soon as possible, and that units above the target percentage would remain above that target percentage over time. Units that currently have less than 8% old growth were required to manage an amount of non-old growth acres needed to reach 8% using management pathways that would facilitate their development into old growth stands. The constraint prohibited the selection of existing old growth stands for regeneration harvesting that would remove them from old growth status until the administrative unit had at least 8% old growth. In all units, regardless of whether they were above or below the 8% threshold, old growth maintenance and restoration treatments that would maintain a stand’s old growth status could be used in existing old growth stands. This method of constraining the model ensured that the intended old growth amount for each unit was met as quickly as possible and then maintained over time.

At the current annual sustainable harvest level of 60.0 MMBF, the model indicates that meeting and maintaining these objectives for old growth on state trust lands is achievable.

## **ANALYSIS METHODS**

### **Old Growth Definition**

The analysis of old-growth distribution relies on DNRC's SLI and ocular observations in the field. The SLI was queried to select stands meeting the age, dbh, and large-tree criteria for old growth based on habitat-type groups (see *GLOSSARY* for DNRC's old growth definition). Field surveys were employed to verify the old-growth status of selected stands and determine if additional stands meet the old-growth definition in the project area.

### **Old Growth Attributes**

Using the SLI, attribute levels in the old growth stands are described and analyzed for preharvest and postharvest conditions. The diversity of old growth definitions and the relative importance of old growth as a specific stand condition led DNRC to develop a tool to analyze and understand old growth. This tool, known as the Full Old Growth Index (*FOGI*), assigns a point value to old growth associated stand attributes contained in DNRC's SLI and then combines them to determine a total index value that describes the overall level of attribute development relative to other stands. Index attributes and point assignments are shown in *TABLE III-6*.

The old growth attributes making up *FOGI* are:

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

Old growth quality depends on the type of old growth, associated wildlife species being considered, where old growth exists on the landscape, and other factors that do not lend themselves to consistent or meaningful quantification. For the purposes of this analysis, we are using attribute levels (*FOGI*) as an indicator of quality but are also cognizant that quality is too nebulous a concept for a quantitative analysis. Using the *FOGI* provides a method to consistently describe the attributes of old growth stands relative to other old growth stands on state managed lands. *FOGI* could be construed as providing an indication of old growth quality, but is more appropriately considered an indication of overall attribute levels. So, while the highest attribute levels may be high quality for some wildlife species and old growth types (for example, mixed-conifer old growth, which tends to exist in a dense and structurally diverse condition), other species and types are highest quality at relatively lower attribute levels (in particular, the ponderosa pine type, which tends to exist in a more open condition that is less structurally diverse). Therefore, the analysis focuses on quantitative or qualitative assessment of attribute levels rather than relying on the value-laden concept of quality.

**TABLE III - 6 - OLD GROWTH INDEX ATTRIBUTES AND POINT ASSIGNMENTS**

<b>ATTRIBUTES<sup>1</sup></b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
Number of large trees	None		Few		Some		Lots	
Coarse woody debris	None	Few	Some	Lots				
Number of snags	None	Few	Some	Lots				
Decadence	None	Little	Some	Lots				
Structure	Single-storied	Two-storied	Multistoried					
Gross MBF	Less than 4	4 to 6	7 to 9	10 to 12	13 to 15	16 to 20	21 to 25	26+
Crown cover index (percent)	Poor (0 to 39)		Medium (40 to 69)		Well (70-plus)			

<sup>1</sup> The blank spaces are not applicable; see OLD GROWTH ATTRIBUTE ASSIGNMENTS at the end of this VEGETATION ANALYSIS for attribute assignments.

**EXISTING ENVIRONMENT AND ENVIRONMENTAL EFFECTS**

**Old Growth Distribution**

Swan River State Forest currently has 6,639 acres of old growth, which is equal to 12.23 percent of the total forested acreage (TABLE III-7). The project area contains 2,743 acres of old growth, which is equal to 12.55 percent of the forested project area acreage (TABLE III-8). Old growth acreages may change over time as field surveys are completed and the SLI database is updated.

The old growth definitions used by DNRC are expressed in terms of cover type. Mixed conifer, western larch/Douglas-fir, subalpine fir, and western white pine (TABLE III-7) are currently the four dominant old growth types on Swan River State Forest.

**TABLE III - 7 - CURRENT OLD GROWTH ACRES AND POSTHARVEST ACTION ALTERNATIVE EFFECTS BY FOREST COVER TYPE FOR SWAN RIVER STATE FOREST**

<b>OLD GROWTH TYPE</b>	<b>OLD GROWTH ACRES</b>	<b>POSTHARVEST</b>	
		<b>ACTION ALTERNATIVE</b>	
		<b>B</b>	<b>C</b>
Douglas-fir	55	17	17
Western larch/ Douglas-fir	859	831	845
Western white pine	387	251	254
Mixed conifer	4,774	4,546	4,668
Subalpine fir	455	450	450

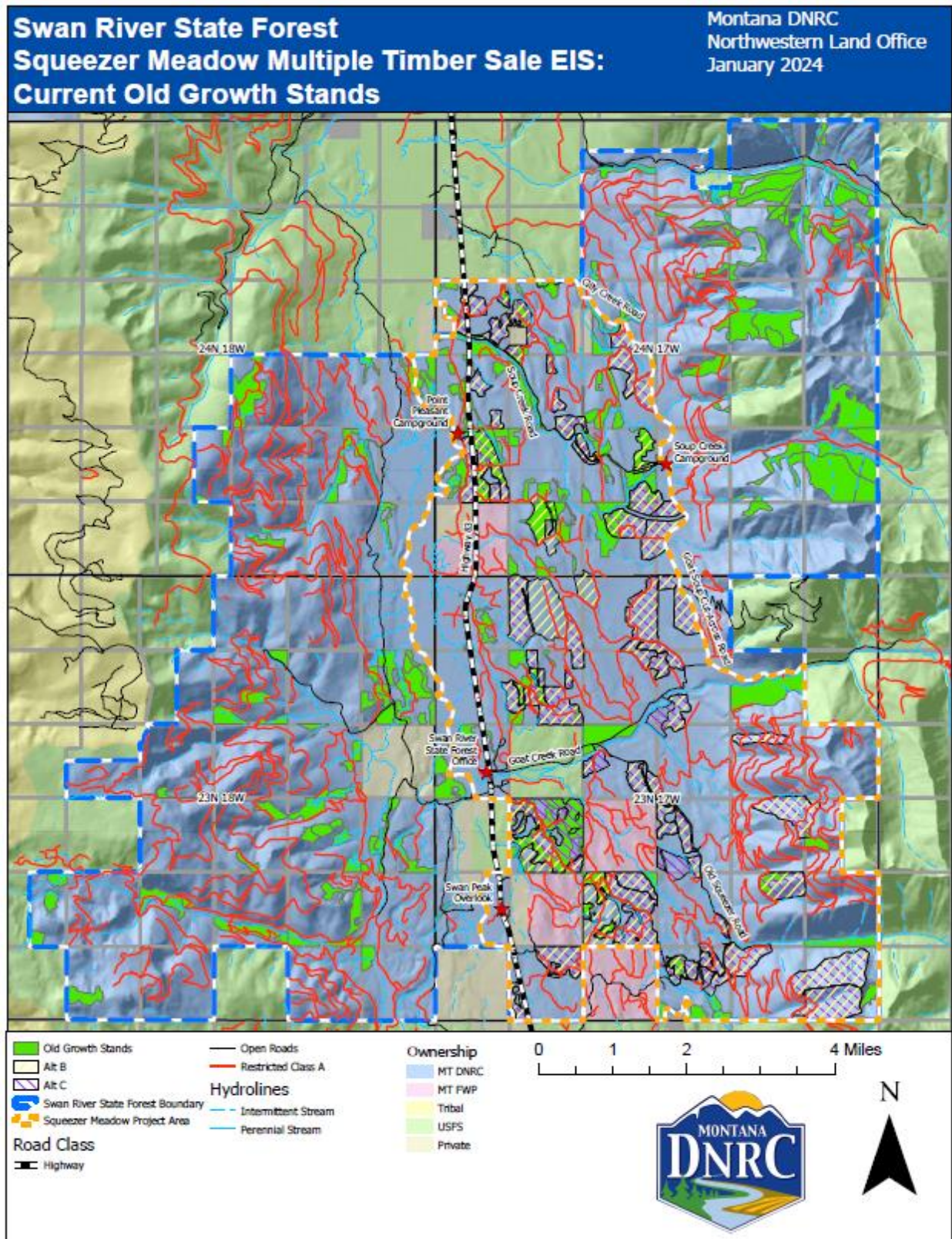
Lodgepole pine	0	0	0
Ponderosa pine	109	109	109
<i>Totals</i>	<i>6,639</i>	<i>6,204</i>	<i>6,343</i>

**TABLE III - 8 - CURRENT OLD GROWTH ACRES AND POSTHARVEST ACTION ALTERNATIVE EFFECTS BY FOREST COVER TYPE FOR THE PROJECT AREA**

OLD GROWTH TYPE	OLD GROWTH ACRES	POSTHARVEST	
		ACTION ALTERNATIVE	
		B	C
Douglas-fir	38	0	0
Western larch/ Douglas-fir	374	346	360
Western white pine	245	108	112
Mixed conifer	1,918	1,691	1,812
Subalpine fir	59	54	54
Lodgepole pine	0	0	0
Ponderosa pine	109	109	109
<i>Totals</i>	<i>2,743</i>	<i>2,308</i>	<i>2,447</i>

The current analysis also looks at the old growth spatial distribution to analyze the effects of a proposed action. *FIGURE III-1* is a map of old growth stands in the project area.

**FIGURE III - 1 - CURRENT OLD GROWTH STANDS ON SWAN RIVER STATE FOREST**



## Direct and Indirect Effects to Old Growth Distribution

- ***Direct and Indirect Effects of No-Action Alternative A to Old Growth Distribution***

Initially, the amount of old growth in the project area and on Swan River State Forest would not change. However, mortality and increasing decadence of existing old growth stands would over time cause some stands to no longer meet the requirements of the old-growth definition, reducing the amount of old growth acreage. Some stands not currently classified as old growth would, over time, attain sufficient numbers of large live trees that meet the diameter and age requirements to be classified as old growth. The cover types of old growth stands would be expected, over time, to shift toward increasing amounts of cover types dominated by shade-tolerant species, such as mixed conifer, with decreases in cover types dominated by shade-intolerant species (western larch/Douglas-fir, western white pine, and ponderosa pine). Old growth stands dominated by shade-tolerant species would be likely to have high attribute levels (high numbers of snags and amount of coarse woody debris, multistoried canopy structure, dense crown cover, and increased decadence), but less longevity on the landscape than old growth stands dominated by shade-intolerant species.

- ***Direct and Indirect Effects of Action Alternative B and C to Old Growth Distribution***

The main objectives for entering the majority of the old growth stands are to treat current high to medium risk stands or prevent a future high-risk status through removal of insect-infested and disease-infested trees, maintenance of historical cover types, and removal or reduction of shade-tolerant species. The old growth maintenance units may be classified as old growth following harvesting; postharvest data collection in particular stands would determine their classification. *TABLE III-9* shows old growth acres treated by harvest prescription and their postharvest old growth status for each alternative. *TABLE III-10* clearly outlines the preharvest and postharvest attributes of each unit proposed for treatment.

Action Alternative B would harvest approximately 760 acres of old growth. Following harvesting operations, 435 acres would no longer meet old growth criteria, which would reduce the amount of old growth acres in the project area by 1.9 percent. Following harvesting, 325 acres would remain classified as old growth. The amount of old growth remaining on Swan River State Forest would be 6,204 acres, and the proportion of acreage classified as old growth would be 11.4 percent (*TABLE III-7*).

Action Alternative C would harvest approximately 717 acres of old growth. Following harvesting operations, 296 acres would no longer meet old growth criteria, which would reduce the amount of old growth acres in the project area by 1.3 percent. Following harvesting, 421 acres would remain classified as old growth. The amount of old growth remaining on Swan River State Forest would be 6,343 acres and the proportion of acreage classified as old growth would be 11.7 percent (*TABLE III-7*).



**TABLE III - 9 - OLD GORWTH ACRES TREATED BY HARVEST PRESCRIPTION AND POSTHARVEST OLD GROWTH STATUS**

	<b>Old Growth Postharvest Acres</b>		
	<b>Old growth postharvest</b>	<b>Not old growth postharvest</b>	<b>Total old growth treated</b>
<b>Harvest Prescription</b>	<b>Alternative B</b>		
Commercial Thin	0	10	10
Old Growth Maintenance	325	0	325
Individual Tree Selection	0	15	15
Over Story Removal	0	0	0
Seed Tree	0	135	135
Shelterwood	0	274	274
Totals	325	435	760
<b>Harvest Prescription</b>	<b>Alternative C</b>		
Commercial Thin	5	0	5
Old Growth Maintenance	359	0	359
Individual Tree Selection	57	9	66
Over Story Removal	0	0	0
Seed Tree	0	135	135
Shelterwood	0	152	152
Totals	421	296	717

**TABLE III - 10 - OLD GROWTH FOGI ATTRIBUTE CLASSIFICATION CHANGES PREHARVEST AND POSTHARVEST BY ALTERNATIVE**

Effects by Action Alternative B									
Current Stand Number	Old Growth Type	Alternative B harvest Prescription	Stand Acres	Pre-Harvest Full Old Growth Index Number	Current FOGI Class	High Risk	Post-Harvest Old Growth Index Number	Post-Harvest FOGI Class	Old Growth Status Post Harvest
23_N17_W0800017	WL/DF	Individual Tree Selection	7	19	Med	Yes			
23_N17_W0800019	WL/DF	Shelterwood	14	9	Low				
23_N17_W0800020	MC	Old Growth Maintenance	10	22	High		13	Med	Yes
23_N17_W0800020	MC	Shelterwood	17	22	High				
23_N17_W0800027	MC	Old Growth Maintenance	6	22	High		13	Med	Yes
23_N17_W2000003	MC	Old Growth Maintenance	95	20	High		13	Med	Yes
23_N17_W2000003	MC	Shelterwood	18	20	High				
23_N17_W2000012	WL/DF	Old Growth Maintenance	19	20	High		12	Low	Yes
23_N17_W2000015	WL/DF	Old Growth Maintenance	10	19	Med		12	Low	Yes
23_N17_W2600013	DF	Shelterwood	38	17	Med				
23_N17_W2800020	WL/DF	Old Growth Maintenance	48	19	Med		12	Low	Yes
23_N17_W2800022	MC	Old Growth Maintenance	18	18	Med		12	Low	Yes
23_N17_W2800024	WL/DF	Old Growth Maintenance	13	13	Med	Yes	13	Med	Yes
23_N17_W3400027	WL/DF	Old Growth Maintenance	28	15	Med		12	Low	Yes
24_N17_W1700011	MC	Shelterwood	20	16	Med				
24_N17_W1700017	MC	Shelterwood	8	15	Med				
24_N17_W1800024	MC	Shelterwood	12	17	Med	Yes			
24_N17_W2000010	MC	Shelterwood	9	18	Med				
24_N17_W2800009	MC	Shelterwood	20	26	High				

24_N17_W2800011	MC	Shelterwood	56	22	High				
24_N17_W3000011	WWP	Seed Tree	133	24	High				
24_N17_W3200015	MC	Old Growth Maintenance	78	23	High		13	Med	Yes
24_N17_W3300008	MC	Shelterwood	6	17	Med	Yes			
24_N17_W3300016	MC	Shelterwood	44	24	High				
<b>Effects by Action Alternative C</b>									
<b>Current Stand Number</b>	<b>Old Growth Type</b>	<b>Alternative C harvest Prescription</b>	<b>Stand Acres</b>	<b>Pre-Harvest Full Old Growth Index Number</b>	<b>Current FOGI Class</b>	<b>High Risk</b>	<b>Post-Harvest Old Growth Index Number</b>	<b>Post-Harvest FOGI Class</b>	<b>Old Growth Status Post Harvest</b>
23_N17_W0800017	WL/DF	Individual Tree Selection	7	19	MED		12		
23_N17_W0800019	WL/DF	Shelterwood	13	9	LOW		7		
23_N17_W0800020	MC	Old Growth Maintenance	10	22	HIGH		17	MED	Yes
23_N17_W0800020	MC	Shelterwood	17	22	HIGH		8		
23_N17_W0800027	MC	Old Growth Maintenance	6	22	HIGH		16	MED	Yes
23_N17_W2000003	MC	Old Growth Maintenance	191	20	HIGH		16	MED	Yes
23_N17_W2000012	WL/DF	Old Growth Maintenance	27	20	MED		16	MED	Yes
23_N17_W2000015	WL/DF	Old Growth Maintenance	10	19	MED		15	MED	Yes
23_N17_W2000016	WL/DF	Old Growth Maintenance	16	19	MED		15	MED	Yes
23_N17_W2000019	WL/DF	Old Growth Maintenance	71	19	MED		15	MED	Yes
23_N17_W2600013	DF	Shelterwood	38	17	MED		7		
23_N17_W3400027	WL/DF	Old Growth Maintenance	28	15	MED		12	MED	Yes
24_N17_W1700011	MC	Individual Tree Selection	20	16	MED		10	LOW	Yes
24_N17_W1700017	MC	Individual Tree Selection	7	15	MED		10	LOW	Yes
24_N17_W1800024	MC	Individual Tree Selection	12	17	MED	Yes	12	LOW	Yes
24_N17_W2000010	MC	Individual Tree Selection	9	18	MED		11	LOW	Yes
24_N17_W2800009	MC	Shelterwood	20	26	HIGH		9		

24_N17_W2800011	MC	Shelterwood	6	22	HIGH		8		
24_N17_W3000011	WWP	Seed Tree	133	24	HIGH		6		
24_N17_W3300008	MC	Shelterwood	5	17	MED	Yes	9		
24_N17_W3300016	MC	Shelterwood	44	24	HIGH		8		

*<sup>1</sup>Stands with less than 5 acres of old growth were not included in this table*

### High Risk Old Growth Stands

As time passes, various factors influencing stand development may cause stands currently defined as old growth to no longer meet the requirements of the *Green et al. (1992)* old growth definitions. Such factors include insect and disease outbreaks, drought, competition, etc. These factors can, gradually or suddenly, reduce the number of large, live trees below the minimum described in *Green et al. (1992)*. Stand vigor, insect and disease presence, and current mortality levels as determined by field reconnaissance and SLI data, can be used to estimate the risk of falling out of the old growth status according to *Green et al. (1992)*. Currently, 1,720 acres, or 63 percent, of the old growth stands in the project area are classified as high risk (see *TABLE III-11*).

**TABLE III - 11 - CURRENT AND POSTHARVEST AMOUNT OF HIGH-RISK OLD GROWTH STANDS IN THE PROJECT AREA**

	POSTHARVEST TREATMENT OLD GROWTH STATUS			TOTALS
	HIGH RISK OLD GROWTH	OTHER OLD GROWTH	NOT OLD GROWTH	
Current and No-Action Alternative A	1,720	1,023	0	2,743
Action Alternative B	1,682	626	435	2,743
Action Alternative C	1,682	765	296	2,743

### Direct and Indirect Effects to Old Growth Risk

- Direct and Indirect Effects of No-Action Alternative A to Old Growth Risk**  
Stands currently classified as high risk would be expected to remain as high-risk stands and, over time, fall out of old growth status as large live trees die and fall below the threshold numbers identified by *Green et al (1992)* to be classified as old growth. Other old growth stands would, over the long term, see their risk rating increase as the stands age and become more decadent.
- Direct and Indirect Effects of Action Alternative B and C to Old Growth Risk**  
Under both Action Alternatives B and C, the amount of high-risk old growth would be reduced by 38 acres through the use of various harvesting prescriptions. Approximately 57 acres would still be classified as high-risk old growth, and the remaining total of high-risk old growth in the project area would be 1,682 acres (see *TABLE III-11*).

### Old Growth Attributes

The FOGI process assigns an index rating to each old growth attribute that, when summed, indicates its total score, or old growth index, for the stand. For analysis purposes, these scores can be grouped into low, medium, and high categories. This provides an indication of the condition of the stand in regards to attributes often associated with old growth. These indices do not necessarily indicate old growth quality, but can be used to compare and classify a

collection of older stands across the landscape. Many of the attributes contributing to the FOGI rating relate to wildlife habitat and are discussed under *WILDLIFE ANALYSIS*. *TABLE III-12* shows the current amounts of old growth acres in each of the FOGI classifications and the effects of the Action Alternatives. See *OLD GROWTH ATTRIBUTE ASSIGNMENTS* at the end of this *VEGETATION ANALYSIS* for a greater explanation of *TABLE III-6*.

**TABLE III - 12 - FOGI CLASSIFICATION FOR THE PROJECT AREA AND POSTHARVEST AMOUNTS**

FOGI CLASSIFICATION	CURRENT ACRES	ACTION ALTERNATIVE	
		B	C
Low	241	345	285
Medium	1,701	1,668	1,790
High	801	295	373
Totals	2,743	2,308	2,447

\*Low FOGI Classification includes stands removed from OG status

**Direct and Indirect Effects to Old Growth Attributes**

- **Direct and Indirect Effects of No-Action Alternative A to Old Growth Attributes**

The current FOGI classification for old growth stands would not change in the short term. Over time, as growth and decadence increase, stands in the low and medium class may progress to medium and high class, respectively. Conversely, stands may revert from the high and medium class to the medium and low class depending on the attributes affected by insects, diseases, forest succession, decay, etc. These changes would probably occur slowly over time due to the numerous factors that contribute to the FOGI classification.

- **Direct and Indirect Effects of Action Alternative B and C to Old Growth Attributes**

Under Action Alternative B, the following changes to the FOGI classification would occur: approximately 435 acres would no longer be classified as old growth, stands classified as low would be increased by 104 acres, stands classified as medium would be reduced by 33 acres, and stands classified as high would be reduced by 506 acres. Detailed changes to FOGI classification changes can be found in *TABLE III-10*.

Under Action Alternative C, the following changes to the FOGI classification would occur: approximately 296 acres would no longer be classified as old growth, stands classified as low would be increased by 44 acres, stands classified as medium would be increased by 89 acres, and stands classified as high would be reduced by 428 acres. Detailed changes to FOGI classification changes can be found in *TABLE III-10*.

**Cumulative Effects to Old Growth**

- **Cumulative Effects of No-Action Alternative A to Old Growth**

Current levels of old growth acres would not change in the short term. As stands continue to mature and large trees eventually die, some stands may no longer meet the old growth definition. Ongoing data collection of stands may change the amount of

acres classified as old growth. The *Three Creeks, White Porcupine, Scout Lake, Cilly Cliffs, Wood Lion, and Lost Napa Multiple Timber Sales Projects* contained old growth stands and harvesting is either complete or on-going. The change in old growth amounts and attribute levels from these projects was incorporated into the current condition on Swan River State Forest. It should be noted that timber stands, whether harvesting occurs or not, may be reinventoried or reindexed in regard to adjustments of stand boundaries, and a more intensive inventory may change the old growth status.

Past road construction, timber harvests, wildfires, and general site characteristics have led to the current amount of old growth characteristics in the entire area. Future timber sales and thinning projects would likely continue to take place in the analysis area. If additional management projects were proposed, the MEPA process would be implemented. The cumulative effects to old growth amounts and distributions due to previous activities on USFS as well as privately-held ground adjacent to Swan River State Forest and the project area, are difficult to quantify because little is known about the total amount of old growth on these ownerships and old growth stand approximations were not possible by analyzing aerial photographs. Old growth appears to have been retained on some USFS ground. The stands of small, private landowners appear as a mosaic, which results in a variety of age classes and inexact amounts of old growth amongst multiple ownerships.

- ***Cumulative Effects of Action Alternative B and C to Old Growth***

The cumulative effects of the Action Alternatives would be similar to those seen under No-Action Alternative A; however, they would reduce the proportion of old growth on Swan River State Forest by approximately 0.80 (Action Alternative B) or 0.54 (Action Alternative C) percent. Old growth attribute levels in harvested stands would generally decrease immediately following harvesting, but over time would be expected to increase.

## **AGE AND COVER TYPE PATCH SIZE**

*Issue:* The proposed activities may affect patch size and shape through tree removal.

### **AGE PATCHES**

#### **Existing Environment**

The size of patches of equivalent age is one way to assess effects of management activities to the forested landscape. Age class patches broadly reflect disturbance in the natural environment and the additional influence of harvesting and associated activities in the managed environment.

Forests change over time. Tracking the changes from historical to current conditions can indicate the effects of management and whether the direction of change is desirable. Assessing historic forest conditions is filled with challenges, such as a lack of actual data or, even when

data is available, compatibility with current information. DNRC has maps of an inventory conducted in the 1930s that provide a general baseline for age (and cover type) patches for Swan River State Forest and the project area. The data does not provide for a seamless comparison between historic and current conditions due to differences in mapping procedures, primarily an 8-fold difference in minimum map unit size (40 acres historically and 5 acres currently). The reduced minimum map unit size results in many more patches of a smaller average size, even when applied to the same forest at the same point in time. However, the data does represent the best historic information available; therefore, the data is presented with the caveats mentioned in this paragraph.

This analysis focuses on stand age classes. The oldest age class also encompasses all old growth stands. However, old growth would represent only a portion of all old age stands, as not all old stands would meet the large-tree requirements that are part of DNRC’s old growth definition. Reconstructing the historic data to quantify patch characteristics of old growth is not possible, so comparisons between historic and current conditions are not made. An analysis of the current patch characteristics of old growth and the effects of each Action Alternative are presented under *OLD GROWTH PATCHES* further on in this analysis.

Historic data indicates that old stand patches in the Swan River State Forest were large. Historically, a single large old stand patch exceeding 14,000 acres dominated Swan River State Forest (previous DNRC analysis indicates that large stands would be divided into many additional polygons using today’s mapping protocols, even in the absence of any harvest-related activities). Other age patches were variable in size. The expectation is that the project area would naturally have smaller patch size means due to imposing the artificial project area boundary onto some existing patches.

**TABLE III - 13 - HISTORIC AND CURRENT MEAN PATCH SIZES BY AGE CLASS FOR SWAN RIVER STATE FORESTS AND THE PROJECT AREA**

AGE CLASS	SWAN RIVER STATE FOREST (56,307 ACRES)		PROJECT AREA (25,436 ACRES)
	HISTORIC	CURRENT	CURRENT
Non-forested	121	56	0
0 to 39 years	91	56	29
40 to 99 years	135	111	128
100 to old stand	76	49	73
Old stand <sup>1</sup>	665	22	21
Overall	280	63	64

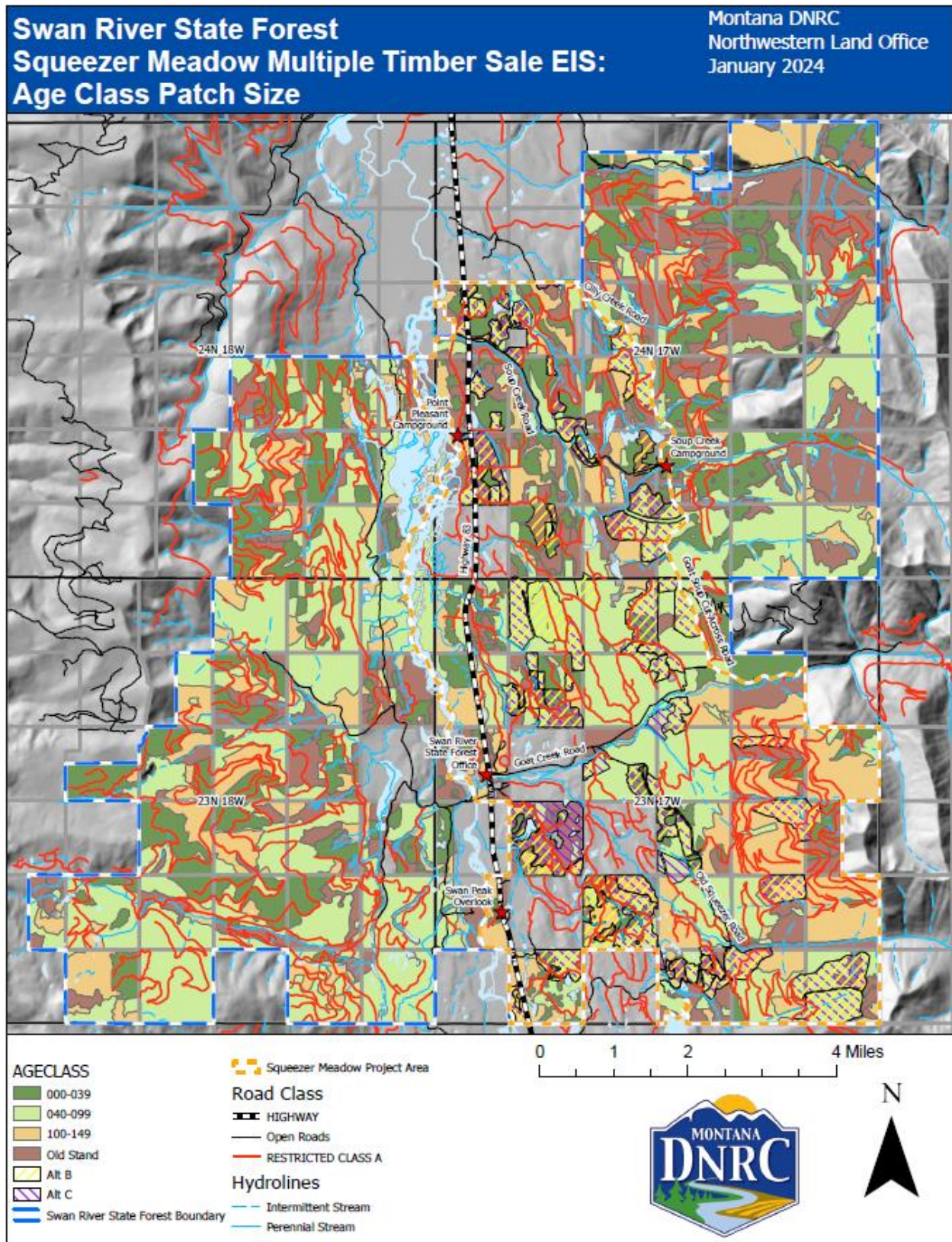
<sup>1</sup>The old stand age class represents the 150-199, 200 plus and old-growth age classes.

Compared to the historic mean patch size for the Swan River State Forest, the current mean patch size of non-forested, 0-39, and old stand age classes in both the project area and Swan River State Forest is smaller than the historic mean, while the mean patch size of the 40-99 and 100 to old stand age classes are close to the historic mean (see *FIGURE III-2* for details). Some of the decrease in patch size can be attributed to different map unit minimums, but the data likely



reflects a real reduction in mean patch sizes, as harvesting and roads have broken up some previously intact patches.

**FIGURE III - 2 - CURRENT PATCH SIZE AND LOCATION BY AGE CLASS ON SWAN RIVER STATE FOREST**



**Direct and Indirect Effects to Age Patches**

- **Direct and Indirect Effects of No-Action Alternative A to Age Patch Size**

Patch sizes would not be immediately affected. Over time, the forest would tend to homogenize, leading to larger patches of older stands, especially in the absence of significant fires or other disturbance events.

- **Direct and Indirect Effects of Action Alternatives B and C to Age Patch Size**

In the project area, the mean patch size would decrease for all age classes except the 0 to 39 age class under both Action Alternatives B and C (TABLE III-14). Mean patch size of the 0 to 39 year age class would slightly increase with each Action Alternative, reflecting the effort to group stand-replacement harvesting near other previously harvested areas.

**TABLE III - 14 - CURRENT AND POSTHARVEST MEAN PATCH SIZES BY AGE CLASS FOR THE PROJECT AREA**

AGE CLASS	CURRENT PROJECT AREA (ACRES)	POSTHARVEST ACTION ALTERNATIVES	
		B	C
		(ACRES)	
Non-forested	0	0	0
0 to 39 years	29	33	37
40 to 99 years	127	87	69
100 to old stand	130	42	75
Old stand	45	10	26
Overall	65	34	49

**Cumulative Effects to Age Patches**

- **Cumulative Effects of All Alternatives to Age Patch Size**

The current age class patch condition reflects the effects of natural disturbances and succession and the cumulative effects of previous activities by DNRC and previous landowners that have been completed and mapped. Overall, harvesting by DNRC and other landowners including the USFS, DFWP, and other private landowners within the cumulative effects analysis area appears to be reducing the patch size of mature stands and increasing the patch size of younger (0-39 and 40-99 year old) stands.

**OLD GROWTH PATCHES**

**Existing Environment**

Old growth represents a subset of the old stand age class. Old stands must contain a specified number and size of 'large' live trees to meet the old growth definition; those large trees must also meet or exceed minimum age requirements. This analysis displays current patch size characteristics of old growth and the effects of each alternative. This analysis does not present a corresponding analysis of historic old growth patch characteristics because the data does not exist. Although it cannot be verified with observations of historic old growth patch size, the reduction in patch size of old stands is expected to reflect a similar reduction in patch size of old

growth stands, but the absolute magnitude is unknown.

Currently, the mean patch size of old growth stands on Swan River State Forest is 56 acres (TABLE III-15). In the project area, the mean old growth patch size is 46 acres. Old growth patches are larger than the mean size of old stand patches in the project area. The disparity between patch sizes of old stands and old growth reflects the addition of the large-tree number, size, and age requirements.

**TABLE III - 15 - CURRENT AND POSTHARVEST MEAN PATCH SIZES OF OLD GROWTH ON SWAN RIVER STATE FOREST AND IN THE PROJECT AREA**

CURRENT SWAN RIVER STATE FOREST (ACRES)	SWAN RIVER STATE FOREST POST HARVEST ACTION ALTERNATIVES (ACRES)		CURRENT PROJECT AREA (ACRES)	PROJECT AREA POST HARVEST ACTION ALTERNATIVES (ACRES)	
	B	C		B	C
56	54	53	46	40	41

**Direct and Indirect Effects to Old Growth Patches**

- **Direct and Indirect Effects of No-Action Alternative A to Old Growth Patches**

The patch size of old growth stands would not be immediately affected. Over time, the effects to the old growth patch size would be uncertain because the continued development of large live trees within old stands is unpredictable. If existing large live trees remain alive and new large trees develop in old-age stands, the mean patch size of old growth would be expected to increase. Conversely, if existing large live trees continue to die from effects of insects, diseases, and other factors, causing the stand to no longer meet the old growth requirements specified by *Green et al. (1992)*, and new large trees fail to develop because of overly dense stands, the mean patch size of old growth would be expected to decrease.

- **Direct and Indirect Effects of Action Alternative B and C to Old Growth Patches**

At the project level, mean old growth patch size would decrease by 6 acres under Action Alternative B, and by 5 acres under Action Alternative C.

**Cumulative Effects to Old Growth Patches**

- **Cumulative Effects of All Alternatives to Old Growth Patches**

At the cumulative-effects level, mean old growth patch size would decrease to 54 acres under Action Alternative B and to 53 acres under Action Alternative C. The current old growth patch condition reflects the effects of natural disturbance and succession and the cumulative effects of previous activities by DNRC that have been completed and mapped. Overall, old growth patches for Swan River State Forest and the project area are reduced from historic to current conditions. Based on aerial-photograph interpretation on a landscape basis, the cumulative effects to old growth patch size due to previous activities on USFS as well as on privately held ground adjacent to Swan River State Forest and the project area have been an overall decrease in old growth patch

size through timber management.

**COVER TYPE PATCHES**

**Existing Environment**

Historic data suggests mean cover type patch sizes are similar to age patch sizes, in part, due to large patches of old western larch/Douglas-fir, and to a lesser extent, western white pine and lodgepole pine, that dominated the forest and the project area. As with mean age class patch sizes, the differences in mapping protocols and, in particular, a different minimum map-unit size confound direct comparison and drawing clear conclusions. However, a real decrease in mean cover type patch size is expected due to the effects of timber harvesting. The effects of succession confound the results and are reflected in the increased patch size of shade-tolerant types (mixed conifer and subalpine fir).

Overall, current cover type patches on Swan River State Forest and the project area are about 40 percent the size of the historic mean (TABLE III-16 and TABLE III-17).

**TABLE III - 16 - HISTORIC AND CURRENT MEAN PATCH SIZES BY COVER TYPE FOR SWAN RIVER STATE FOREST AND PROJECT AREA**

<b>COVER TYPE CLASS</b>	<b>HISTORIC ACRES</b>	<b>SWAN RIVER STATE FOREST (ACRES)</b>	<b>CURRENT PROJECT AREA (ACRES)</b>
Douglas-fir	114	61	85
Hardwood	41	32	23
Lodgepole pine	160	57	41
Mixed conifer	228	291	239
Noncommercial	0	0	0
Nonforested	50	0	0
Nonstocked	0	39	12
Ponderosa pine	243	36	36
Subalpine fir	505	225	244
Water	0	0	0
Western larch/Douglas-fir	2,366	76	65
Western white pine	1,799	58	37
Overall	526	108	90

**Direct and Indirect Effects to Cover Type Patches**

- **Direct and Indirect Effects of No-Action Alternative A to Old Growth Patches**  
The cover type patch sizes would not be immediately affected; however, over time, diversity of habitats in terms of cover type patches would likely be reduced through forest succession. The result would be an increase in the mean size of patches dominated by shade-tolerant species as shade-intolerant species are excluded.
- **Direct and Indirect Effects of Action Alternative B and C to Old Growth Patches**

Each Action Alternative would slightly reduce the overall average cover type patch size (TABLE III-17 – PROJECT AREA POSTHARVEST MEAN PATCH SIZES BY COVER TYPE FOR EACH ALTERNATIVE). Action Alternative B would reduce the mean patch size by 21 acres and Action Alternative C by 15 acres. The greatest changes in patch sizes would occur in the mixed-conifer cover type. The mixed-conifer cover type patches would be reduced in size by 1,044 acres under Action Alternatives B and 703 in Action Alternative C. Western white pine patch size would be reduced by 492 acres under Action Alternative B and 320 acres under Action Alternative C. Western larch/Douglas-fir patch size would decrease by 786 acres under Action Alternative B and 417 acres under Action Alternatives C. Western white pine would not change Action Alternatives B and C, respectively. All cover type patch sizes would be affected marginally or not at all by the project.

**TABLE III - 17 - PROJECT AREA POSTHARVEST MEAN PATCH SIZES BY COVER TYPE FOR EACH ALTERNATIVE**

COVER TYPE CLASS	CURRENT (ACRES)	ACTION ALTERNATIVE (ACRES)	
		B	C
Douglas-fir	85	45	61
Hardwood	23	23	23
Lodgepole pine	41	14	17
Mixed conifer	239	47	150
Nonforested	0	0	0
Nonstocked	12	8	8
Ponderosa pine	36	28	29
Subalpine fir	244	117	107
Western larch/ Douglas-fir	65	30	45
Western white pine	39	32	36
Overall	90	33	53

**Cumulative Effects to Old Growth Patches**

- ***Cumulative Effects of All Alternatives to Cover Type Patches***

The current cover type patch condition reflects previous activities by DNRC and natural disturbances and succession that have been completed and mapped. Overall, cover type patch sizes have been reduced from historic to current conditions. Cumulative effects of past harvests have been incorporated into the project area. The effect of past management activities on USFS, DFWP, and other private land within the CEAA on cover type patches through aerial-photograph interpretation is difficult. Active management of forested lands suggests an increase in early seral species such as western larch and ponderosa pine.

## **FRAGMENTATION**

*Issue:* The proposed activities may affect forest fragmentation on the landscape through tree removal.

### **Existing Environment**

Forest fragmentation refers to the breaking up of previously contiguous blocks of forest. Most often, the fragmentation is used in reference to the disruption of large contiguous blocks of mature forest caused by forest management activities such as road building and timber harvesting. In relation to fragmentation, management activities begin by putting holes in the natural forested landscape (i.e. portions of the forest are removed via harvesting, thus creating patches of immature forest within a background matrix of mature forest). As management continues and more harvesting takes place, the open patches created can become connected to other open patches, thus, severing the previously existing connections between patches of mature forest. While the appropriate level of fragmentation for any particular forest is unknown, forests fragmented by management activities generally do not resemble natural forest conditions.

Forest fragmentation was analyzed using aerial photographs of the project area in ArcMap and querying the SLI. Aerial photographs provided a visual of past harvesting and current stand appearances such as stocking density and stand boundaries. Queries in the SLI and other layers provided information on contiguous areas of stands in the same age class, stocking levels, and stand densities. Alternative effects on the patch size of old growth stands were also analyzed. Field visits helped to verify this information to establish increases or decreases in a given patch size.

Historically, wildfires burned with varying intensities and return intervals and to different sizes across Swan River State Forest, which interacted with insect and disease activities and blowdown events to create a mosaic of forest cover types and age classes. Today, forest management is the primary agent influencing fragmentation. If intense fires were to occur during extreme fire seasons, they would influence fragmentation across the landscape, as would insect and disease activities and blowdown events.

The majority of the project area is a matrix, or mosaic, of well-stocked older stands interspersed with younger stands resulting from harvesting activities of past even-aged management; thus, the stands have been fragmented to some degree. Some man-made patches in harvest units range from 10 to 640 acres. However, some areas have not been entered previously and represent a continuous forest of stands uninfluenced by human activities, but of various stocking levels due to past insect infestations. Refer to *CONNECTIVITY ANALYSIS* in *WILDLIFE ANALYSIS* for an assessment of fragmentation effects on closed-canopied forests. Refer to the patch size of age classes, old growth, and cover type in this analysis for additional indications of the effects of forest fragmentation.

### **Direct and Indirect Effects to Fragmentation**

- ***Direct and Indirect Effects of No-Action Alternative A to Fragmentation***

Forest fragmentation would not be directly affected by this alternative. Over time, and

depending on an unknown future, indirect effects would include a reduction in fragmentation if additional harvesting is not imposed by management and existing patches of immature forests grow to maturity. Insects, diseases, or fire, depending on the acreage involved and severity, could result in an increase in fragmentation as well.

- ***Direct and Indirect Effects of Action Alternative B and C to Fragmentation***

In the stands designated for regeneration harvesting, the primary effects would be creating a larger area of younger stands with a corresponding reduction in mature forest stands. Stands designated for seed tree, shelterwood, or overstory removal harvesting would contribute to the fragmentation of mature forests.

Stands designated for other harvesting prescriptions would maintain greater than 40 percent crown cover and would be more similar to adjacent mature stands of timber than would the regeneration harvest units and, therefore, would not contribute to fragmentation. These prescriptions may allow for openings in the canopy, the openings may resemble gaps created by small areas of crown torching that occur during low-intensity fires. However, these instances would not contribute to fragmentation.

Some regeneration harvest units are adjacent to past harvest areas and other proposed units, which would result in an enlargement of the younger age class patches. The result would be more of a blended geometric shape of larger regeneration units. The large size of regeneration units would result in larger mature stands in the future, thus, reducing fragmentation. However, future timber harvesting would result in additional fragmentation if existing mature timber patches received a regeneration harvest. The actual net effect on fragmentation would depend on future timber harvesting.

#### **Cumulative Effects to Fragmentation**

- ***Cumulative Effects of No-Action Alternative A to Fragmentation***

The on-going *Lost Napa Multiple Timber Sales*, as well as previous management activities, such as the *Wood Lion*, *Cilly Cliff*, *Three Creeks*, *White Porcupine*, and *Scout Lake* multiple timber sales, have added to the fragmentation of the forest. The stands that primarily contributed to fragmentation are the regeneration units. Units that involve thinning treatments did not provide harsh breaks in the canopy, but a reduced crown cover. The aerial view shows the differences from one unit to the other from the point of stand density, but do not necessarily differ from the point of age class.

Based on aerial-photograph interpretation on a landscape basis, the cumulative effects to fragmentation due to previous activities on USFS, DFWP, as well as on privately held ground adjacent to Swan River State Forest and the project area, have been an overall increase in the size of younger age class patches through timber management.

- ***Cumulative Effects of Action Alternatives B and C to Fragmentation***

An overall increase in the patch size of younger age classes and a decrease in the patch size of older age classes would occur where regeneration harvest units are proposed. See the discussion on age classes for acres that would change by alternative.



## STAND VIGOR

*Issue:* The proposed activities may affect forest stand vigor through tree removal.

### Existing Environment

Stand vigor, a qualitative assessment of stand health in relation to growth potential, is affected by a variety of factors such as stand age and density, insects, diseases, and weather. Insects and diseases are currently active in the project area, decreasing vigor, reducing growth, causing mortality, removing stands from the old growth classification, and resulting in lost economic value. Elevated populations of Douglas-fir beetles, fir engravers, mistletoe, mountain pine beetles, white pine blister rust, and various heart rots exist throughout the project area. Indian paint fungus is common in grand fir and subalpine fir. The majority of tree species show effects from insect infestations and disease infections, causing value to be lost. Also, tree crowns appear sparse, yellowing, and/or fading in some stands, reflecting poor health and slow growth.

The SLI identifies stand vigor for each stand on Swan River State Forest in 1 of 4 categories. The 4 categories for vigor classification are:

- full,
- good to average,
- just below average to poor, and
- poor

The majority of the stands selected for harvesting fall in the *good to average* and *just below average to poor* category (TABLE III-18).

**TABLE III - 18 - CURRENT HARVEST UNIT VIGOR CLASSIFICATION (PERCENT) BY ACTION ALTERNATIVE**

VIGOR	ACTION ALTERNATIVE	
	B	C
Full	5.83	5.83
Good to average	63.83	63.83
Just below average to poor	30.04	29.87
Poor	0.30	0.47

### Direct and Indirect Effects to Stand Vigor

- ***Direct and Indirect Effects of No-Action Alternative A to Stand Vigor***

No immediate change in the proportion of existing stand vigor is expected unless a large disturbance, such as a wildfire, occurs (TABLE III-18 and TABLE III-19).

Forest succession, driven by the impacts of forest insects and diseases when fires are being suppressed, would continue to reduce stand vigor. As the forest ages and composition becomes more homogenous, vigor is expected to decrease.

- ***Direct and Indirect Effects of Action Alternative B to Stand Vigor***

Postharvest, *full* vigor would increase by approximately 1,195 acres, *good to average* vigor would increase by approximately 325 acres, *just below average to poor* vigor would decrease on approximately 1,515 acres, and *poor* vigor would decrease on approximately 5 acres (TABLE III-19).

**TABLE III - 19 - CURRENT AND POSTHARVEST PROJECT AREA VIGOR**

STAND VIGOR	CURRENT		ACTION ALTERNATIVE			
			B		C	
	ACRES	PERCENT	ACRES	PERCENT	ACRES	PERCENT
Full	1,216	6	2,411	11	2,411	11
Good to average	13,948	64	14,273	65	14,107	65
Just below average to poor	6,565	30	5,050	23	5,217	24
Poor	65	0	60	0	60	0
Non-forested	58	N/A	58	N/A	58	N/A
<i>Totals</i>	<i>21,852</i>	<i>100</i>	<i>21,852</i>	<i>100</i>	<i>21,852</i>	<i>100</i>

- ***Direct and Indirect Effects of Action Alternative C to Stand Vigor***

Postharvest, *full* vigor would increase by approximately 1,195 acres, *good to average* vigor would decrease by approximately 159 acres, *just below average to poor* vigor would decrease by approximately 1,348 acres, and *poor* vigor would decrease by approximately 5 acres (TABLE III-19).

**Cumulative Effects to Stand Vigor**

- ***Cumulative Effects of No-Action Alternative A to Stand Vigor***

Current stand vigor would remain the same across the forest. Over time, stand vigor would be expected to decrease in the absence of disturbance or management. Occurrences of mortality of trees or groups of trees would reduce the stand vigor in localized areas. Limited salvaging may increase the stand vigor in localized areas. Large reductions in stand vigor would occur if a large fire came through the area and salvage harvesting and regeneration or replanting attempts did not follow.

- ***Cumulative Effects of Action Alternatives B and C to Stand Vigor***

Cumulative effects would result in an increase in vigor in areas where harvesting has occurred and a decrease in vigor in areas where harvesting has not occurred. The trees no longer perform to their highest potential and become susceptible to insects and diseases, etc. Based on aerial-photograph interpretation on a landscape basis, the cumulative effects to stand vigor due to previous activities on USFS, DFWP, as well as privately held ground adjacent to Swan River State Forest and the project area, have typically been similar to those described for Swan River State Forest, above. Vigor

typically increases as stands are harvested and regenerate postharvest; vigor typically decreases as a stand ages and remains in an unmanaged state.

**STAND STRUCTURE**

*Issue:* The proposed activities may affect forest stand structure through tree removal.

**Existing Environment**

Stand structure indicates a characteristic of stand development and how the stand would continue to develop. The disturbance regime or most recent disturbance event can also be reflected. Stand structure is described by 3 categories that describe the number of distinct canopy layers present in a stand:

*Single-storied:* One distinct canopy layer is present; this condition is most commonly seen in young stands following disturbance or prior to regeneration establishment in mature stands that have been harvested with regeneration methods such as seed tree and shelterwood cutting.

*Two-storied:* Two distinct canopy layers are present; this condition is associated with recently harvested or burned stands that have a number of large, fire-resistant trees growing over established or advanced regeneration, or with the understory reinitiation stage of stand development where shade-tolerant trees establish beneath the existing overstory.

*Multistoried:* At least 3 distinct canopy levels are present; this condition is commonly associated with older stands that have entered the steady state stage of stand development, where understory trees are advancing into the overstory, or in uneven-aged stands. This condition is often indicative of a long period without disturbance.

TABLE III-20 compares the current proportion of stands and the postharvest results by alternative in single-storied, two-storied, and multistoried stands in the project area.

**TABLE III - 20 - CURRENT AND POSTHARVEST STAND STRUCTURE (PERCENT) IN THE PROJECT AREA**

STAND STRUCTURE	CURRENT AMOUNTS	POSTHARVEST	
		ACTION ALTERNATIVE	
		B	C
Single-storied	17	22	19
Two-storied	20	24	26
Multistoried	49	40	41
Non-forested	14	14	14

### **Direct and Indirect Effects to Stand Structure**

- ***Direct and Indirect Effects of No-Action Alternative A to Stand Structure***

No immediate change in the proportion of existing stand structure is expected unless a large disturbance, such as a wildfire, occurs (TABLE III-20).

Forest succession, driven by the impacts of insects and diseases when fires are being suppressed, would reduce the variability of stand structure. As the forest ages and composition become more homogenous, so would the stand type.

- ***Direct and Indirect Effects of Action Alternative B to Stand Structure***

The single-storied stand structure would increase approximately 1,283 acres; the two-storied stand structure would increase approximately 989 acres; and the multistoried stand structure would decrease approximately 2,272 acres.

The proportion of single-storied stand structure in the project area would increase from 17 percent currently to 22 percent, the proportion of two-storied stand structure would increase from 20 to 24 percent, and the proportion of multistoried stand structure would decrease from 49 to 40 percent (TABLE III-20).

- ***Direct and Indirect Effects of Action Alternative C to Stand Structure***

The single-storied stand structure would increase approximately 561 acres; the two-storied stand structure would increase approximately 1,423 acres; and the multistoried stand structure would decrease approximately 1,984 acres.

The proportion of single-storied stand structure in the project area would increase from 17 percent currently to 19 percent, the proportion of two-storied stand structure would increase from 20 to 26 percent, and the proportion of multistoried stand structure would decrease from 49 to 41 percent (TABLE III-20).

### **Cumulative Effects to Stand Structure**

- ***Cumulative Effects of No-Action Alternative A to Stand Structure***

The cumulative effects to stand structure distributions due to previous activities on Swan River State Forest are represented in the description of the current condition. Generally, those effects have been to reduce the acres in multistoried stand structures while increasing the acres in the single-storied stand structure through even-aged management. However, as a whole, the forest contains a mosaic of structures that include single-storied, two-storied, and multistoried conditions.

Although harvesting has changed the proportion of stand structure distribution, the harvesting methods used emulate the range of disturbances, from stand-replacement fire to mixed severity and light underburns, which have historically occurred in Swan River State Forest. Seed tree and shelterwood harvests have shifted stands to a single-storied stand structure following harvesting, similar to the effects of stand-replacing fire. Old growth maintenance, uneven aged management, and variable thinning treatments have left trees in multiple size classes, initially moving stands to a two-storied structure following harvesting that would, over time and in the absence of further harvesting activities or natural disturbance, develop into multistoried conditions. These treatments emulate the effects of mixed and low-severity fires.

Barring natural disturbance, over time, untreated stands would gradually shift toward heterogeneous, multistoried, or classic uneven-aged stand structures. Treated stands would also gradually shift toward those stand structures through time.

Based on aerial-photograph interpretation on a landscape basis, the cumulative effects to stand structure distributions due to previous activities on USFS, DFWP, as well as on privately held ground adjacent to Swan River State Forest and the project area, have been variable. Actively managed areas tend to resemble a single-storied stand structure of a single age class, or rather, a stand very homogeneous in appearance. Areas that have not been actively managed can appear single-storied to multistoried due to variances in stand conditions and age classes. Exact stand structure assessments were not possible due to lack of field reconnaissance on non-DNRC managed ground.

- ***Cumulative Effects of Action Alternatives B and C to Stand Structure***

The cumulative effects of the Action Alternatives would be similar to those seen in No-Action Alternative A; however, across areas where management would occur, the result would be a greater increase in the single storied stand structures and a greater decrease in the two-storied and multistoried stand structures.

## **CROWN COVER**

*Issue:* The proposed activities may affect forest crown cover through tree removal.

### **Existing Environment**

Crown cover, an estimate of the ratio between tree crown area and ground surface area, is usually expressed in terms of percent and is another measure of stand stocking and density. Categories used to describe crown cover include well-stocked (over 70 percent), medium-stocked (40 to 69 percent), poorly stocked (less than 39 percent), and non-stocked.

The SLI database has a rating for overall crown cover and a rating for sawtimber crown cover in the stand. In terms of overall crown cover in the project area, 45.2 percent of stands are well stocked, 25.9 percent are medium stocked, 18.2 percent are poorly stocked, 0.3 percent are non-stocked. The poorly stocked sawtimber category consists of 18.2 percent of the project area; the associated stands are typically in poor health or have high quantities of rock and/or brush. Timber in these stands is generally not of good merchantable quality, but in the instance of poor stand health, steps may be taken to address the issue.

### **Direct and Indirect Effects to Crown Cover**

- ***Direct and Indirect Effects of No-Action Alternative A to Crown Cover***

No-Action Alternative A would not change the crown cover in the short term. Over time, individuals and groups of trees would be removed from the canopy by insects, diseases, windthrow, or fires and this would result in variable changes to crown cover as canopy gaps are created and gradually filled. Patches of variable size currently exist where the Douglas-fir bark beetles and root rot have killed Douglas-fir, white pine blister rust has killed western white pine, or significant windthrow occurred from storms passing through.

Overall, crown cover and stocking would likely increase over time in the absence of disturbances. Were large fires to occur, overall crown cover would be reduced. Ongoing insect and disease issues would reduce crown cover and sawtimber stocking in some areas prior to understory re-initiation.

- ***Direct and Indirect Effects of Action Alternatives B and C to Crown Cover***

The reduction in crown cover subsequent to harvest treatments would vary by Action Alternative and silvicultural prescription. In general, reduced crown cover affects stand growth and development in various ways. First, competition among the crowns of overstory trees is reduced, allowing accelerated volume growth and increased seed production. Second, competition for water and nutrients is reduced, thus, allowing trees to be more resistant to both drought and bark beetle attacks. Third, a more diverse and vigorous understory is able to establish. Finally, sunlight is allowed to reach the forest floor, which, along with seedbed preparation, is of particular importance to the successful regeneration of early seral species such as western larch and western white pine. For this analysis, the residual crown cover includes both the overstory and understory tree canopies that remain after harvesting, including both merchantable and sub merchantable trees.

In areas with overstory removal, and seed tree treatments, the final crown cover would be less than 40 percent. Final crown cover on all other harvesting prescriptions would be a minimum of 40 percent.

Under Action Alternative B, the project area would have approximately 36.4 percent well-stocked stands, approximately 40.9 percent medium-stocked stands, approximately 22.4 percent poorly-stocked stands, approximately 0.3 percent non-stocked stands (see TABLE III-21).

Under Action Alternative C, the project area would have approximately 33.8 percent well-stocked stands, approximately 44.2 percent medium-stocked stands, approximately 21.8 percent poorly-stocked stands, approximately 0.3 percent non-stocked stands (see TABLE III-21).

**TABLE III - 21 - PERCENT OF PROJECT AREA CURRENT AND POSTHARVEST CROWN COVER BY ALTERNATIVE**

CROWN COVER	CURRENT	POSTHARVEST	
		ACTION ALTERNATIVE	
		B	C
Well stocked	45.2	36.4	33.8
Medium stocked	25.9	40.9	44.2
Poorly stocked	18.2	22.4	21.8
Non-stocked	0.3	0.3	0.3

Crown cover would increase over time in all harvest units as regeneration establishes in harvested areas and as crowns of remaining trees expand and take advantage of available growing space created by tree removal in individual tree selection, old growth maintenance, and thinning harvest units.

#### **Cumulative Effects to Crown Cover**

- ***Cumulative Effects of No-Action Alternative A to Crown Cover***

Current crown cover would remain the same across the forest. Over time, crown cover would be expected to increase in the absence of disturbance. Mortality of trees or groups of trees would reduce the crown cover in localized areas. Large reductions in crown cover would occur if a large fire came through the area.

- ***Cumulative Effects of Action Alternatives B and C to Crown Cover***

Overall, reductions of crown cover in well-stocked stands would be dispersed across the landscape. Representation of medium-stocked stands would increase following harvesting, as would poorly-stocked stands. As stands regenerate, crown cover would increase. Based on aerial-photograph interpretation on a landscape basis, the cumulative effects to crown cover due to previous activities on USFS, DFWP, as well as privately held ground adjacent to Swan River State Forest and the project area, have been similar to those described for Swan River State Forest. These properties are similar in that their stocking level typically increases as stands regenerate postharvest and all entities have created a mosaic of crown cover on the landscape. Exact crown cover assessments were not possible due to lack of field reconnaissance on non-DNRC managed ground.

## **INSECTS AND DISEASES**

*Issue:* The proposed activities may affect forest insect and disease levels through tree removal (both suppressed/stressed and infested/infected).

#### **Existing Environment**

Planning for both the short and 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 to certain insects and diseases than others (*Byler and Hagle 2000*). Identifying vulnerable stands and developing suitable management plans can help alleviate future problems that may prevent achievement of long-term objectives for forest management.

Current insect activity is mapped annually during aerial-detection surveys carried out by the USDA Forest Service in cooperation with the Montana DNRC. New occurrences and expansion of existing pockets, particularly of bark beetles and defoliators, are mapped and approximate acreages and locations are collected. Some disease data is collected during aerial surveys, but due to the cryptic nature of forest diseases it is not nearly as expansive as the data for insects. Field surveys identify areas with insect and disease activities for timber-harvesting opportunities. Maps of several successive years of flight surveys are available at the Swan River State Forest office.

The major forest insects and diseases currently affecting forest productivity include:

### Diseases

- Armillaria root disease
- Larch dwarf mistletoe
- White pine blister rust
- Indian Paint Fungus
- Cedar laminated root and butt rot
- Red-brown butt rot

### Insects

- Douglas-fir bark beetle
- Fir engraver
- Mountain pine beetle
- Western spruce budworm

#### ➤ **Armillaria Root Disease**

Armillaria root disease, caused by the fungus *Armillaria ostoyae*, is a common pathogen of conifers in western North America. Stands impacted by Armillaria root disease occur throughout the project area. While Armillaria root disease can affect all conifers, the most susceptible are Douglas-fir, grand fir, and subalpine fir. Silvicultural approaches that emphasize early seral species, natural regeneration, and reduction of root to root pathways between susceptible species are recommended for stands with Armillaria root disease (for example: *Filip and Goheen 1984*; -; *Morrison and Mallett 1996*; *Morrison et al. 2000*);).

#### ➤ **Western Larch Dwarf Mistletoe**

Western larch dwarf mistletoe, caused by *Arceuthobium laricis*, is considered the most important disease of western larch in the Inland Northwest (*Beatty et al. 1997*). Dwarf mistletoe are parasitic, seed-bearing plants that obtain moisture and nutrients from their hosts, resulting in a reduction in tree vigor and growth. Infections on western larch cause branches to form dense clumps of twigs known as “witches’ brooms”, which are prone to breakage under snow loads. Mistletoe infection can also exacerbate a tree’s susceptibility to attack by wood borers (*Gibson 2004*).

The incidence and severity of western larch dwarf mistletoe appears to be highly variable across the project area. This likely reflects a complex history of mixed-severity and stand-replacing fires in these forests. Depending on the spatial distribution of mistletoe-infected, seed-bearing trees following fires, western larch regeneration might remain free of infection, have a substantial lag-time prior to infection, or become infected early in development. The earlier a tree becomes infected by dwarf mistletoe, the greater the impacts (*Mathiasen 1998*).

Due to the seeding habit of dwarf mistletoes, spread and intensification are at their worst when an infected overstory exists over regeneration of the same tree species. Seed tree or shelterwood treatments can still be carried out in stands that have dwarf mistletoe infections in the overstory (*Mathiasen 1998*), but tree selection needs to discriminate against the most heavily infected western larch and leave as many non or lightly-infected trees as possible (*Beatty et al. 1997*).



➤ **White Pine Blister Rust**

Two five-needled pine species (western white pine and whitebark pine) have declined where they occurred historically on Swan River State Forest. The primary cause is white pine blister rust, a disease caused by the non-native fungus *Cronartium ribicola*, which can infect and kill western white pine and whitebark pine of all ages and sizes (Keane and Arno 1993; Schwandt et al. 2013).

Some western white pine and whitebark pine remain on Swan River State Forest because either they possess natural genetic resistance to the rust or have not been infected. Retention of such trees is encouraged to maintain genetic diversity and promote natural regeneration where possible (Schwandt and Zack 1996).

Management and restoration recommendations for western white pine emphasize planting rust-resistant western white pine seedlings, pruning the lower bole, and maintaining western white pine genetic diversity (Fins et al. 2001).

Current options for restoration of whitebark pine were addressed by Keane and Parsons (2010). They include combinations of prescribed fire, thinning, selection cuttings, and fuel enhancement cuttings.

➤ **Indian Paint Fungus**

Indian paint fungus is a true heartrot that very commonly infects true firs and hemlocks. This fungus is the predominant cause of heartrot and volume losses in these species in western North America (Hansen and Lewis 1997).

In the project area, Indian paint fungus is well distributed on both grand and subalpine firs. Stand exams and reconnaissance surveys showed approximately 30 to 40 percent infection rate among moderate and high risk stands. Management recommendations to reduce losses from this pathogen include keeping rotation lengths of susceptible species to less than 150 years, early thinning, leaving vigorous nonwounded residual trees, and avoiding tree damage when conducting silvicultural treatments (Filip et al. 1983; Filip et al. 2009).

➤ **Cedar laminated root and butt rot**

Cedar laminated root and butt rot is caused by the fungus *Phellinus weirii*. This disease is responsible for the majority of western cedar heartwood decay in the Inland Northwest (Hagle 2006). Little is known about the life cycle and infection processes of this fungus. Trees are rarely killed outright but can experience extensive decay extending into the butt log and down into the heartwood of roots. Cavity-nesting species often utilize decayed cedar. Stand exams and reconnaissance surveys showed approximately 50+ percent infection and damage rate among moderate and high risk stands. Management recommendations are to avoid wounds and to harvest at an age prior to the development of extensive decay (Hagle 2006).

➤ **Red-Brown Butt Rot**

Red-brown butt rot, also known as Schweinitzii root and butt rot, is caused by the root-infecting fungal pathogen *Phaeolus schweinitzii* (Hagle and Filip 2010). Any conifer can be a host but infection is considered of primary importance in Douglas-fir. Red-brown butt rot infects trees via small roots and causes decay in the interior of the roots, which eventually

extends into the butt log, making such trees susceptible to stem collapse. Instead of affecting trees in slowly-expanding groups due to the fungus growing from root system to root system at root contacts, as with root diseases such as *Armillaria* root disease, red-brown butt rot tends to affect trees on an individual basis (*Hansen and Lewis 1997*). Most damage occurs in stands more than 80 years of age. Management options are limited; rotations can be shortened to about 90 years in Douglas-fir to minimize loss due to decay and less-affected host species can be emphasized over Douglas-fir.

➤ ***Douglas-Fir Bark Beetle***

Douglas-fir bark beetle has been active in recent years on Swan River State Forest. The project area has an elevated incidence of the Douglas-fir bark beetle in areas proposed for harvesting. This is due, in part, to continual spread within the forest and active populations on adjacent lands. In general, stands that are at highest risk to attack by the Douglas-fir bark beetle are those with:

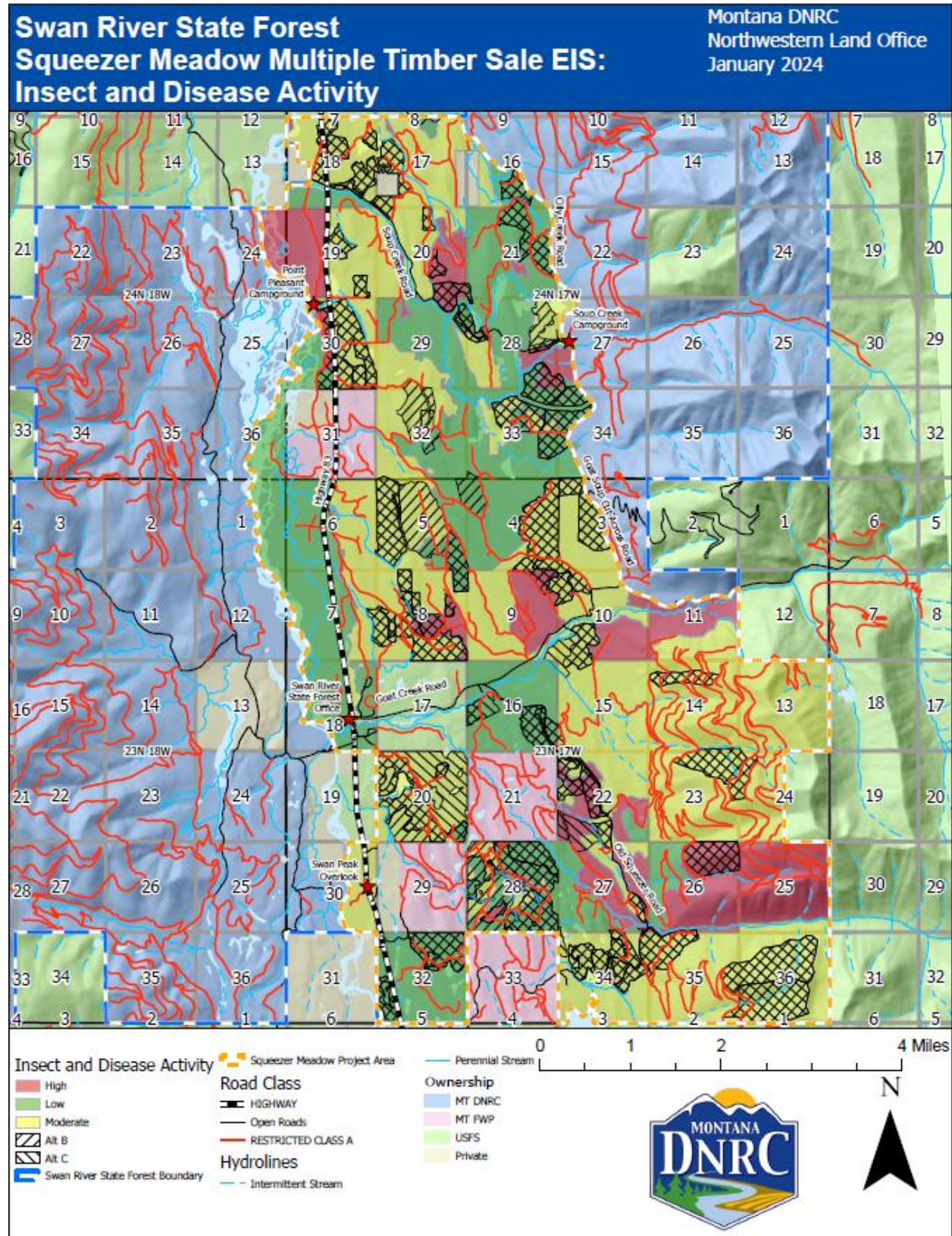
- basal areas greater than 250 square feet per acre;
- an average stand age greater than 120 years;
- an average dbh greater than 14 inches; and
- a stand composition greater than 50 percent Douglas-fir (*USDA Forest Service 1999*).

Management of the Douglas-fir bark beetle should concentrate on the removal of wind-thrown Douglas-fir and the salvage of newly attacked trees before adult beetles can emerge (*Kegley 2011; Livingston 1999; Schmitz and Gibson 1996*).

Douglas-fir in most of the proposed harvest areas are at high risk of Douglas-fir bark beetle attack due to age, size, and stocking. Numerous pockets of infestations were located in the analysis area in 2022. Each spring, aerial surveys and light field reconnaissance by *DNRC* foresters were completed to determine the extent of infestations (see *FIGURE III-3*).

Currently, 15 to 20 percent of stands within the project area contain snags in varying levels of decay and low to moderate infestation levels of Douglas-fir bark beetles.

**FIGURE III - 3 - 2023 INSECT AND DISEASE ACTIVITY IN THE PROJECT AREA FOR ALL ALTERNATIVES**



➤ **Fir Engraver**

The fir engraver, *Scolytus ventralis*, has killed many grand and subalpine firs in the Swan Valley. Its primary host is grand fir (Ferrell 1986). Endemic populations of fir engraver beetles are closely associated with root disease centers or other factors that stress its hosts; they rarely make successful attacks on vigorous grand fir (Goheen and Hansen 1993). Silvicultural practices that promote the vigor of grand fir stands (thinning, for example) and promote species less susceptible to root disease can reduce impacts from the fir engraver (Ferrell 1986). The fir engraver is present in 10 to 15 percent of stands in the project area; however, most of that area has been previously affected and only small patches in select stands are experiencing current activity.

➤ **Mountain pine beetle**

The mountain pine beetle (*Dendroctonus ponderosae*) is a native North American bark beetle; hosts include lodgepole pine, western white pine, whitebark pine, and ponderosa pine (Amman et al. 1989; Gibson et al. 2009). A mountain pine beetle attack is typically characterized by the presence of pitch tubes along the bole of the tree, although 'blind attacks' can occur in moisture-stressed trees with boring dust as the only indicator. Mountain pine beetles kill trees by girdling the cambium layer beneath the bark and introducing blue stain fungi that grow into the sapwood, both of which disrupt the flow of water and nutrients through the tree (Gibson et al. 2009). During an outbreak mountain pine beetles can kill extensive areas of host trees.

Numerous areas of mountain pine beetle infestations were located in the analysis area in 2010. The beetle was estimated to have caused lodgepole and ponderosa pine mortality on approximately 400 acres within the project area. Each spring, aerial surveys, as well as light field reconnaissance by DNRC foresters, were completed to determine the extent of the infestations (see FIGURE III-3). In recent years mountain pine beetle population levels have decreased but they are still minimally present and active.

➤ **Western Spruce Budworm**

The western spruce budworm, *Choristoneura occidentalis*, has been active in recent years across Swan River State Forest. It is the most widely distributed and destructive defoliator in western North America (Fellin and Dewey 1986). Large populations can persist if stand conditions are favorable and hosts are available. Repeated defoliation over several years may result in decreased growth, increased susceptibility to bark beetles, and, though extremely rare in the Swan Valley, mortality (USDA Forest Service 2011). Within the project area, hosts include: Douglas-fir, Engelmann spruce, grand fir, subalpine fir, and western larch. Factors that influence outbreaks include:

- a large percentage of shade-tolerant species present;
- drier habitat types;
- stand overstocking;
- multi-storied stand structure;
- low tree vigor;

- increasing stand age; and
- continuous, stand cover types (*USDA Forest Service 1989*).

Management of the western spruce budworm should emphasize even-aged management, thinning from below, lower stand densities, and maintaining tree species diversity (*Fellin and Dewey 1986; USDA Forest Service 1989*).

Numerous pockets of infestations were located in the analysis area from 2020 to 2022. Each spring, aerial surveys and light field reconnaissance by DNRC foresters are completed to determine the extent of infestations (see *FIGURE III-3*). Budworm was estimated to have been present on at least 20% of stands within the project area but activity seems to be declining.

#### **Direct and Indirect Effects to Insects and Disease**

- ***Direct and Indirect Effects of No-Action Alternative A to Insects and Disease***

Sawlog volume would continue to be lost from the project area due to insect and disease effects, especially from Douglas-fir bark beetle, *Armillaria* root disease, mountain pine beetle, and Indian paint fungus in inaccessible stands with large trees. Salvage logging would continue where stands are accessible without building new roads.

If this alternative were implemented, seral and other shade-intolerant species, such as western larch and Douglas-fir, would continue to be lost from insect infestations and disease infections. The spread of the fir engraver would continue, causing mortality in grand and subalpine firs.

School trusts may lose long-term revenue due to:

- increasing mortality rates and sawlog defect that are caused by the ongoing presence of a variety of the aforementioned pathogens;
- reduced growth rates as old-growth stands continue to age and defects increase; and
- the non-regeneration of high-valued species such as western larch and western white pine.

- ***Direct Effects of Action Alternatives B and C to Insects and Disease***

Harvest treatments would target those species or individual trees affected by insects and diseases, as well as salvage recently killed trees. Douglas-fir currently or recently infested by the Douglas-fir bark beetle, lodgepole pine currently or recently infested by the mountain pine beetle, and western white pine currently or recently infested by the mountain pine beetle would be removed when merchantable value exists. Western larch with moderate to severe infections of dwarf mistletoe would be harvested. Grand fir and subalpine fir would be removed if infected with Indian paint fungus. Western white pine currently infected or recently killed by white pine blister rust would be removed when merchantable value exists. Where possible, whitebark pine would be retained. Trees within *Armillaria* root disease pockets would be removed, particularly if conversion to early-seral species is possible. Engelmann spruce infected with western spruce budworm would be removed before loss of merchantable value occurs.

Harvest treatments would focus on leaving early-seral species, such as western larch, that are more resistant to insect and diseases than shade-tolerant species. Reserve trees left following harvesting would also provide a seed source for natural regeneration.

Insect and disease problems would be reduced following implementation of either Action Alternative. Action Alternative B would treat more acres within the project area and with a higher degree of even-aged regeneration treatments that promote the establishment a new age class composed primarily of early seral species that tend to be more resistant to insects and diseases. Action Alternative C treats fewer acres across the landscape and uses more uneven-aged and intermediate treatments that would focus on retention of early seral species within the existing overstory and removal of trees affected by insects or disease or those more susceptible to insects and disease.

The stands selected for Action Alternative B are spread throughout the project area and have insect and disease activities occurring at all levels, from low to moderate to high levels. Emphasis would be placed on trees (groups or individuals) that are affected by insects or diseases, are at risk of infection, or, if dead, contain merchantable material. In units utilizing a regeneration harvest (2,692 acres), seed trees would remain scattered throughout to provide a seed source; these seed trees would primarily be shade-intolerant species, such as western larch and western white pine (planted seedlings that are genetically modified to resist white pine blister rust), that have a higher tolerance to insects and diseases. Action Alternative B treats stands with various levels of insect and disease risk: low 2,099 acres; moderate 2,313 acres; and high 824 acres.

The stands selected for Action Alternative C are slightly more concentrated in the project area and have insect and disease activities occurring at all levels, from low to moderate to high levels. Emphasis would be placed on trees (groups or individuals) that are affected by insects or diseases, are at risk of infection, or, if dead, contain merchantable material.

The majority of the units (1,894 acres) in Action Alternative C would be treated with regeneration harvests, but a higher degree of uneven-aged and intermediate treatments would be applied compared to Action Alternative B. Regenerating species would be shade-intolerant species, such as western larch and western white pine (planted seedlings that are genetically modified to resist white pine blister rust), that are more resistant to many of the infecting agents currently present. Action Alternative C treats stands with various levels of insect and disease risk: low 2,023 acres; moderate 2,053 acres; and high 785 acres.

- ***Indirect Effects of Action Alternatives B and C to Insects and Disease***

Where shelterwood, commercial thin, and old growth recruitment treatments are applied, increased vigor and growth rates of the remaining trees due to the availability of light, nutrients, and moisture would result as an indirect effect. Following treatment, the species composition would be more resilient to damage by forest diseases and insects.

Rust-resistant western white pine, western larch, and, in some cases, ponderosa pine, Douglas-fir or Engelmann spruce would be planted in units utilizing seed tree harvest treatments. The western white pine seedlings would increase a declining component on Swan River State Forest. The planting of western larch would help reduce the likelihood of future insect and disease problems due to its lower susceptibility to many of the problems being addressed.

Action Alternative B would treat a greater number of stands at moderate risk due to insects and disease present throughout the project area. This alternative would also treat the most acres with site-intensive management treatments such as shelterwood harvests to address insect and disease problems, which, in turn, would lead to healthier forest stands in the future.

Action Alternative C also proposes harvesting insect-infected and disease-infected stands spread throughout the project area. This alternative would not treat as many areas with shelterwood harvesting or as many stands at moderate risk to address insect and disease problems as Action Alternative C. Overall, this alternative may do less than Action Alternative B to address the insect and disease problem prevalent on the project area.

#### **Cumulative Effects to Insects and Disease**

- ***Cumulative Effects of No-Action Alternative A to Insects and Disease***

No harvesting of live, dead, dying, or high-risk trees would occur. Some salvage harvesting of insect-infested and diseased trees may occur, but at a slower, less-effective rate and not as a result of this analysis or association with this project. Forest stands would maintain dense stocking levels; which contribute to the spread of insects, diseases, and fuel loading; which could lead to high-intensity fires, unnatural forest structures, and overall poor health of the stand.

- ***Cumulative Effects of Action Alternatives B and C to Insects and Disease***

Timber management activities on Swan River State Forest, including those proposed to varying extents under each Action Alternative, have generally implemented prescriptions that would reduce losses and recover mortality due to heartrots, bark beetles, white pine blister rust, western larch dwarf mistletoe, blowdown, and other causes. Older stands are the most susceptible to many of the identified insect and disease problems in the project area due to lack of vigor, stand age, drought, and other factors. Stand regeneration treatments that would bring older stands to a 0 to 39 year age class are producing stands with species compositions more resilient to the effects of forest insects and diseases and more consistent with historic forest conditions. Thinning treatments have further reduced the percentage of infected or infested trees.

Activities on USFS as well as on small, private landholdings adjacent to Swan River State Forest and the project area have been variable. Depending on land management objectives or other mandates, small private landowners or other government agencies

may or may not currently employ prescriptions that aim to reduce insect and disease levels on their lands.

## **FIRE EFFECTS**

*Issue:* The proposed activities may affect forest fuels and fire behavior through tree removal.

### **Existing Environment**

#### **Swan River State Forest Fire History**

Swan River State Forest displays a mosaic pattern of age classes and cover types that have developed due to variations in fire frequency and intensity. In areas that have experienced relatively frequent fires, Douglas-fir, western larch, and ponderosa pine cover types, with a component of lodgepole pine and western white pine, were produced. As fire frequencies become longer in time, shade-tolerant species (grand fir, subalpine fir, Engelmann spruce, western red cedar) have a better chance to develop. Higher elevation sites in the forest have longer fire frequencies, and the resultant stands are multistoried with a dominant shade-tolerant cover type. Where fire frequencies were short, the stands are open, single-storied, and occasionally two-storied. As fire suppression began, cover types and fire frequencies were altered. Stands of ponderosa pine, western larch, and/or Douglas-fir have become multi-storied with shade-tolerant species. Ponderosa pine-dominated stands that were once open now have a thick understory of Douglas-fir and/or grand fir. Fires that do occur are generally kept small and natural fire effects are limited. If a larger scale fire were to start, many acres could be affected due to ladder fuels, heavy fuel accumulation, and other environmental factors.

Swan River State Forest has identified 395 fires (still missing 2020 fire data) that have burned 10,162 acres over the last 33 years within the forest's direct protection area. On average, 12.3 fires per year occur within this time period 210 lightning fires have burned 9,334 acres, with the largest occurring in 2003 during a dry lightning storm; that fire burned 6,215 acres. Lightning causes approximately 55 percent of all fire starts on Swan River State Forest, and humans cause approximately 45 percent. Human-caused fires are typically started from campfires, debris burning, equipment, or incidents directly related to powerline sparks (<https://svc.mt.gov/dnrc/firereports/default.aspx:F1000> Reports).

Past research of fire history in Swan Valley has been conducted. The following summaries describe the fire history and patterns these fires created on the landscape.

*Hart (1989)* summarized the historical data as follows:

*Although most of the burns...were of stand-replacement intensity, many less intense fires had also crept over wide areas. The upper (southern) half of Swan valley had been extensively burned and was blanketed by fallen trees. In this area, fires were moderate, thinning the forest. The lower (northern) Swan also was scarred by fires, but it had a great deal of older mixed forest; species typical of mesic sites were found in this region...*



*Antos and Habeck (1981)*, working mostly in the northern portion of Swan Valley, emphasized the dominance of low-frequency, high-intensity fires (stand-replacement fires) in determining stand patterns:

*During most summers, the occurrence of frequent rain makes intense fires unlikely; but in some years, dry summers set the stage for large crown fires. Most stands were initiated on large burns... An average frequency of replacement burns of between 100 and 200 years was characteristic... Stands over 300 years old do occur, and repeat burns less than 20 years apart have also occurred. In some forests initiated by replacement burns, ground fires have occurred after stand establishment, with variable effects on the overstory. Very wet sites, such as stream bottoms and lower north slopes, often experience partial burns when located within the perimeter of large replacement burns.*

The analysis of fire history indicates that the lower elevations of Swan Valley were burned frequently; in the drier southern half, the intervals were shorter than on the moister northern part. Between the years of 1758 and 1905, the northern portion of the range had fire-free intervals of about 30 years, and the presence of western larch and even-aged lodgepole pine suggests the fires were of higher intensity. The remaining samples are from the southern end and these have a shorter interval of 17 years (*Freedman and Habeck, 1985*).

Historical data indicates that forests in Swan River State Forest and the project area were cooler and moister than the broad scale *Climatic Section* and western Montana averages. Forests were also considerably older with a far higher proportion of western larch/Douglas-fir cover types than at the broad scale. Although the forests of Swan River State Forest were old, the representation of shade-tolerant cover types was low, indicating disturbance was frequent or recent enough to prevent widespread cover type conversion through succession.

### **Fire Groups**

The project area is primarily represented by 3 fire groups as classified by *Fischer and Bradley (1987)*. Fire Group 6 is found on moist Douglas-fir (63.0 percent of the project area). Fire Group 7 is found on cool habitat types usually dominated by lodgepole pine (15.2 percent of the project area). Fire Group 4 is found on warm, dry Douglas-fir habitat types (10.5 percent of the project area). Other fire groups represented in the project area include Fire Group 8 (dry, lower subalpine habitat types) representing 4.1 percent, Fire Group 10 (cold, moist upper subalpine and timberline habitat types) representing 4.0 percent, Fire Group 9 (moist upper subalpine habitat types) representing 1.9 percent, Fire Group 5 (cool, dry Douglas-fir habitat types) representing 1.1 percent and Fire Group 11 (warm, moist grand fir, western redcedar and western hemlock habitat types) representing 0.3 percent. *TABLE III-22* describes the characteristics of the Fire Groups present in the project area.

**TABLE III - 22 - CHARACTERISTICS OF FIRE GROUPS OCCURRING IN THE PROJECT AREA (Fischer and Bradley, 1987)**

Fire Group	Acres	Percent of project area	Fire return interval/severity	Average fuel loading (tons/acre)	Postharvest fuel loading (tons/acre)
4	2,296	10.5%	Frequent/low to moderate	11	10 to 25
5	249	1.1%	Frequent/low	10	10 to 25
6	13,751	62.9%	Frequent/low to moderate	12	10 to 25
7	3,316	15.2%	Frequent/low to moderate	18	10 to 25
8	901	4.1%	Frequent to infrequent/low to moderate	18	10 to 25
9	407	1.9%	infrequent/mixed (low to high)	25	10 to 25
10	864	4.0%	frequent to infrequent/mixed (low to high)	18	10 to 25
11	59	0.3%	infrequent/mixed (low to high)	25	10 to 25

Nearly 75 percent of the project area is in fire groups that are characterized by frequent, low-severity fires (Fire Groups 4, 5 and 6). These sites are generally drier than those characterized by other fire groups, and typically have significant components of ponderosa pine and Douglas-fir. On these sites, frequent, low-severity fire would kill most Douglas-fir and maintain forests dominated by ponderosa pine. A prolonged fire-free interval would allow the establishment and development of Douglas-fir.

Fire Group 7 is found in 15.2 percent of the project area and is characterized by frequent fires that vary in intensity. These sites would see a mixture of stand-replacing and thinning fires that would continue to propagate lodgepole pine.

The remaining portion (approximately 10 percent) of the project area (Fire Groups 8, 9, 10, 11) is characterized by sites with predominantly cool or moist conditions, resulting in variable frequency and severity of fire that ranges from stand-replacing during droughty conditions to minor ground fires under normal or excessively moist conditions. In these fire groups, fire-free intervals may range from 100 to 200 years between stand-replacing fires, but return intervals of 30 years have also been documented, particularly in the relatively drier grand fir habitat types that have a component of ponderosa pine. The moist conditions on these sites can allow these areas to serve as a fire break for low-intensity ground fires. These sites have high fuel loadings and high plant productivity that, when combined with drought conditions, can lead to severe and widespread fires. The effects of fire on these sites are dependent on severity, but generally

create conditions favorable to early-seral, shade-intolerant species by killing shade-tolerant overstory trees and preparing mineral seedbeds for natural regeneration.

### **Hazards and Risks in the Project Area**

The hazards and risks associated with wildfires include a potential loss of timber resources, effects to watersheds, and loss of property. The majority of timber stands being considered for harvesting are in the mature or older age classes in stands that have not burned since pre-European settlement. Fire hazards in these areas range from above- to near-natural levels with moderate to high accumulations of down and ladder fuels relative to stand densities. Some of the western larch/Douglas-fir stands have a dense understory of grand fir, creating a significant hazard due to its density and structure that increases the risk that a low-intensity ground fire could develop into a stand-replacing crown fire.

Many of the old growth stands in the project area are relic stands. Stand-replacing fires have not occurred in the area for 200 or more years. As the stands continue to age and mortality occurs from various biotic and abiotic factors, fuels would accumulate. These stands have an in-growth of shade-tolerant trees, which provide ground and ladder fuels, thus increasing their susceptibility to intense fires, especially during times of drought. Accessible stands have had salvage logging and firewood cutting that has reduced the larger diameter down fuels in the area. The continued encroachment of shade-tolerant trees, accumulations of down woody debris, and mortality increases fire risks.

Increased recreational use in the area is another potential ignition source that may result in a hazardous condition due to fuel accumulation.

### **Direct and Indirect Effects to Fire Effects**

- ***Direct and Indirect Effects of No-Action Alternative A to Fire Effects***

The wildfire hazard would not change substantially in the short term. With continued fuel accumulation from down woody debris, the potential for wildfires increases. Large-scale, stand-replacing fires may be the outcome. Eventually, due to the continuing accumulation of fine fuels, snags, ladder fuels, and deadwood components, the risk of stand-replacement fires would increase.

- ***Direct and Indirect Effects of Action Alternatives B and C to Fire Effects***

Immediately following timber harvesting, the amount of fine fuels would increase. Hazards would be reduced by scattering slash, cutting limbs and tops to within a maximum height to hasten decomposition, spot-piling by machine in openings created by harvesting, broadcast burning, and burning landing piles.

Seed tree and shelterwood units would be treated by simultaneously piling slash and scarifying soil with an excavator, followed by burning slash piles. Scarification prepares seedbeds for natural regeneration.

The hazards of destructive wildfires in these stands would be reduced because larger, more fire-resistant species would be left at wider spacing. Grand fir, some Douglas-fir, western red cedar, and subalpine fir, which pose a higher crown-fire hazard because of their low-growing branches and combustible nature, would be removed. This would

reduce the potential mortality from low- to moderate-intensity fires but would not 'fireproof' the stands from the high-intensity stand-replacing fires brought on by drought and wind.

Seed tree and shelterwood harvest treatments would reduce wildfire hazards. Regeneration harvests, where slash has been treated, but trees are still small, have proven to be fire resistant in many cases. However, contrary conclusions have been put forth wherein timber harvesting is believed to have increased the risk of wildfires, especially in the short term, where logging slash was not treated. Fire hazards would slowly increase over time as trees reach pole size, crown densities increase, and fuels accumulate.

Immediately following timber harvest where partial cutting treatments (commercial thin, overstory removal, etc.) are applied, the amount of fine flashy fuels would increase. Wildfire hazard would be reduced by scattering slash, cutting limbs and tops to lay low to the ground to hasten decomposition. Spot piling with an excavator in openings or areas of heavy concentrations, followed by burning of slash piles would reduce the fire hazard. Fire hazards would again slowly increase over time as crown densities increase and fuels accumulate.

#### **Cumulative Effects to Fire Effects**

- ***Cumulative Effects of No-Action Alternative A to Fire Effects***  
The risk of wildfires would continue to increase as a result of long-term fire suppression.
- ***Cumulative Effects of Action Alternatives B and C to Fire Effects***  
Fuel loadings would be reduced in treated stands, decreasing wildfire risks in these specific areas.

*The Wood Lion and Lost Napa Multiple Timber Sales* have a combination of broadcast burning and excavator piling, with burning to be completed from the fall of 2023 to the fall of 2028. Past and ongoing salvage sales across Swan River State Forest will also have excavator piling and burning associated with slash at the landings. The net cumulative effect would be a reduction in wildfire risks.

#### **SENSITIVE PLANTS**

*Issue:* Harvest activities may affect sensitive plant populations through ground disturbance or influence their abundance due to changes in water yield or nutrient levels.

#### **Existing Environment**

DNRC's SLI and the *Montana Natural Heritage Program (MTNHP)* were used to identify the potential presence of plant Species of Concern, including threatened, endangered, or sensitive plant species, in the project area. Species of Concern are native species that are considered at risk of extirpation in Montana due to declining populations, threats to their habitats, restricted distribution, or other factors. Designation as a Montana Species of Concern is not a statutory or regulatory classification (*MTNHP 2023*). Results of this search were compared to the location of

proposed harvest sites for potential direct and indirect impacts and the need for mitigation measures was assessed.

MTNHP data queried in December 2023 identified 24 Species of Concern and 6 Potential Species of Concern existing within the project area, and an additional 11 species with known occurrence within one (1) mile of the project area boundary using the MTNHP Map Viewer (*TABLE III-23*). Most plant Species of Concern and their related habitat features were found in wetland areas (such as fens, marshes, bogs, sloughs, wet meadows, streamside and riparian areas, springs, or ponds) that are not normally classified as forest stands or considered for timber harvesting.

DNRC's SLI indicates that whitebark pine, a threatened species under the Endangered Species Act, is present both within the project area and in one harvest unit proposed under both Action Alternatives. Whitebark pine occurs in upper subalpine and timberline forest habitats. According to MTNHP data, two other plant species, wavy moonwort and small yellow lady's-slipper, were observed within harvest unit boundaries proposed under both Action Alternatives. Wavy moonwort occurs along roadside or other disturbed areas, while small yellow lady's-slipper is found wet forest areas or ecotones between wet forests and meadows.

**TABLE III - 23 - PLANT SPECIES OF CONCERN POTENTIALLY FOUND WITHIN THE PROJECT AREA**

Species Group	Common Name	Scientific Name	State Rank*	Species of Concern**	Observed in Project Area	Habitat
Vascular Plants	Round-leaved Orchis	<i>Amerorchis rotundifolia</i>	S3	SOC	Yes	Wetland
Vascular Plants	Upward-lobed Moonwort	<i>Botrychium ascendens</i>	S3	SOC		Roadside/Disturbed Sites
Vascular Plants	Wavy Moonwort	<i>Botrychium crenulatum</i>	S3	SOC	Yes	Roadside/Disturbed Sites
Vascular Plants	Mountain Moonwort	<i>Botrychium montanum</i>	S3S4	PSOC	Yes	Wet Forest
Vascular Plants	Spoon-leaf Moonwort	<i>Botrychium spathulatum</i>	S1	SOC	Yes	Wetland
Vascular Plants	Lake-bank Sedge	<i>Carex lacustris</i>	S1S2	SOC		Wetland
Vascular Plants	Small Yellow Lady's-slipper	<i>Cypripedium parviflorum</i>	S3S4	PSOC	Yes	Wet Forest
Vascular Plants	Sparrow's-egg Lady's-slipper	<i>Cypripedium passerinum</i>	S2S3	SOC	Yes	Wet Forest
Vascular Plants	English Sundew	<i>Drosera anglica</i>	S3	SOC		Wetland
Vascular Plants	Roundleaf Sundew	<i>Drosera rotundifolia</i>	S3S4	PSOC	Yes	Wetland
Vascular Plants	Crested Shieldfern	<i>Dryopteris cristata</i>	S3	SOC	Yes	Wetland
Vascular Plants	Beaked Spikerush	<i>Eleocharis rostellata</i>	S3	SOC	Yes	Wetland

Vascular Plants	Giant Helleborine	<i>Epipactis gigantea</i>	S2S3	SOC	Yes	Wetland
Vascular Plants	Marsh Horsetail	<i>Equisetum palustre</i>	S3	SOC	Yes	Wet Forest
Vascular Plants	Meadow Horsetail	<i>Equisetum pratense</i>	S2	SOC		Wet Forest
Vascular Plants	Slender Cottongrass	<i>Eriophorum gracile</i>	S3	SOC	Yes	Wetland
Vascular Plants	Slender Wintergreen	<i>Gaultheria ovatifolia</i>	S3S4	PSOC	Yes	Wetland
Vascular Plants	Northern Toadflax	<i>Geocaulon lividum</i>	S3S4	PSOC		Wetland
Vascular Plants	Water Howellia	<i>Howellia aquatilis</i>	S3	SOC	Yes	Wetland
Vascular Plants	Pale-yellow Jewel-weed	<i>Impatiens aurella</i>	S3	SOC		Wetland
Vascular Plants	Spurless Touch-me-not	<i>Impatiens ecalcarata</i>	S3S4	PSOC		Wetland
Vascular Plants	Loesel's Twayblade	<i>Liparis loeselii</i>	S2	SOC	Yes	Wetland
Vascular Plants	Kalm's Lobelia	<i>Lobelia kalmii</i>	S3	SOC	Yes	Wetland
Vascular Plants	Foxtail Muhly	<i>Muhlenbergia andina</i>	S2S3	SOC		Wetland
Vascular Plants	Adder's Tongue	<i>Ophioglossum pusillum</i>	S3	SOC	Yes	Wetland

Vascular Plants	Whitebark Pine	<i>Pinus albicaulis</i>	S3	SOC	Yes	Subalpine Forest, Timberline
Vascular Plants	Blunt-leaved Pondweed	<i>Potamogeton obtusifolius</i>	S3	SOC	Yes	Wetland
Vascular Plants	Pod Grass	<i>Scheuchzeria palustris</i>	S3	SOC	Yes	Wetland
Vascular Plants	Water Bulrush	<i>Schoenoplectus subterminalis</i>	S3	SOC		Wetland
Vascular Plants	Tufted Club-rush	<i>Trichophorum cespitosum</i>	S2	SOC	Yes	Wetland
Vascular Plants	Flatleaf Bladderwort	<i>Utricularia intermedia</i>	S2	SOC		Wetland
Bryophytes	Stiff Matt Moss	<i>Brachythecium turgidum</i>	SH	PSOC	Yes	Wetland
Bryophytes	Richardson's Calliergon Moss	<i>Calliergon richardsonii</i>	SH	PSOC	Yes	Wetland
Bryophytes	Hamatocaulis Moss	<i>Hamatocaulis vernicosus</i>	S1	SOC	Yes	Wetland
Bryophytes	Meesia Moss	<i>Meesia triquetra</i>	S2	SOC		Wetland
Bryophytes	Limprichtia Moss	<i>Scorpidium revolvens</i>	S1	SOC	Yes	Wetland
Bryophytes	A Scorpidium Moss	<i>Scorpidium scorpioides</i>	S2	SOC	Yes	Wetland
Lichens	Pustulate Tarpaper Lichen	<i>Collema curtisporum</i>	S1	SOC	Yes	Moist Riparian Forest
Lichens	Gray Lungwort Lichen	<i>Lobaria hallii</i>	S2	SOC	Yes	Moist Riparian Forest
Lichens	Chalky Bush Lichen	<i>Ramalina labiosorediata</i>	S1	SOC	Yes	Moist Riparian Forest



Lichens	Hooded Bush Lichen	<i>Ramalina obtusata</i>	S2	SOC	Yes	Moist Riparian Forest
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\*State Rank:

S1: At high risk because of extremely limited and/or rapidly declining population numbers, range and/or habitat, making it highly vulnerable to global extinction or extirpation in the state.

S2: At risk because of very limited and/or potentially declining population numbers, range and/or habitat, making it vulnerable to global extinction or extirpation in the state.

S3: Potentially at risk because of limited and/or declining numbers, range and/or habitat, even though it may be abundant in some areas.

\*\*Species of Concern:

SOC: Species of Concern

PSOC: Potential Species of Concern

### **Direct and Indirect Effects to Sensitive Plants**

- ***Direct and Indirect Effects of No-Action Alternative A to Sensitive Plants***

No harvesting or associated activities would occur under No-Action Alternative A. As a result, no impacts to sensitive plants are expected under this alternative.

- ***Direct and Indirect Effects of Action Alternatives B and C to Sensitive Plants***

Whitebark pine is present in one proposed harvest unit in both Action Alternatives. Whitebark pine is not considered a commercial timber species, and no whitebark pine would be harvested under either alternative. Regeneration harvesting would be expected to create conditions suitable for establishment of whitebark pine seedlings. As a result, no negative impacts to whitebark pine are expected under both of the Action Alternatives.

Although small yellow lady's-slipper has been observed near wet areas included within a proposed harvest unit included in both Action Alternatives B and C, those areas would be excluded from harvest through establishment of equipment restriction zones that would protect wetland features and small yellow lady's-slipper habitat from harvest. As a result, no negative impacts to small yellow lady's-slipper are expected under both of the Action Alternatives.

Wavy moonwort is found near roadsides and disturbed areas and impacts from harvesting and associated activities under both Action Alternatives are likely to be beneficial for this species.

Because most sensitive plants present or potentially present in the project area are found in wet areas where harvesting will not occur, no negative effects are expected to sensitive plants under Action Alternatives B or C. If other Species of Concern are encountered within harvest units during the course of operations, mitigations to exclude those areas from harvest and protect populations of plant Species of Concern would be implemented.

### **Cumulative Effects to Sensitive Plants**

- ***Cumulative Effects of All Alternatives to Sensitive Plants***

If changes occur in the water yield or nutrient level, sensitive plant populations may, in turn, be affected. Given the level of the proposed and active harvesting on Swan River State Forest and other lands in the project area, no measurable changes in water yield or surface water levels are anticipated from the proposed action alternatives in Goat, Squeezer, or Soup creeks. No change in nutrient levels would occur due to mitigation measures designed to prevent erosion and sediment delivery. USFS lands, other State managed lands, and private landholdings may have sensitive plant populations on their ownership, and various activities may impact those populations.

## **NOXIOUS WEEDS**

*Issue:* Harvest activities may affect noxious weeds through ground disturbance.

### **Existing Environment**

Spotted knapweed (*Centaurea mauclosa*), yellow hawkweed (*Hieracium caespitosum*), orange hawkweed (*Hieracium aurantiacum*), Canada thistle (*Cirsium arvense*), Bull thistle (*Cirsium vulgare*), oxeye daisy (*Chrysanthemum leucanthemum*), and common St. John's-wort (*Hypericum perforatum*) have become established along road edges in the project area. Swan River State Forest has an ongoing program to reduce the spread and occurrence of noxious weeds.

### **Direct and Indirect Effects to Noxious Weeds**

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

Noxious weed populations would continue as they exist. Weed seed would continue to be introduced by recreational use of the forest and other forest management activities on adjacent ownerships. Swan River State Forest may initiate spot spraying to reduce noxious weed spread along roads under the FI program.

- ***Direct and Indirect Effects of Action Alternatives B and C to Noxious Weeds***

Logging disturbance would provide opportunities for increased establishment of noxious weeds; log hauling and equipment movement would introduce weed seeds from other sites. The occurrence and spread of existing or new noxious weeds would be reduced by mitigation measures in the form of integrated weed-management techniques. Grass seeding of new and disturbed roads and landings, and spot spraying of new infestations would reduce or prevent the establishment of new weed populations. Contractors would be required to wash and have machinery inspected prior to entering the project area to reduce the introduction of noxious weed seeds. Roadside herbicide spraying would reduce existing populations of noxious weeds. All herbicide applications would follow label directions, avoid introduction of chemicals into riparian systems, and target only the intended species of noxious weeds.

### **Cumulative Effects to Noxious Weeds**

- ***Cumulative Effects of No-Action Alternative A to Noxious Weeds***

Salvage logging on state-managed land and activities on adjacent lands would continue to provide opportunities for noxious weeds to become established. Current population levels would continue to exist and may increase over time.

- ***Cumulative Effects of Action Alternatives B and C to Noxious Weeds***

The Action Alternatives, together with other management and recreational activities on Swan River State Forest, would provide an opportunity for the transfer of weed seed and increased establishment of noxious weeds. Preventative actions facilitated by the *Lake County Weed Board* and the active weed-management activities performed by Swan River State Forest would reduce the spread and establishment of noxious weeds, as well as the impacts resulting from the replacement of native species. Swan River State Forest would continue to perform weed management through this action depending on funding levels. The US Forest Service works in conjunction with Swan River State

Forest to treat noxious weeds; therefore, treatment of noxious weeds could be expected on adjacent parcels under their continued weed-management efforts. Private landowners may continue to transfer weed seed through vehicle travel and lack of weed management.

**FOREST CARBON**

*Issue:* Harvest activities may affect forest carbon amounts.

**Existing Environment**

The Total Forest Carbon (*USFS 2023a*) and Above Ground Forest Carbon (*USFS 2023b*) layers contained in the U.S. Forest Service Forest Inventory and Analysis (FIA) program’s Big Data Mapping and Analytics Platform (BIGMAP) was used to assess forest carbon stocks at the scales of the Swan River State Forest and project areas. The Swan River State Forest currently contains an estimated 2,870,330 metric tons (Mt) of total forest carbon, with 891,180 Mt as above ground forest carbon (*TABLE III-24*). The project area currently contains 1,106,939 Mt of total forest carbon, with 344,209 Mt of above ground forest carbon.

**TABLE III - 24 - FOREST CARBON STOCK IN THE SWAN RIVER STATE FOREST AND PROJECT AREAS**

Existing Condition	SRSF	Project Area	Alternative B	Alternative C
	<i>Mt (Metric tons of Carbon)</i>			
Total Forest Carbon	2,870,339	1,106,939	267,337	243,297
Above Ground Forest Carbon	891,108	344,209	85,261	78,011
<b>Post-Harvest Alternative B</b>				
Total Forest Carbon	2,826,994	1,063,594	223,992	
Above Ground Forest Carbon	847,763	300,864	41,916	
Percent Total Forest Carbon Removed	1.5%	3.9%	16.2%	
Percent Above Ground Forest Carbon Removed	4.9%	12.6%	50.8%	
<b>Post Harvest Alternative C</b>				
Total Forest Carbon (Mg C)	2,831,916	1,068,516		204,874
Above Ground Forest Carbon	852,685	305,786		39,588
Percent Total Forest Carbon Removed	1.3%	3.5%		15.8%

Percent Above Ground Forest Carbon Removed	4.3%	11.2%		49.3%
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**Environmental Effects to Forest Carbon**

- ***Direct, Indirect and Cumulative Effects of No-Action Alternative A to Forest Carbon***

Because no harvesting or associated activities would occur under No-Action Alternative A, there would be upwards of 51,799 metric tons (Mt) of unharvested forest carbon retained in the project area. Converting the above ground carbon stock to carbon dioxide using a published wildfire emission factor of 1,596 g/kg (Urbanski, 2013) would release approximately 82,671 Mt of additional carbon dioxide from unmanaged project area biomass proposed for harvest under Alternative C if a wildfire were to burn through project area.

- ***Direct, Indirect and Cumulative Effects of Action Alternatives B to Forest Carbon***

An estimated total of 51,799 Mt of above ground carbon would be harvested under Action Alternative B. Of this, approximately 31,277 Mt would be in logs that are removed from the site, and 20,522 Mt would be in logging slash (TABLE III-25). Burning of logging slash would remove 12,069 Mt that would be released into the atmosphere as carbon dioxide. The total amount of carbon dioxide emissions from slash burning would be 44,255 Mt (TABLE III-26). The remaining 8,454 Mt of carbon in slash would remain on-site for soil nutrient retention or as unconsumed material in slash piles.

Altogether, the proposed timber harvesting under Action Alternative B would remove an estimated 43,345 Mt of carbon from the site, representing 1.5 percent of the total forest carbon and 4.9 percent of the above ground forest carbon on the Swan River State Forest, and 3.9 percent of the total forest carbon and 12.6 percent of the above ground forest carbon in the project area (TABLE III-24).

Other projects currently in various stages of harvesting under the *Wood Lion* and *Lost Napa Multiple Timber Sales* projects would be expected to remove carbon at a similar rate of approximately 1.1 tons of carbon removed per thousand board feet harvested.

**TABLE III - 25 - DISPOSITION OF HARVESTED CARBON (METRIC TONS) UNDER ACTION ALTERNATIVES B AND C**

	Alternative B	Alternative C
Total Harvested Carbon	51,799	46,250
Total Logs	31,277	27,263
Total Slash	20,522	18,987
Slash Piled/Burned	12,069	11,161
Slash Piled/Unburned	635	587
Slash Remaining on-site	7,819	7,239
Total Carbon Removed From Site	43,345	38,423

**TABLE III - 26 - CARBON DIOXIDE EMISSIONS (METRIC TONS) UNDER ACTION ALTERNATIVE B AND C**

	Alternative B	Alternative C
Carbon Dioxide Emissions	44,255	40,926
Carbon Dioxide Emitted per MBF harvested	1.11	1.16

- **Direct, Indirect and Cumulative Effects of Action Alternatives C to Forest Carbon**

An estimated total of 46,250 Mt of above ground carbon would be harvested under Action Alternative C. Of this, approximately 27,263 Mt would be in logs that are removed from the site, and 18,987 Mt would be in logging slash (TABLE III-25). Burning of logging slash would remove 11,161 Mt that would be released into the atmosphere as carbon dioxide. The total amount of carbon dioxide emissions from slash burning would be 40,926 Mt (TABLE III-26). The remaining 7,827 Mt of carbon in slash would remain on-site from return skidding for soil nutrient retention or as unconsumed material in slash piles.

Altogether, the proposed timber harvesting under Action Alternative C would remove an estimated 38,423 Mt of carbon from the site, representing 1.3 percent of the total forest carbon and 4.3 percent of the above ground forest carbon on the Swan River State Forest, and 3.5 percent of the total forest carbon and 11.2 percent of the above ground forest carbon in the project area (TABLE III-24).

Other projects currently in various stages of harvesting under the *Wood Lion* and *Lost Napa Multiple Timber Sales* projects would be expected to remove carbon at a similar rate of approximately 1.1 tons of carbon removed per thousand board feet harvested.

## **GEOLOGY AND SOILS ANALYSIS**

### **INTRODUCTION**

The following document discloses the potential impacts to soil resources within the project area as defined in *CHAPTER 1 – PURPOSE AND NEED FOR ACTION* for each of the 2 alternatives outlined in *CHAPTER II – ALTERNATIVES*. Both Action Alternatives vary by the amount of new and temporary road construction, type and extent of logging system used, and silvicultural prescriptions. All of the variables mentioned above have been shown to result in a range of impacts to soil resources in both magnitude and spatial extent (*DNRC 2009a, 2011*). The following document will analyze each alternative with respect to issues and concerns that were raised internally within DNRC and through public comment and public field tours as described in *CHAPTER 1 – PURPOSE AND NEED, SCOPE OF THIS EIS, ISSUES STUDIED IN DETAIL*.

### **ISSUES AND MEASUREMENT CRITERIA**

The following bulleted issue statements listed below summarizes both internal and public concerns that were identified prior to field review and document development.

- Traditional ground-based harvest operations have the potential to compact and displace surface soils which can reduce hydrologic function, macro-porosity, and aggregate stability. This suite of processes is referred to as soil function.
- Areas of impacted soil function have the potential to increase rates of offsite erosion which may affect productive surface soils.
- Activities associated with the proposed actions such as timber harvest and road construction have the potential to affect slope stability through increased runoff response and road surface drainage concentration resulting in the exceedance of resisting forces on landslide prone hillslopes.
- The removal of large volumes of both coarse and fine woody material through timber harvest reduces the amount of organic matter and nutrients available for nutrient cycling possibly affecting the long-term productivity of the site.
- Repeat entries into a forest stand with heavy equipment has the potential to reinforce existing detrimental soil impacts and cumulatively inhibit soil recovery and soil productivity.

Field reviews, professionally published soils surveys, geologic maps, landscape vegetation data and DNRC soil monitoring data guided data collection of measurement criteria for this analysis. The methods for how this information will be used to disclose impacts can be reviewed in the analysis methods section of this document. The measurement criteria that will be used to assess direct, indirect, and cumulative effects regarding the issues previously listed outlined below (*TABLE III-27*).



**TABLE III - 27 - MEASUREMENT CRITERIA**

GENERALIZED ISSUES	MEASUREMENT CRITERIA	UNITS
Soil Physical Properties	Displacement, Rutting, and Compaction ( <i>Howes et al. 1983</i> )	Percent (%) of area
Erosion	K Factor, Slope, Erosion Risk and Sediment Delivery Efficiency, Rainfall Intensity	K, %, Risk, in/day
Site Nutrients	Volume of coarse and fine woody debris	Tons/Acre
Long Term Productivity	Amount of acres proposed for re-entry, coarse and fine woody debris	Acres, Tons/Acre
Slope stability	Area of existing and proposed new road construction on potentially unstable landtypes.	Acres

### **ANALYSIS AREAS**

The project area consists of 25,436 acres located within Swan River State Forest (Attachment B, Figure B-1). While harvest within each alternative varies by location and intensity as well as by the type and extent of logging systems employed, the common analysis area for direct and indirect effects to soil physical properties, erosion, nutrient cycling and site productivity will include harvest units, log landings, and areas of new and temporary road construction.

Cumulative effects by definition are the collective impacts on the human environment of the proposed action(s) when considered in conjunction with other past, present, and future actions related to the proposed action by location or generic type. For an impact to soil resources to be cumulative they must overlap a least twice in both time and space. Considering this constraint, the cumulative effects analysis area for all proposed alternatives will be the same as that described for direct and indirect impacts above.

### **ANALYSIS METHODS**

It has been displayed through DNRC soil monitoring (*DNRC 2009a, 2011*) that past performance in harvest design, BMP design and implementation and timber sale contract administration are good indicators of expected future results regarding impacts to soil resources. The following soil analysis was designed around this assumption which has been validated through 25 plus years of quantitative soil monitoring conducted by DNRC.

Soil disturbance within harvest units proposed for re-entry were evaluated for current levels of detrimental soil impacts in portions of harvest units with documented historic harvest. The level of existing impacts within these areas, as well as data from soil monitoring results, will be used to forecast potential effects of the proposed actions. Numerous efforts in past DNRC soil monitoring and environmental documents (*DNRC 2009a, 2011*) have explored the natural amelioration rate of compacted soils similar to those found in the project area and this information will also assist in forecasting potential effects.

Erosion will be qualitatively assessed using variables of erosion K factors, erosion risk, sediment delivery efficiency, slope and probability of various rainfall intensities.

Forecasting effects to site nutrient pools will be guided by coarse and fine woody debris data collected throughout both the project area and Swan River State Forest (*Brown 1974*) in various

habitat types and intensities of historic management. This data will be used in concert with scientific literature (*Harvey et al. 1987, Graham et al. 1994, Laiho and Prescott 1999, Harrison et al. 2011*) to not only forecast potential impacts but recommend effective mitigations.

All of the above listed measurement criteria are interconnected and support positive feedback mechanisms with soil biologies. The summation of all the above listed variables, physical, chemical and biological soil properties, create a suite of processes that together control soil productivity and ultimately control forest productivity. The risk of impacts to each measurement criteria will be summarized and qualitatively assessed to forecast potential impacts to the soil resources long-term productivity.

Effective risk management requires assessment of inherently uncertain events and circumstances, typically addressing 2 dimensions: how likely the effect is to occur (probability), and the magnitude the effect would be if it happened (impact) (*Hillson and Hulett 2004*). This method of risk management and communication is employed for all issues throughout this document.

## **RELEVANT AGREEMENTS, LAWS, PLANS, RULES, AND REGULATIONS**

Developed in 1996, the SFLMP is a programmatic plan that outlines the approach and philosophy guiding land-management activities on forested school trust lands throughout the state of Montana (*DNRC 1996*). Within this plan, detrimental soil disturbance is defined and recommends that projects implemented by DNRC should strive to maintain the long-term soil productivity of a site by limiting detrimental soil impacts to 20 percent or less of a harvest area and retain adequate levels of both coarse and fine woody material to facilitate nutrient retention and cycling.

To accomplish these goals and objectives contract stipulations and site specific BMPs are developed to provide protection for soil resources in a project area. The *Forest Management Rules [ARM 36.11.422 (2) (2) (a)]* state that appropriate BMPs shall be determined during project design and incorporated into implementation. *ARM's 36.11.410 through 36.11.414* mandates that adequate coarse woody debris shall be left on site to facilitate nutrient conservation and cycling. To ensure the incorporated BMPs are implemented and site productivity maintained, specific requirements are incorporated into the DNRC timber sale contracts. The following are some general BMPs and mitigations that would be incorporated into the proposed action to ensure adequate soil protection and long-term productivity of the site.

- Limit equipment operations to periods when soils are relatively dry, (less than 20 percent soil moisture), frozen or snow covered (12 inches packed or 18 inches unconsolidated) to minimize soil compaction and rutting and to maintain drainage features.
- Ground-based logging equipment (tractors, skidders, and mechanical harvesters) is limited to slopes less than 45 percent on ridges, convex slopes; and to 40 percent or less on concave slopes without winter conditions.

- The Forest Officer shall approve a plan for felling, yarding and landings in each harvest unit prior to the start of operations in the unit. The locations and spacing of skid trails and landings shall be designated and approved by the Forest Officer prior to construction.
- Levels of coarse and fine woody material will be retained on site as prescribed by the Forest Officer and recommended by the project soil scientist using the best available science (*Graham et al. 1994*). Ten to 15 tons/acre of woody material and upwards of 25 tons/acre, in favorable habitat types or intense silviculture prescriptions, is recommended for the Project Area. Upwards of 35 percent of this volume should be retained as fine woody material (1 to 3 inches) with as much fine needles retained on site as possible.

These general BMPs along with site specific mitigations designed during contract development have been monitored for effectiveness by DNRC since 1988 and have repeatedly been shown to be an effective measure to achieve objectives described in the SFLMP (*DNRC 2009a, 2011*).

## **EXISTING ENVIRONMENT**

This section describes the current conditions and trends of the soil resources within the project area. These conditions, with respect to geology and soils, will serve as the baseline to which environmental effects of the alternatives will be compared.

### ***CLIMATE***

The climate of the Project Area is seasonal and highly variable. The average annual precipitation of 20 to 90 inches in the project area is directly correlated to elevation which ranges from 3,104 to 9,309 feet. Approximately 62 percent of this precipitation is received as snow in winter months from late November to early April although spring rains during May and June also comprise a large portion of annual precipitation. The table below (*TABLE III-28*) provides storm recurrence intervals for the project area along with the associated 24-hour precipitation totals and the probability of such a storm happening in any given calendar year.

**TABLE III - 28 - PRECIPITATION INTENSITY AND RECURRENCE**

<b>RECURRENCE INTERVAL (YEARS)</b>	<b>24 HOUR PRECIPITATION (INCHES)</b>	<b>PROBABILITY OF OCCURANCE PER YEAR (%)</b>
1	1.1	100%
2	1.3	50%
4	1.4	25%
5	1.5	20%
10	1.8	10%
20	2.2	5%
25	2.3	4%
50	2.4	2%

The probability of intense precipitation over short durations can be an analog to erosive events and can help highlight the probability of erosion during such events. It is assumed here that BMP effectiveness would be compromised to varying degrees during a storm with an event probability less than 4 percent.

### **GEOLOGY**

The geology within the project area is dominated by the middle to upper stratigraphic sections of the Ravalli group and conformably above this sequence, the Piegan group, both Precambrian in age. The only formation within the Ravalli group exposed in the project area is the poorly exposed Spokane formation. This formation is thinly bedded to laminated, red to maroon-gray, coarse-grained argillite and siltites (MBMG 2004). The Spokane formation is relatively resistant to weathering and is a fair nutrient source for soils (Johnson and Garrison-Johnston 2007).

Basal sections of the Piegan group include the Helena Formation which dominates outcrops in higher elevations of the project area. This formation is characterized by cyclic bedding, forming bands of gray to black argillite or gray dolomitic siltite that weathers to a tan color, alternating with dense limestone that weathers to orange-brown (MBMG 2004). Moderately resistant to weathering, the mineralogy of this formation makes for a poor source of soil nutrients required for tree growth (Johnson and Garrison-Johnston 2007).

During the Laramide orogeny, a period of mountain building in western North America, which started in the Late Cretaceous, 70 to 80 million years ago, and ended 35 to 55 million years ago, the Swan Valley was formed through block faulting along the Swan fault on the eastern margins of the valley. This period of uplift is responsible for the dramatic relief observed today along the Swan front and more gradual grades of the headwall dipping to the east in the southern Mission Mountains.

### **LANDFORM AND SOILS**

The landforms and valley morphology observed today in the Swan Valley are largely a result of glacial and fluvial processes working in concert to erode, transport and redeposit sediment. Two large scale continental glacial advances and recessions have helped to transport the

massive glacial till deposits we observe today in the form of moraines, eskers, outwash plains and numerous other glacial features. Since the end of the Pinedale Glaciation, approximately 15,000 years ago, massive alpine glaciers had advanced and receded through the Swan Valley ultimately resulting in the numerous lakes and glacial outwash deposits at canyon mouths along the Swan and Mission mountains.

In general, the soils within the project area adjacent to the valley floor include deep alluvial and glacial deposits on low grades. Wetland or hydric soils have been identified adjacent to kettle lakes, areas consistently inundated by flood waters and areas influenced by beaver activity. Shallow bedrock and high rock content residual soils are found on glacial scoured ridges while valley hillslopes have moderate to deep glacial till deposits with cobble silt loam subsoils. In total, 21 individual landtypes have been mapped in the project area. For further discussion of the landtype attributes and locations refer to *ATTACHMENT B, TABLE B-1* and *FIGURE B-1*, respectively.

Erosion and sediment delivery efficiency is based on slope and soil erosion K factor. The risk of erosion is described as slight, moderate, high, or severe (*Hansen 2004*). A rating of low indicates that erosion is unlikely under ordinary climatic conditions; moderate indicates that some erosion is likely and that erosion-control measures may be needed; high indicates that erosion is very likely and that erosion control measures including revegetation of bare areas are advised; and severe indicates that substantial erosion is expected, loss of soil productivity and off-site damage are likely, and erosion-control measures are costly and generally impractical (*Hansen 2004*). Sediment delivery efficiency refers primarily to landform slope the map unit is located on and the proximity of the map unit with respect to water features. Soil map units associated with upland environments or on ridges are typically inefficient at transporting sediment to water features when compared to those associated with riparian or streambank map units. The table below (*TABLE III-61*) presents terrain slope within the project area as well as the individual alternatives. Upwards of 85% of each alternative is under 40% slope which indicates the project area is largely a low energy environment. Steep, continuous hillslopes, while present in the project area, comprise a very small percentage of the project area land base but have significant potential energy in terms of erosive power (*Carson and Kirby 1972*). These steep, mid to upper hillslope positions are typically considered areas of sediment production and transport regarding hillslope processes, but also employ the lowest impact harvest systems. These areas, generally >50% slope, comprise less than 5% of each alternative within project area.

**TABLE III - 29 - SLOPE CLASS DISTRIBUTIONS**

SLOPE CLASS(%)	PROJECT AREA			ANALYSIS AREA - ALT. B			ANALYSIS AREA - ALT. C		
	ACRES	PROJECT AREA (%)	CUMULATIVE TOTAL (%)	ACRES	Alt B (%)	CUMULATIVE TOTAL (%)	ACRES	Alt C (%)	CUMULATIVE TOTAL (%)
0-10%	14,136	55.6%	55.6%	2,792	53.3%	53.3%	2,637	54.2%	54.2%
11-20%	4,819	18.9%	74.5%	1,279	24.4%	77.8%	1,092	22.5%	76.7%
21-30%	1,556	6.1%	80.6%	317	6.1%	83.8%	289	5.9%	82.7%
31-40%	1,130	4.4%	85.1%	178	3.4%	87.2%	173	3.6%	86.2%
41-50%	1,338	5.3%	90.3%	280	5.3%	92.6%	280	5.8%	92.0%
51-60%	1,175	4.6%	95.0%	225	4.3%	96.8%	225	4.6%	96.6%
>60%	1,282	5.0%	100.0%	165	3.2%	100.0%	165	3.4%	100.0%

A common feature to all soil map units within the project area, though spatially explicit, is the influence of volcanic ash. Volcanic ash from eruptions along the Pacific Northwest Cascade Range has significantly influenced forest soil productivity in the Inland Northwest (*Mullineaux 1996; Shipley et al. 1983*) and particularly the project area. Soils influenced by volcanic ash have lower bulk densities, higher porosities, high cation exchange capacity and higher water infiltration and retention (*Shoji et al. 1993*) as well as reduced stress to plant growth during droughty conditions. Very low bulk density values are consistent with ash influenced surface soils. Ash thickness in the project area has been observed to range from a few inches to 6 to 8 inches in favorable aspects.

#### **HISTORIC HARVEST AND RELEVANT MANAGEMENT ACTIONS**

Since the 1920's the Swan River State Forest has been actively managed for timber production. The majority of timber harvest in these early periods involved select cutting of only the most merchantable timber. Timber was typically hand felled and skidded with horses until mechanized equipment was employed. Impacts to soil resources prior to the late 1950s are assumed to be ameliorated except for the most heavily impacted skid trails, which comprise a very low percentage of the analysis area.

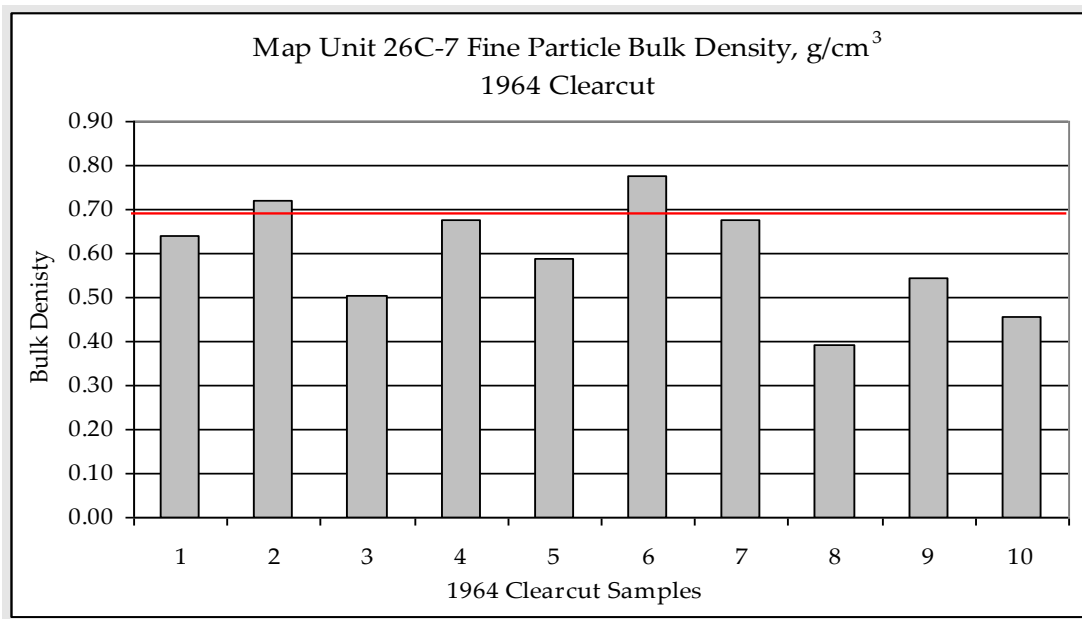
Accurate inventory and record keeping from the 1960s to the present enables a more analytical analysis of past soil resource impacts. As previously shown in *FIGURE III-6*, four distinct and

pronounced periods of timber harvest have occurred on the east side of the Swan River State Forest including the 1960s, the 1980s, the early 2000s (Three Creeks, Scout Lake). The most recent timber harvest is ongoing with the completion of sales from the Lost Napa timber sale projects.

Soil samples were collected within a historic harvest unit representative of the stands that were harvested in the 1960's. Results show no pronounced differences between average bulk density values when compared to an un-entered stand on similar soils. The results of these data indicate that past soil resource impacts have naturally ameliorated within this harvest unit due to the moist climatic conditions found in the project area, long periods of freeze-thaw climatic conditions, and root penetration from ground vegetation and the regenerating stand (FIGURE III-4).

We can further extrapolate these point measurements to the whole harvest unit by examining random transects that were placed throughout the unit to monitor soil disturbance. Using 5 transects and 500 sample points, the level of compaction within this historic harvest unit was estimated at 1.6% of the 18.3-acre unit. Furthermore, it was estimated that on average 4.2% of the unit was considered detrimentally impacted by either displacement or compaction. No erosion was observed within this historic harvest unit. This information is critical when considering the temporal aspect of soil impacts from implementing the proposed actions of this project and will be referenced later in this document when considering environmental consequences.

**FIGURE III - 4 - SOIL PHYSICAL PROPERTIES WITHIN A 1964 HARVEST UNIT**



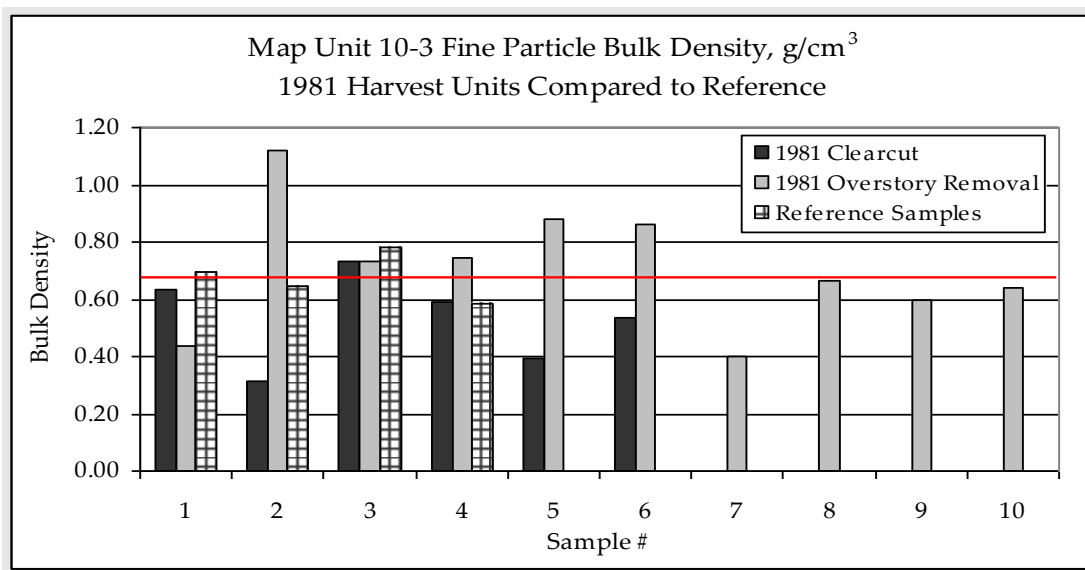
A similar methodology was employed on two sites that were harvested in 1981 by different silvicultural prescriptions. One unit was clearcut and one unit received an over-story removal

treatment. Data from bulk density samples collected from each unit and their associated reference sample is presented above in *FIGURE III-4*. The red line within the figure indicates the average bulk density values from reference soil samples of soil map unit 26C-7.

Impacts from historic harvests from 1981 can still be observed in the physical soil properties within the overstory removal harvest unit through slightly elevated bulk density values as shown below in *FIGURE III-5*. Bulk density values within the clearcut are at or below average reference values (depicted by red line). The values presented below could be attributed to the site preparation methods used for the clearcut unit as compared to the overstory removal unit. In a regeneration harvest, it is common practice to scarify the forest floor to encourage natural regeneration of the stand. This was commonly accomplished with a brush rake attached to a skidder. This practice would have aided compacted areas to recover more rapidly when compared to the overstory removal unit where scarification was not an objective.

Extrapolating these point measurements to the 45-acre overstory removal harvest unit through randomly placed transects indicated that disturbance levels were slightly higher in the 1981 harvest unit than those observed in the clearcut from 1964. Overall, 10.7% of the unit was observed to be compacted through knife probing. Displacement of surface soils was observed on an additional 3.7% of the unit totaling 14.4% of the unit recovering from detrimental soil impacts from the 1981 harvest. Again, these data provide an excellent insight into natural recovery rates for soil impacts within the Project Area, are useful when describing the existing conditions of the soil resources and provide helpful insight for forecasting probable impacts for each Action Alternative.

**FIGURE III - 5 - SOIL PHYSICAL PROPERTIES WITHIN A 1981 HARVEST UNIT**

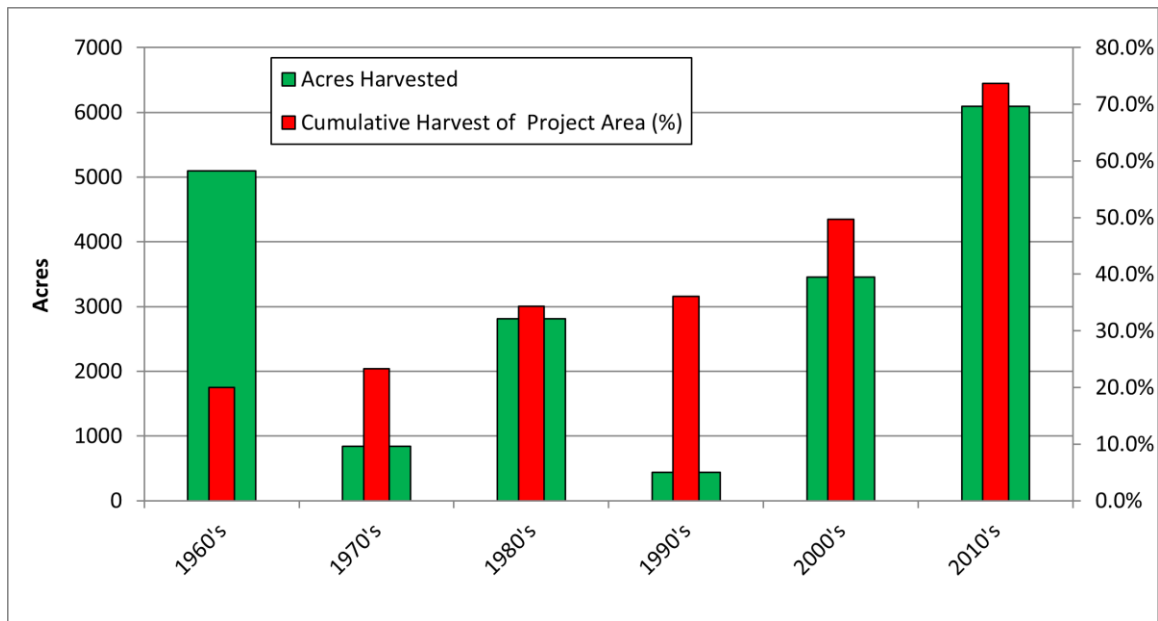


The most recent large timber sale within the east side of the Swan River State Forest was the Lost Napa timber sale projects. Soil monitoring was conducted on three individual timber sales



in the summer of 2012. The landtypes that soil monitoring was conducted on within these timber sales were similar to landtypes 27-7, 26C-8 and 26C-9 within the Squeezer Meadow Analysis Area. Monitoring results showed total detrimental impacts to range from 12.0% to 17.2% of the site. No erosion was noted within the harvest unit. Compaction was not physically measured but was noted to be low except on main skid trails and landings. Harvest operations were conducted when soil moisture conditions were dry, slopes within the unit were moderate and no departures from BMPs were noted. These data help to show the effectiveness of DNRC contract administration process, site-specific mitigation and BMPs that are incorporated into timber sale contracts.

**FIGURE III - 6 - SQUEEZER MEADOW PROJECT AREA HISTORIC HARVEST**



Under Action Alternative B approximately 2,889 acres are proposed for re-entry and under Action Alternative C approximately 2,756 acres are proposed for re-entry. Most of these acres are stands that were cut prior to 1990. Proposed re-entry of more recently (since 1990) harvested stands would consist mainly of overstory removal treatments where the original prescription was regeneration harvest. The stands in these previously harvested areas are fully stocked but have evidence of historic skid trails. It was estimated that less than 5 percent of these acres had detrimental soil conditions from previous entries.

**NUTRIENT CYCLING AND SITE PRODUCTIVITY**

Coarse and fine woody debris and the organic forest floor provide a critical role in all forested ecosystems through nutrient cycling, microbial habitat, moisture retention and protection of the forest floor and mineral soil from erosion (*Harmon et al. 1986*). Coarse woody debris decays at various rates and is largely dependent on local climatic conditions with the degree of decay directly related to the service it provides to the ecosystem. Coarse wood in advance stages of

decay contains many nutrients (sulfur, phosphorous, and nitrogen), provides important sites for non-symbiotic nitrogen fixation (*Larson et al. 1978, Wicklow et al. 1973*) and can hold large volumes of moisture for vegetation during dry periods.

Forest management can affect the volumes of both fine and coarse woody debris through timber harvest resulting in changes (both positive and negative) to site nutrient pools necessary for the long-term nutrient demands of the forest, and, thus, long-term productivity of the site. The data presented below (*TABLE III-30*) were collected from 187 randomly oriented transects in previously managed stands with various silviculture prescription throughout Swan River State Forest. Similar to soil disturbance, as harvest intensity increases coarse and fine woody debris retention can decrease if not properly mitigated. This data helps to forecast proper woody debris retention mitigations in concert with proposed logging systems and prescriptions within each Action Alternative.

**TABLE III - 30 - COARSE WOODY DEBRIS VOLUMES BY PRESCRIPTION.** *Swan River State Forest.*

PRESCRIPTION	SAMPLE SIZE	PROPOSED ACRES (ALT B/ALT C)	AVERAGE (TONS/ACRE)	FWD RATIO*
Clearcut	61	0/0	11.7	0.39
Seed Tree	35	1,584/1,796	11.7	0.36
Overstory Removal	34	649/649	15.2	0.37
Shelterwood	12	210/88	15.3	0.41
Commercial Thin	19	206/227	17.5	0.44
Salvage	9	0/0	21.4	0.31
Selection	17	0/0	26.7	0.42

\*FWD Ratio = FWD/Total Woody Material (FWD = fine woody debris)

The data presented below (*TABLE III-31*) was also collected from the same transects but has been stratified by various habitat types within the Project Area. These results show that the volume of coarse woody debris in the project area are consistent with the recommendations made by *Graham et al. (1994)* to support soil biologics and moisture retention objectives.

**TABLE III - 31 - COARSE WOODY DEBRIS VOLUMES BY HABITAT TYPE.**

HABITAT TYPE	SAMPLE SIZE	AVERAGE (TONS/ACRE)	GRAHAM ET AL. (1994) (TONS/ACRE)
Douglas-fir	1	6.8	12-24
Grand Fir	22	16.2	7-14
Spruce	1	18.3	n/a
Subalpine fir	24	20.8	11-23
Western Red Cedar	16	21.9	16-33

Prescriptions for nutrient and slash management for both Action Alternatives would use the data collected during field reconnaissance in concert with those recommended in the literature (Graham et al. 1994).

### **SLOPE STABILITY**

Slope stability is the ability of material on a slope to remain in equilibrium (stable) and, therefore, represents some balance between driving forces (shear stress) and resisting forces (shear strength). Many variables, both natural and/or anthropogenic, may affect either driving or resisting forces. For a slope to be considered unstable driving forces and resisting forces must be close to unity. Factors affecting these forces include slope, parent material, vegetation, and precipitation. While landslides and mass movements are a dominant geomorphic agent and landscape evolution process in certain areas of the country, it is not a commonly observed process in northwest Montana.

Both the *Flathead National Forest Land System Inventory* and DNRC soil surveys do not identify specific landtypes in the project area with a high risk of mass failure. During field review, small areas adjacent to locations of new road construction were identified as sensitive areas where management actions may affect slope equilibrium and the possibility of slope failure if not adequately mitigated. These areas were avoided if possible and where avoidance was not possible, mitigation measures focused on the road construction practices were identified to reduce the risk of failure.

### **ENVIRONMENTAL EFFECTS**

This section will disclose the direct, indirect, and cumulative effects of all proposed action alternatives. Direct and indirect environmental effects common to both alternatives will be summarized and then followed by effects unique to each alternative. Cumulative effects will be summarized by alternative and will be presented in the section titled *CUMULATIVE EFFECTS BY ALTERNATIVE* immediately following direct and indirect effects.

### **OVERVIEW**

Past soil monitoring on DNRC timber projects conducted on soils similar to those found in the project area allows informed forecasting of potential effects to soils under each Action

Alternative. *TABLE III-32* presents soil monitoring projects completed by DNRC since 1987 that were conducted within the boundaries of the *Flathead National Forest Land System Inventory* (Martinson et al. 1999).

Soil monitoring of the Coal Creek Timber Sale in 1987 documented the highest level of soil disturbance on state lands and it should be noted that operations were conducted prior to BMP implementation. While these values are excessive, much was learned from these old practices and, thus, is still relevant. The average value of total impacts from all projects will be used to forecast detrimental effects for tractor logging units within each alternative along with a potential range of impacts. The range of impacts will include values within one standard deviation of the sample mean.

**TABLE III - 32 - SOIL MONITORING PROJECTS RELAVANT TO THE PROJECT AREA**

PROJECT NAME	YEAR	MAP UNITS	AVERAGE SLOPE (%)	PRESCRIPTION	EQUIPMENT	SEASON	TOTAL DETRIMENTAL
Coal Creek; Unit 5	1987	26C-8*	23%	Seed Tree	Ground Based	Winter	19.1
Coal Creek; Units 8,9,10	1987	73*	31%	Seed Tree	Ground Based	Summer/Fall	34.2
Goat Rot Hill; Unit 2	1989	26A-9*	15%	Clear Cut	Ground Based	Summer	10.2
South Wood #2; Unit 2	1991	23-9*	29%	Commercial Thin	Ground Based	Summer	8.1
Lower Stillwater #2; Units 2,6	1991	28-7, 26G-7	7%	Clear Cut	Ground Based	Winter	7.7
Chicken Werner; Unit 10	2003	26C-8	37%	Seed Tree	Ground Based	Summer	8.0
Dog Meadow North; Unit 9	2006	26C-8	10%	Seed Tree	Ground Based	Summer/Fall	21.2
Shorts Meadow; Unit 6,9	2010	27-7	29%	Seed Tree	Ground Based	Summer	1.8
White Donut	2011	27-7	16%	Seed Tree	Ground Based	Summer/Fall	12.0
White Porcupine #1	2012	26C-9*	27%	Clear Cut	Ground Based	Summer/Fall	17.2
White Porcupine #2	2012	26C-8	32%	Seed Tree	Ground Based	Summer	16.3
*Denotes map units within the Squeezer Meadow analysis area							14.2%

It has been shown that cable logging systems create less soil disturbance than ground-based systems (Allen et al. 1999; Aulerich et al. 1974; Cromack et al. 1978; DNRC 2009a, 2011) and thus, it would be inappropriate to apply a soil disturbance rate from ground based systems to cable or skyline systems. DNRC has conducted soil monitoring on seven harvest units that employed cable logging systems and found that ground disturbance values average 7.0 percent of the unit and range from 2.3 percent to 11.4 percent (DNRC 2011). The results of these finding will be applied to all cable harvest units when predicting potential soil impacts. All cable harvest monitoring projects were completed after full implementation of BMPs and are assumed to be reflective of current forest practices. Due to this, the observed range of impacts will be used to forecast potential soil impacts and not the standard deviation as in ground-based forecasts.

### **Direct and Indirect Effects**

- ***Direct and Indirect Effects of No-Action Alternative A***

Under the No-Action Alternative A, timber harvesting or road construction would be deferred. No harvest units would be entered or re-entered resulting in no new detrimental soil impacts. Erosion and sediment production from proposed harvest units would continue to be stable and mimic natural base erosion rates. Nutrient pools would continue to accumulate with additional inputs from the surrounding forest stands. Data collected during project development, information gained from past DNRC soil monitoring projects and from the research community show that the soils within the project area will continue on a stable or increasing trend with regard to productivity and soil function. No adverse direct or indirect effects to soils resources would occur under this alternative.

- ***Direct and Indirect Effects Common to Action Alternatives B and C***

#### **Erosion**

Under both Action Alternatives, the potential for upland erosion and transport within actual harvest unit boundaries would be moderate based on field observation of past projects, DNRC-monitoring data, moderate erosion rates and generally steep slopes in harvest units. Observed erosion is typically limited to compacted locations where organic matter, vegetative cover and surface soils have been most disturbed and the hydrologic function of the soil has been limited. These locations are usually found on main skid trails, cable corridors and at log landings. On these impacted sites the potential for erosion is a function of the soil texture, severity of impacts and rainfall intensity. Erosion risk and sediment delivery efficiency has been summarized by soil map unit can be found in ATTACHMENT B, TABLE B-1. In general, steep impacted sites are most prone to erosion and offsite transport. Due to the moderate risk of erosion and low probability of high rainfall intensity, impacted areas can be mitigated with standard erosion control measures. These include providing temporary vegetative cover with logging slash, installing drainage features on landings and main skid trails and mechanically ripping heavily impacts sites to assist the hydrologic recovery of

compacted soils. Considering all these factors, a moderate probability of low-level effects to soil productivity resulting from off-site erosion is expected as a result of implementing either Action Alternative. Sediment production and erosion are not expected to generate measurable differences under either Action Alternative.

#### **Slope Stability**

There would be a moderate risk for actions proposed under both Action Alternatives to increase the risk of slope instability during and after project implementation. This risk would be short in duration measured by the time it would take for a harvest unit and/or road cut or fill slope to revegetate. Sensitive sites prone to mass failure were identified during field review and would have silvicultural prescriptions designed to minimize the effect to slope stability by minimizing canopy removal and thus hydrologic response during precipitation events.

Cut and fill slopes of new road construction could potentially slough and be difficult to revegetate. Numerous mitigation measures as well as engineering and construction techniques such as increased site drainage, cut and fill slope stabilization, and full bench construction can be applied to potentially unstable slopes to achieve a stable road prism. These techniques would be incorporated as necessary into the timber sale contract. The mitigations and techniques mentioned above are very general in nature but provide the basic concepts that would be adapted into site specific designs. With mitigation measures applied, both Action Alternatives present a moderate risk of slope instability.

#### **Nutrient Cycling and Long-Term Soil Productivity**

Both Action Alternatives would have a low probability of low-level impacts for a short duration (15 to 20 years) to site nutrient pools and long-term soil productivity. The removal of nitrogen, potassium, and sulfur along with other micronutrients from the site through timber harvest would be mitigated by mimicking volumes of coarse and fine woody material found throughout the project area (*TABLE III-31*). The volume of coarse and fine woody material retained on site would vary by habitat type and silvicultural prescription but would typically range from 10 to 25 tons per acre as recommended by *Graham et al. (1994)*.

- ***Direct and Indirect Effects Unique to Action Alternative B***

#### **Soil Physical Properties**

Under Action Alternative B approximately 5,236 acres would be harvested from the project area and 5.3 miles of permanent road would be constructed. Tractor (87 percent) and cable (13 percent) yarding systems would be used to extract the timber. Permanent roads would change the land use of the affected area from forest products to transportation. *TABLE III-33* presents the approximate number of acres that would be disturbed and the expected range detrimental soil effects.

**TABLE III - 33 - SOIL DISTURBANCE FROM ACTION ALTERNATIVE B**

HARVEST SYSTEM	ACRES/ MILES	SOIL IMPACT RATE		IMPACTED AREA	
		AVERAGE (%)	RANGE (%)**	AVERAGE (ACRES)	RANGE (ACRES)
Tractor	4,535	14%	5.4 – 23.0	634.9	244.9 – 1,043.1
Cable	701	7%	2.3 – 11.4	49.1	16.1 – 79.9
New Road Construction	5.3	100%		25.7	25.7
Analysis Area; Acres of Expected Impacts		13.6%	5.5 – 21.9%	709.7	286.7 – 1,148.7
* New road construction assumes a clearing limit average of 40 feet					
** Range of impacts assumes one standard deviation of the average rate and summarized as a weighted average					

The level of soil disturbance forecasted from harvest activities under Action Alternative B is below the recommended amount outlined in the SFLMP (DNRC 1996) and will result in more disturbance than Action Alternative C. In total, 13.6 percent of harvest units/roads and 2.8 percent of the land in the gross project area would have compromised soil function of varying degrees within the analysis area and the project area, respectively. Action Alternative B presents a high probability of low to moderate level impacts to soil physical properties within the analysis area for moderate durations (80 to 100 years). Long-term soil productivity is expected to be maintained at levels described in the *EXISTING ENVIRONMENT* and within the SFLMP (DNRC 1996).

- ***Direct and Indirect Effects Unique to Action Alternative C***

**Soil Physical Properties**

Under Action Alternative C approximately 4,861 acres would be harvested within the project area and 5.3 miles of permanent road would be constructed. Tractor (86 percent) and cable (14 percent) yarding systems would be used to extract the timber. TABLE III-34 presents the approximate number of acres that would be disturbed and the expected range of detrimental soil effects.



**TABLE III - 34 - SOIL DISTURBANCE RESULTING FROM ACTION ALTERNATIVE C**

HARVEST SYSTEM	ACRES/ MILES	SOIL IMPACT RATE		IMPACTED AREA	
		AVERAGE (%)	RANGE (%)**	AVERAGE (ACRES)	RANGE (ACRES)
Tractor	4,160	14%	5.4 – 23.0	582.4	224.6 – 956.8
Cable	701	7%	2.3 – 11.4	49.1	16.1 – 79.9
New Road Construction	5.3	100%		25.7	25.7
Analysis Area; Acres of Expected Impacts		13.5%	5.5 – 21.9%	657.2	266.4 - 1,062.4
* New road construction assumes a clearing limit average of 40 feet					
** Range of impacts assumes one standard deviation of the average rate and summarized as a weighted average					

The level of soil disturbance forecasted from harvest activities under Action Alternative is below the recommended amount outlined in the SFLMP (DNRC, 1996) and would result in less disturbance than Action Alternative B. In total, 13.5 percent of harvest units/roads and 2.6 percent of the land in the gross project area would have compromised soil function of varying degrees within the analysis area and project area, respectively. Action Alternative C presents a high probability of low to moderate level impacts to soil physical properties within the analysis area. Long-term soil productivity is expected to be maintained at levels described in the existing conditions within the SFLMP (DNRC 1996).

**Cumulative Effects**

As mentioned previously, for a proposed action to have cumulative effects to soil resources the action must overlap a previous or potential future action. The overlap refers to both the harvest unit in question and 2 points in time. The following paragraphs summarize cumulative effects by each alternative.

- ***Cumulative Effects of No-Action Alternative A***

Under No-Action Alternative A, no timber harvesting or road construction would be implemented. No new impacts to the soil resources would be expected and soil productivity trends would continue on a stable to upward trend resulting from continual amelioration of past soil impacts within harvest units, but not previously constructed permanent roads. Nutrient cycling would continue as both coarse and fine woody materials decay and are incorporated into the soil profile as organic matter and soil wood. Potential future forest management actions within the stands selected in each alternative are foreseeable, but the design and objectives of future projects is impractical to predict. Small sanitation, salvage and firewood permits would continue to be offered within the project area under No-Action Alternative A. If stands within the project area are re-entered in potential future projects or permits, historic skid trails and landings

would be reused and all relevant BMPs and mitigations would be included into project design to minimize the potential of cumulative effects.

- ***Cumulative Effects of Action Alternative B***

Under Action Alternative B, a total of 2,889 acres that have had past-management activities since the 1960's would be re-entered. All observed impacts in these stands were solely isolated to historic skid trails and temporary roads, which was estimated to be less than 20 percent of the area. These impacted trails and roads would again be used under the proposed action and existing impacts would be reinforced, slowing natural amelioration rates. Additional impacts would also be expected, but with primary skid trails already established, cumulative soil impacts are expected to remain below 20 percent of the harvest area as recommended by the SFLMP. Assuming BMPs and general mitigations outlined in this document are applied, the long-term productivity of the site is expected to be maintained. Action Alternative B presents a low risk of moderate cumulative effects to soil physical properties that would be expected to ameliorate within a stand rotation. Action Alternative B presents more risk for cumulative effects to soil function than Action Alternative C.

No harvest units proposed for re-entry under Action Alternative B were observed to contain areas of chronic erosion. All past impacted areas have revegetated naturally and have returned to their natural base erosion rates. No cumulative effects from erosion and slope stability within the analysis area are expected.

There would be a moderate probability of low level cumulative effects to nutrient pools within the re-entered stands under Action Alternative B. In general, stands currently contain adequate levels of both fine and coarse woody material. If a stand's nutrient retention levels were mismanaged in the past, the re-entry allows DNRC to better manage site nutrients through woody debris retention that mimics the amount found in similar habitat types and as recommended *Graham et al. (1994)*.

In summary, actions within Action Alternative B present a low probability of low level cumulative effects to soil productivity in the 2,889 acres proposed for re-entry. In proposed harvest areas not previously entered, cumulative effects to soil productivity would be the same as those reported in the direct and indirect effects analysis.

- ***Cumulative Effects of Action Alternative C***

Under Action Alternative C, a total of 2,756 acres would be re-entered that have had past-management activities since the 1960s. All observed impacts in these stands were solely isolated to historic skid trails and temporary roads, which was estimated at less than 20 percent of the area. These locations would be reused under the proposed action and existing impacts would be reinforced, slowing natural amelioration rates. Additional impacts would be expected, but with primary skid trails already established,

cumulative soil impacts are expected to remain below 20 percent of the harvest area as recommended by the SFLMP. Assuming BMPs and general mitigations outlined in this document are applied, the long-term productivity of the site is expected to be maintained. Action Alternative C presents a low risk of moderate cumulative effects to soil physical properties that would be expected to ameliorate within a stand rotation. Action Alternative C presents less risk of cumulative effects to soil function than Action Alternative B.

No historically managed sites within the project area were observed to contain chronic erosion features. All past impacted areas have revegetated naturally and have returned to their natural base erosion rates. No cumulative effects from erosion and slope stability within the analysis area are expected.

There would be a high probability of low level cumulative effects to nutrient pools within the re-entered stands under Action Alternative C. In general, stands currently contain adequate levels of both fine and coarse woody material averaging approximately 15.5 tons/acre. The variability observed within the dataset can largely be described by habitat type and to a lesser degree, silviculture prescription, with ranges from 1 to 32 tons/acre. If a site's nutrient retention levels were mismanaged in the past, the re-entry allows DNRC to better manage site nutrients through woody debris retention that mimics the amount found in similar habitat types and as recommended *Graham et al. (1994)*.

In summary, actions within Action Alternative C present a low probability of low level cumulative effects to soil productivity in the 2,756 acres proposed for re-entry. In proposed harvest areas not previously entered, cumulative effects to soil productivity would be the same as those reported in the direct and indirect effects analysis.

## **WATERSHED AND HYDROLOGY ANALYSIS**

### **INTRODUCTION**

#### ***PROJECT AREA AND PROJECT ACTIVITIES***

The gross Project Area (see *CHAPTER 1 – PURPOSE AND NEED* for Project Area) includes 25,436 acres within Swan River State Forest. Affected watersheds include the Cilly Creek, Soup Creek, Goat Creek, Squeezer Creek and Swan River Drainages watersheds in the Swan River watershed. Each of these watersheds includes land managed by the Flathead National Forest and the DNRC. There are also areas outside of the watersheds listed that are included in the proposed Project Area. The proposed Action Alternatives would include a combination of ground based and cable yarding methods to harvest timber on a range of acres from 4,861 to 5,236 within the Project Area. Infrastructure for the proposed action would involve the construction of approximately 5.3 miles of new temporary and permanent road to access proposed harvest areas. All proposed road construction would be done outside of the SMZs.

#### ***RESOURCE DESCRIPTION***

Water yield and sediment delivery will be assessed in this analysis. Annual water yield increases and changes to timing and magnitude of peak flows can affect channel stability if dramatically altered, and sediment delivery from both in-channel and introduced sources is a primary component of overall water quality in a watershed.

### **ISSUES AND MEASUREMENT CRITERIA**

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

#### ***SEDIMENT DELIVERY***

Sediment delivery can be affected by timber harvesting and related activities, primarily through road construction. These activities can lead to water-quality impacts by increasing the production and delivery of fine sediment to streams. Construction of roads, skid trails, and landings can generate and transfer substantial amounts of sediment through the removal of vegetation and exposure of bare soil. In addition, removal of vegetation near stream channels reduces the sediment-filtering capacity and may reduce channel stability and the amounts of large woody material. Large woody debris is a very important component of stream dynamics, creating natural sediment traps and energy dissipaters to reduce the velocity and erosive power of stream flows. Other aspects of sediment analysis, such as sediment storage and transport, can also be found in the *FISHERIES ANALYSIS* portion of this document.

Measurement Criteria: Tons of sediment delivery per year using procedures adapted from the *Washington Forest Practices Board (Callahan 2000)*. Sediment from harvesting activities and vegetative removal will be analyzed qualitatively through data collected in the BMP audit process along with information found in the *GEOLOGY AND SOILS* portion of this document.

### ***WATER YIELD***

Water yield can be affected by timber harvesting and road construction. These activities can affect the timing, distribution, and amount of water yield in a harvested watershed. Water yields tend to increase proportionately to the percentage of canopy removal (*Haupt et al. 1976*), because removal of live trees reduces the amount of water transpired, leaving more water available for soil saturation and runoff. Canopy removal also decreases interception of rain and snow and alters snowpack distribution and snowmelt, which lead to further water yield increases. Higher water yields may lead to increases in peak flows and peak-flow duration, which can result in accelerated streambank erosion and sediment deposition. Vegetation removal can also reduce peak flows by changing the timing of snowmelt. Openings will melt earlier in the spring with solar radiation and have less snow available in late spring when temperatures are warm. This effect can reduce the synchronization of snowmelt runoff and lower peak flows.

Measurement criteria: Equivalent Clearcut Acres (ECA) and percent water yield increase. All past and proposed timber-management activities are converted to ECA using procedures outlined in *Forest Hydrology Part II (Haupt et al. 1976)*. Peak flow duration and timing will be addressed qualitatively.

## **ANALYSIS AREAS**

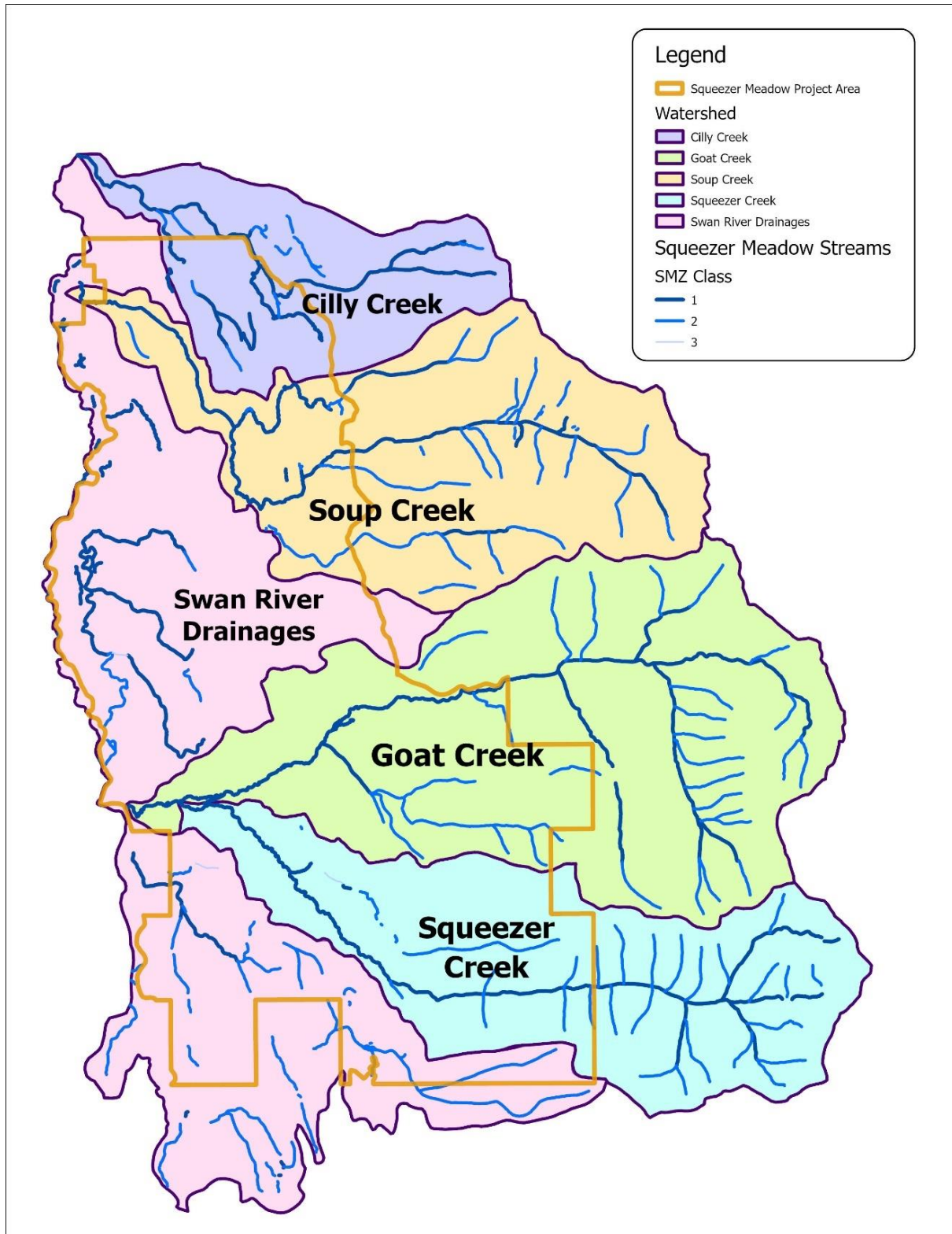
### ***SEDIMENT DELIVERY***

Direct, indirect, and cumulative effects to sediment delivery will be analyzed in each of the 5 Project Area watersheds listed in the *PROJECT AREA* and *PROJECT ACTIVITIES* portion of this analysis. A quantitative analysis will be completed on Cilly Creek, Soup Creek, Goat Creek and Squeezer Creek. A qualitative analysis will be used in the Swan River Drainages analysis area since the streams are discontinuous and do not have a single point of confluence. All existing and proposed road construction activities related to the Project Area on all ownership within each Project Area watershed will be analyzed. These watersheds were chosen as an appropriate scale of analysis for the *Washington Forest Practices Board* method and will effectively display the estimated impacts of proposed activities. Additional sites not located within the Project Area watershed boundaries will be assessed qualitatively for their potential to affect downstream water.

### **WATER YIELD**

Direct, indirect, and cumulative effects to water yield will be analyzed in the Cilly Creek, Soup Creek, Goat Creek and Squeezer Creek watersheds listed in the *PROJECT AREA* and *PROJECT ACTIVITIES* portion of this analysis. A map of the Project Area watersheds and their relation to the proposed Project Area is found below (*FIGURE III-7*). All existing activities on all ownerships and proposed activities related to the Project Area, including road construction, within each Project Area watershed will be analyzed using the ECA method to estimate the changes in average annual water yield that may occur as a result of the proposed project. These watersheds were chosen as an appropriate scale of analysis for the ECA method and will effectively display the estimated impacts of proposed activities. A qualitative assessment of water yield will be done for Swan River drainages analysis area listed in the *PROJECT AREA* and *PROJECT ACTIVITIES* portion of this analysis.

**FIGURE III - 7 - PROJECT AREA WATERSHEDS.** Map of Project Area watersheds.



## **ANALYSIS METHODS**

Analysis methods for cumulative effects include all proposed DNRC activities and planned actions on other ownerships. However, potential future management on other ownerships was not considered due to the speculative nature of predicting the intentions of other landowners. For a complete list of past activities considered in this analysis, please refer to *CHAPTER I, SCOPE OF THE EIS – RELEVANT PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS*. Each of the analyses below was conducted on a watershed basis, and included activities on all roads and acres, regardless of ownership.

### **SEDIMENT DELIVERY**

Analysis methods to assess sediment delivery consisted of a sediment-source inventory. All roads and stream crossings within Project Area watersheds were evaluated to determine sources of introduced sediment. Data was collected between 2019 and 2022 to estimate quantities of sediment delivery from roads using procedures adapted from the *Washington Forest Practices Board (Callahan, 2000)*. Proposed new roads and stream crossings were assessed using the same methodology based on all proposed new crossings meeting applicable BMPs. In addition, in-channel sources of sediment were identified using channel-stability rating methods developed by *Pfankuch (1975)* and through the conversion of stability rating to reach condition by stream type developed by *Rosgen (1996)*. These analyses were conducted in 2004 by a DNRC hydrologist, and the results were verified in 2022 to ensure the validity of the results.

### **WATER YIELD**

Analysis methods to assess the water yield increase for the watersheds in the Project Area consisted of the ECA method as outlined in *Forest Hydrology Part II (Haupt 1976)*. ECA is a function of total area roaded and harvested, percent of crown removal in harvesting, and amount of vegetative recovery that has occurred in harvest areas. This method equates area harvested and percent of crown removed with an equivalent amount of clearcut area. For example, if 100 acres had 60 percent crown removed, ECA would be approximately 60, or equivalent to a 60-acre clearcut. The relationship between crown removal and ECA is not a 1-to-1 ratio, so the percent ECA is not always the same as the percent canopy removal. As live trees are removed, the water the trees would have evaporated and transpired either saturates the soil or is translated to runoff. This method also calculates the recovery of these increases as new trees begin to grow and move toward preharvest water use.

Analysis methods to evaluate the watershed risk of potential water yield increase include establishing a threshold of concern. In order to determine a threshold of concern, acceptable risk level, resource value, and watershed sensitivity are evaluated according to *Young (1989)*. The watershed sensitivity is evaluated using qualitative assessments, as well as procedures



outlined in *Forest Hydrology Part II (Haupt 1976)*. The stability of a stream channel is an important indicator of where a threshold of concern should be set. As water yields increase as a result of canopy removal, the amount of water flowing in a creek gradually increases. When these increases reach a certain level, the bed and banks may begin to erode. More stable streams will be able to handle larger increases in water yield before they begin to erode, while less stable streams will experience erosion at more moderate water yield increases (*Rosgen 1996*).

### **RISK ASSESSMENT CRITERIA**

Where risk is assessed in both sediment-delivery and water yield analyses, the following definitions apply to the level of risk reported:

- low risk = impacts are unlikely to result from proposed activities,
- moderate risk = there is approximately a 50-percent chance of impacts resulting from proposed activities, and
- high risk = impacts are likely to result from proposed activities.

Where levels or degrees of impacts are assessed in this analysis, the following definitions apply to the degree of impacts reported:

- very low impact = impacts from proposed activities are unlikely to be measurable or detectable and are not likely to be detrimental to the water resource;
- low impact = impacts from proposed activities would likely be measurable or detectable, but are not likely to be detrimental to the water resource;
- moderate impact = impacts from proposed activities would likely be measurable or detectable, and may or may not be detrimental to the water resource;
- high impact = impacts from proposed activities would likely be measurable or detectable and are likely to have detrimental impacts to the water resource.

## **RELEVANT AGREEMENTS, LAWS, PLANS, RULES, AND REGULATIONS**

### **MONTANA SURFACE WATER-QUALITY STANDARDS**

According to *ARM 17.30.608 (1)(b)(i)*, the Swan River Drainage, including Cilly, Soup, Goat and Squeezer creeks, is classified as B-1. Among other criteria for B-1 waters, no increases are allowed above naturally occurring levels of sediment, and minimal increases over natural turbidity. "Naturally occurring," as defined by *ARM 17.30.602 (17)*, includes conditions or materials present during runoff from developed land where all reasonable land, soil, and water conservation practices (commonly called BMPs) have been applied. Reasonable practices include methods, measures, or practices that protect present and reasonably anticipated

beneficial uses. These practices include, but are not limited to, structural and nonstructural controls and operation and maintenance procedures. Appropriate practices may be applied before, during, or after completion of activities that could create impacts.

Designated beneficial water uses within the Project Area include cold-water fisheries and recreational use in the stream, wetlands, lake, and surrounding area. In addition, the Cilly Creek Watershed also has domestic water use and irrigation water rights as beneficial uses.

#### **WATER-QUALITY-LIMITED WATERBODIES**

Swan Lake and Goat Creek are currently listed on the 2020 *Montana 303(d)* list. Each of the Project Area watersheds is a tributary to the Swan River, which is the primary inflow to Swan Lake. The 303(d) list is compiled by the Montana DEQ as required by *Section 303(d)* of the *Federal Clean Water Act* and the *Environmental Protection Agency Water Quality Planning and Management Regulations (40 CFR, Part 130)*. Under these laws, DEQ is required to identify waterbodies that do not fully meet water-quality standards, or where beneficial uses are threatened or impaired. These waterbodies are then characterized as “water quality limited” and, thus, targeted for *Total Maximum Daily Load (TMDL)* development. The TMDL process is used to determine the total allowable amount of pollutants in a waterbody of a watershed. Each contributing source is allocated a portion of the allowable limit. These allocations are designed to achieve water-quality standards.

The *Montana Water Quality Act (MCA 75-5-701 through 705)* also directs DEQ to assess the quality of State waters, ensure that sufficient and credible data exists to support a *303(d)* listing, and develop TMDL for those waters identified as threatened or impaired. Under the Montana TMDL Law, new or expanded nonpoint source activities affecting a listed waterbody may commence and continue provided they are conducted in accordance with all reasonable land, soil, and water conservation practices. DNRC will comply with the TMDL Law and interim guidance developed by DEQ through implementation of all reasonable soil and water conservation practices, including BMPs and *Forest Management Rules (ARM 36.11.401 through 450)*.

Swan Lake is currently listed as fully supporting for all beneficial uses. Goat Creek above the confluence with Squeezer Creek is listed as not supporting aquatic life. The current listed cause of impairment in Goat Creek is total suspended solids; the probable sources include silviculture harvesting, highways, roads, bridges, infrastructure (new construction). Through the *Swan Lake Watershed Group* and its associated *Swan Lake Technical Advisory Group*, a water-quality restoration plan was developed for Swan Lake in June 2004. The *Swan Lake Watershed Group* and *Technical Advisory Group* are comprised of local stakeholders and include:

- the *Swan Valley Connections*, *Flathead Lake Biological Station* at Yellow Bay, and *Friends of the Wild Swan*;
- landowners, including the USFS, Montana DNRC; and
- regulatory agencies, including DEQ and the EPA.

The *Water Quality Restoration Plan* was approved by EPA in August 2004, and activities are ongoing to correct current sources and causes of sediment to Swan Lake and its tributaries. DNRC is an active partner and participant in this process. All proposed activities within the Project Area would implement activities to alleviate identified sources of sediment and comply fully with all TMDL requirements.

### **MONTANA SMZ LAW**

By the definition in *ARM 36.11.312 (3)*, the majority of the stream reaches in the Cilly Creek, Soup Creek, Goat Creek and Squeezer Creek watersheds are class 1 streams. All of these streams and many of their tributaries have flow for more than 6 months each year. Many of these stream reaches also support fish. Some of the smaller first-order tributaries may be classified as class 2 or 3 based on site-specific conditions. A class 3 stream is defined as a stream that does not support fish; normally has surface flow during less than 6 months of the year; and rarely contributes surface flow to another stream, lake or other body of water (*ARM 36.11.312 (5)*). According to *ARM 36.11.312 (4)*, a class 2 stream is a portion of a stream that is not a class 1 or class 3 stream segment.

### **FOREST MANAGEMENT RULES**

In 2003, DNRC drafted *Administrative Rules for Forest Management*. The portion of those rules applicable to watershed and hydrology resources include *ARM 36.11.422* through *426*. All applicable rules will be implemented if they are relevant to activities proposed with this project.

## **EXISTING ENVIRONMENT**

### **INTRODUCTION**

The existing environment was assessed in the watersheds in the proposed Project Area, and includes Cilly, Soup, Goat and Squeezer creeks. Each of these drainages lies on the west slope of the Swan Range and forms a portion of the eastern geologic boundary of the Swan Valley. Precipitation ranges from approximately 20 inches annually in the valley bottom to approximately 70 inches near ridge tops. Stream gaging data gathered since 1976 on Project Area streams show that peak discharge in streams on the east side of the Swan Valley show approximately a 5-fold increase from low flow to peak discharge. These and other attributes will be described in more detail in the following sections.

## **SEDIMENT DELIVERY**

In-channel and out-of-channel sources of sediment delivery were assessed by DNRC hydrologists and fisheries biologists in 2022 and 2023 and by *PBS&J Consulting* in association with the development of the *Swan Lake Water Quality Protection Plan* and *TMDL (DEQ 2005)*. The results of these assessments were used in the following sections of this analysis.

### **Cilly Creek In-Channel Sources**

In-channel sources of sediment were evaluated in Cilly Creek based on field reconnaissance from 2004, 2013, 2019, 2022 and 2023. Stream reaches in the Cilly Creek Watershed were rated in good to fair condition. Cilly Creek flows perennially in most reaches, but flow becomes subsurface during the summer and fall in some low-gradient reaches in the valley bottom.

Stream reaches in the upper portions of the Cilly Creek watershed are mainly A3 and A4 channels using a classification system developed by *Rosgen (1996)*. Channel types rated as “A” are typically steeper than 4-percent gradient and have a low degree of meander (sinuosity). Channel-bed materials in A3 and A4 types are mainly cobble and gravel. Stream reaches in the lower portions of the Cilly Creek Watershed are mainly B4 and B5. Channel-bed materials in B4 and B5 channels are mostly gravel and coarse sand. Given the cobble, gravel, and coarse sand beds and the gradient of these stream types, bed materials commonly move. No areas of down-cut channels were identified during field reconnaissance. Large woody debris was found in adequate supply to support channel form and function. Woody material in a stream provides traps for sediment storage and gradient breaks to reduce erosive energy and work as flow deflectors to reduce bank erosion. Large woody debris is also assessed for its ability to provide habitat for aquatic species. These issues are discussed further in the *FISHERIES ANALYSIS*. Little evidence of past streamside harvesting was found, and, where past logging took place in the riparian area, no deficiency of existing or potential downed woody material was apparent in the streams.

### **Soup Creek In-Channel Sources**

In-channel sources of sediment were evaluated in Soup Creek based on field reconnaissance from 2004, 2013, 2019, 2022 and 2023. Stream channels in the Soup Creek Watershed are primarily in good to fair condition. An unnamed tributary to Soup Creek had reaches in the lower elevations rated in poor condition. This tributary begins in Section 23 on Flathead National Forest lands and flows west through Section 22 of the proposed Project Area. About 0.5 mile of stream on this tributary is rated in poor condition. This reach represents less than 3 percent of the total length of streams in the watershed. The primary reason for poor reach rating is a gully cutting through an alluvial fan. Alluvial fans are areas where stream material has been deposited for millennia, are similar to a river delta, and are usually found where a

stream comes out of a steep canyon onto a broad, flat valley bottom. Alluvial fans commonly have streams that shift and jump from one channel to another because the material is easily moved by flowing water. The rest of the channel stability in Soup Creek is described below.

Most reaches of Soup Creek were classified as B3 using a classification system developed by *Rosgen (1996)*. Channel types rated as “B” are typically in the 2- to 4-percent gradient range, and have a moderate degree of meander (sinuosity). Channel bed materials in B3 types are mainly cobble with some boulders and gravel. No areas of down-cut channels were identified during field reconnaissance. Large woody debris was found in adequate supply to support channel form and function. Woody material in a stream provides traps for sediment storage and gradient breaks to reduce erosive energy and work as flow deflectors to reduce bank erosion. Large woody debris is also assessed for its ability to provide habitat for aquatic species. These issues are discussed further in the *FISHERIES ANALYSIS*. The lower reaches of the watershed flow through a series of wetlands and beaver ponds. The beaver dams can lead to changing water levels in the stream, but the wetlands and beaver ponds tend to moderate the high runoff periods and settle out sediment and channel bed materials that may be carried downstream during runoff. Past management of streamside stands occurred in the lower reaches of the watershed. Where past logging took place in the riparian area, no deficiency of existing or potential downed woody material was apparent in the stream.

#### **Goat Creek In-Channel Sources**

In-channel sources of sediment were evaluated in Goat Creek based on field reconnaissance from 2001, 2022 and 2023. Stream channels in the Goat Creek Watershed are primarily in good to fair condition. The Goat Creek Watershed has a high supply of small- to moderate-sized woody material due to natural rates of lateral channel migration and large avalanche chutes in the headwater portions of the drainage. Material deposited after an avalanche is prone to forming debris jams that periodically break. With continuous forming, breaking and reforming of debris jams, gravel bars frequently form upstream of the jam features. The rest of the channel stability in Goat Creek is described below.

Most reaches of Goat Creek were classified as B3 using a classification system developed by *Rosgen (1996)*. Channel types rated as “B” are typically in the 2- to 4-percent gradient range, and have a moderate degree of meander (sinuosity). Channel bed materials in B3 types are mainly cobble with some boulders and gravel. No areas of down-cut channels were identified during field reconnaissance.

A large pulse of in-channel stored sediment was released to Goat Creek during a high-flow event in June of 2022. Field reconnaissance showed that a majority of the woody debris sediment traps in Goat Creek were washed out during a several-day period of heavy rain. The

sediment stored behind these structures became available for transport through the Goat Creek channel. As of 2023, sediment traps and debris jams were re-forming, and fine sediment values found in McNeil coring in Goat Creek showed no measurable increase in fine sediment deposition in areas sampled. These findings are discussed further in the *FISHERIES ANALYSIS*.

Lateral channel migration was found at one site in Goat Creek during field reconnaissance. This site is located upstream from the bridge over Goat Creek on the Old Squeezer Road. This lateral migration appears to be a result of a combination of downed trees re-directing flow coupled with high flows. The migration is occurring in the Goat Creek floodplain where lidar data show relic channels being re-activated. This lateral migration poses an elevated risk to the Old Squeezer Road and to the concrete bridge over Goat Creek. This site will continue to be evaluated and channel restoration efforts may be undertaken to protect existing infrastructure. These activities would not occur with any of the proposed activities in the Squeezer Meadow project but would rely on other sources of funding to complete any necessary repairs. The effects of any proposed remedial measures at this site would be analyzed separately since it is not currently known what measures may be taken, and impacts would be speculative.

Large woody debris was found in adequate supply to support channel form and function. Woody material in a stream provides traps for sediment storage and gradient breaks to reduce erosive energy and work as flow deflectors to reduce bank erosion. Large woody debris is also assessed for its ability to provide habitat for aquatic species. These issues are discussed further in the *FISHERIES ANALYSIS*. Past management of streamside stands occurred in the lower reaches of the watershed. Where past logging took place in the riparian area, no deficiency of existing or potential downed woody material was apparent in the stream.

#### **Squeezer Creek In-Channel Sources**

In-channel sources of sediment were evaluated in Squeezer Creek based on field reconnaissance from 2001, 2022 and 2023. Stream channels in the Squeezer Creek Watershed are primarily in good to fair condition. The Squeezer Creek Watershed has a high supply of small- to moderate-sized woody material due to natural rates of lateral channel migration and large avalanche chutes in the headwater portions of the drainage. Material deposited after an avalanche is prone to forming debris jams that periodically break. With continuous forming, breaking and reforming of debris jams, gravel bars frequently form upstream of the jam features. The rest of the channel stability in Squeezer Creek is described below.

Most reaches of Squeezer Creek were classified as B3 using a classification system developed by *Rosgen (1996)*. Channel types rated as “B” are typically in the 2- to 4-percent gradient range, and have a moderate degree of meander (sinuosity). Channel bed materials in B3 types are

mainly cobble with some boulders and gravel. No areas of down-cut channels or lateral migration were identified during field reconnaissance.

A large pulse of in-channel stored sediment was released to Squeezer Creek during a high-flow event in June of 2022. Field reconnaissance showed that a majority of the woody debris sediment traps in Squeezer Creek were washed out during a several-day period of heavy rain. The sediment stored behind these structures became available for transport through the Squeezer Creek channel. As of 2023, sediment traps and debris jams were re-forming, and fine sediment values found in McNeil coring in Squeezer Creek showed no measurable increase in fine sediment deposition in areas sampled. These findings are discussed further in the *FISHERIES ANALYSIS*.

Large woody debris was found in adequate supply to support channel form and function. Woody material in a stream provides traps for sediment storage and gradient breaks to reduce erosive energy and work as flow deflectors to reduce bank erosion. Large woody debris is also assessed for its ability to provide habitat for aquatic species. These issues are discussed further in the *FISHERIES ANALYSIS*. Past management of streamside stands occurred in the lower reaches of the watershed. Where past logging took place in the riparian area, no deficiency of existing or potential downed woody material was apparent in the stream.

#### **Road System**

The existing road system located within and leading to the proposed Project Area was reviewed in 2022 and 2023 for existing and potential sources of sediment. Based on the sediment-source review, several existing sources of sediment were identified on the existing road system. Each of the sources identified in this analysis are either found on DNRC-managed ownership or are associated with roads that are under a Cost-Share Agreement entered into by DNRC and Flathead National Forest. Most of the delivery sites are located at stream crossings.

There are 6 existing crossing structures identified in the Goat Creek watershed that are in need of work. These are not existing sources of sediment, but potential sources of sediment due to improper sizing, installation, or because they are native log/earth structures. There are two log/earth structures that are at risk of delivering approximately 20-30 cubic yards of fine sediment to Goat Creek tributaries should these structures collapse or become over-topped and wash out. The remaining 4 structures are corrugated metal pipes that are undersized or not installed on proper stream gradient. These culverts are a risk to wash out and generate 30-50 cubic yards of fine sediment should they become over-topped.

There is 1 existing crossing structure identified in the Squeezer Creek watershed that is undersized and at risk of delivering approximately 40-50 cubic yards of fine sediment should it become over-topped.

There are 2 existing crossing structures identified in the Swan River Drainages analysis area that are a potential risk of sediment delivery to stream channels. One is an under-sized culvert that has been over-topped in the past, and is at risk of over-topping in the future. This site has the potential to deliver 40-50 cubic yards of fine sediment to a stream channel should it become over-topped. The other is a log/earth structure that is at risk of delivering approximately 20-30 cubic yards of fine sediment to a stream should this structure collapse or become over-topped and wash out.

The total estimated sediment delivery from roads in the Project Area to Cilly, Soup, Goat and Squeezer creeks are displayed below (TABLE III-35). These sediment-delivery values are estimates based on procedures outlined above and are not measured values. Portions of the proposed haul routes lie outside of these Project Area watersheds, and include road segments in the Swan River Drainages analysis area. These roads were assessed qualitatively and were found to have applicable BMPs in place. The Goat Creek Road has had recent BMP improvements installed through a funding source outside of timber sale receipts to add a crushed gravel lift, so nothing other than minor maintenance would be needed to maintain functioning BMPs.

**TABLE III - 35 - CURRENT SEDIMENT DELIVERY.** *Current estimated sediment delivery to Project Area streams from existing road system.*

	<b>CILLY CREEK</b>	<b>SOUP CREEK</b>	<b>GOAT CREEK</b>	<b>SQUEEZER CREEK</b>
Existing tons per year	0.79	0.84	0.26	0.06

Estimated sediment delivery from the road system occurs primarily at stream crossings, and sediment comes from a variety of sources. Identified sources of sediment delivery found during the inventory are minor and located on sites needing additional road surface drainage and BMP upgrades. These sites are found mainly on older roads that were constructed before the adoption of forest management BMPs. Some sites have BMPs in place, but are not functioning as designed due to maintenance. These sites are also responsible for some of the smaller delivery sources.

Much of the existing road system in the proposed Project Area meets applicable BMPs. Surface drainage and erosion control features were installed on the road systems in most of the Cilly, Soup, Goat and Squeezer creek watersheds through recent past project work.



## **WATER YIELD**

According to *ARM 36.11.423*, allowable water yield increase values were set at levels to ensure compliance with all water-quality standards, protect beneficial uses, and exhibit a low to moderate degree of risk. This means that the allowable level is a point below which water yields are unlikely to cause any measurable or detectable changes in channel stability. The allowable water yield increase for the Cilly Creek Watershed has been set at 11.7 percent based on channel-stability evaluations, watershed sensitivity, resource value, and acceptable risk. This water yield increase is considered low risk, and would be reached approximately when the ECA level in Cilly Creek reaches the estimated level of 1,408 acres. The allowable water yield increase for the Soup Creek Watershed has been set at 9.0 percent based on channel-stability evaluations, watershed sensitivity, and acceptable risk. This water yield increase is considered low risk, and would be reached approximately when the ECA level in Soup Creek reaches the estimated level of 2,181 acres. The allowable water yield increase for the Goat Creek Watershed has been set at 10.0 percent based on channel-stability evaluations, watershed sensitivity, and acceptable risk. This water yield increase is considered low risk, and would be reached approximately when the ECA level in Goat Creek reaches the estimated level of 3,502 acres. The allowable water yield increase for the Squeezer Creek Watershed has been set at 10.0 percent based on channel-stability evaluations, watershed sensitivity, and acceptable risk. This water yield increase is considered low risk, and would be reached approximately when the ECA level in Squeezer Creek reaches the estimated level of 2,294 acres. Based on review of 1966 aerial photography and DNRC section records in the Project Area, timber-harvesting and associated road-construction activities have taken place in the Cilly, Soup, Goat and Squeezer creek watersheds since the early 1900s. Timber management history on land administered by the Flathead National Forest was also included for each of the Project Area watersheds. These activities, combined with the vegetative recovery that has occurred, have led to an estimated 10.2 percent water yield increase over a fully forested condition in the Cilly Creek Watershed, 6.2 percent over a fully forested condition in Soup Creek, 3.2 percent over a fully forested condition in Goat Creek and 2.8 percent over a fully forested condition in Squeezer Creek. Existing conditions for water yield and the associated ECA levels in the Project Area watersheds are summarized below (*TABLE III-36*). Estimated water yield and ECA levels are well below established thresholds in all Project Area watersheds

**TABLE III - 36 - CURRENT WATER YIELD.** Water yield and ECA increases in Project Area watersheds.

	CILLY CREEK	SOUP CREEK	GOAT CREEK	SQUEEZER CREEK
Existing water yield increase percent	10.2	6.2	3.9	2.8
Allowable water yield increase percent	11.7	9.0	10.0	10.0
Existing ECA	1,148	1,716	1,275	760
Allowable ECA	1,408	2,181	3,502	2,294

## ENVIRONMENTAL EFFECTS

### SEDIMENT DELIVERY

#### Direct and Indirect Effects

- ***Direct and Indirect Effects of No-Action Alternative A to Sediment Delivery***

No-Action Alternative A would have no direct effects to sediment delivery beyond those currently occurring. Existing sources of sediment, both in-channel and out of channel would continue to recover or degrade based on natural or preexisting conditions.

Indirect effects of No-Action Alternative A would be an increased risk of sediment delivery to streams from crossings that do not meet applicable BMPs. These sites would continue to pose a moderate risk of sediment delivery to streams until other funding became available to repair them.

- ***Direct and Indirect Effects of Action Alternative B to Sediment Delivery***

Direct and indirect effects of Action Alternative B to sediment delivery would include the maintenance or improvement of BMPs at several stream crossings. Erosion control and BMPs would be improved on up to 80 miles of existing road. This work would not substantially change the sediment delivery values in any of the project area watersheds. Nearly all of the road segments evaluated were meeting BMP standards, and those that are not meeting BMP standards are located away from stream crossings and present a low risk of sediment delivery. Proposed BMP improvements would create bare soil, increasing the risk of erosion and sediment delivery, but these risks would be offset by the improved function of surface drainage and erosion control measures.

These projected sediment delivery values are net values for each watershed. These values include the projected increases in sediment delivery from stream crossing replacements and new road construction, as well as projected sediment reductions from BMP improvements and road and stream-crossing improvement activity. A more detailed summary of sediment delivery estimates is found below in (TABLE III-37, TABLE III-38, TABLE III-39, and TABLE III-40).

Action Alternative B would also construct approximately 5.3 miles of new permanent road and reconstruct approximately 1.48 miles of existing low standard road. No new stream crossings would be installed with any of the proposed new road construction. Action Alternative B would also reclaim 7.2 miles of existing low standard road that is no longer necessary for current or future management. These roads would be decommissioned and left unusable by vehicle traffic, and all crossing structures would be removed and rehabilitated. The impacts of proposed new roads are discussed below and in TABLE III-37, TABLE III-38, TABLE III-39, and TABLE III-40. The remainder of the impacts of new road construction is related to the risk of erosion resulting from exposure of bare soil. The risk of sediment delivery from new permanent roads is low where these roads are located away from stream crossings. As cut slopes and fill slopes revegetate, this risk would decrease. Installation of surface drainage and the implementation of other BMPs and *Forest Management Rules* would further reduce the risk of erosion or sediment delivery from new roads by routing road surface drainage through adequate filtration zones prior to entering a stream.

There is a high risk of low impacts to Project Area streams from the proposed replacement of 3 existing stream crossing structures and the removal and rehabilitation of 6 existing stream crossings in Action Alternative B. This alternative would propose to replace 3 existing stream crossings: 1 in the Goat Creek Watershed, 1 in the Squeezer Creek watershed and 1 in the Swan River Drainages analysis area. This alternative would propose to remove 6 existing stream crossing structures and restore the stream channels: 5 in the Goat Creek watershed, and 1 in the Swan River Drainages analysis area. The high risks of low impacts are related mainly to the exposure of bare soil on cut and fill slopes on and around the proposed crossing sites. As these sites re-vegetate in 2 to 3 years, these sites would become a low risk of low impacts to sediment delivery. The removal and rehabilitation of 6 existing stream crossing structures would reduce the potential for 30-50 cubic yards of fill material entering project area streams at each site should these poorly designed or decaying structures fail or wash out.

- Action Alternative B would have a low risk of sediment delivery to streams as a result of proposed timber-harvesting activities. The SMZ law, *Administrative Rules for Forest*

*Management*, and applicable BMPs would be applied to all harvesting activities, which would minimize the risk of sediment delivery to draws and streams. The Montana BMP audit process has been used to evaluate the application and effectiveness of forest-management BMPs since 1990; this process has also been used to evaluate the application and effectiveness of the SMZ Law since 1996. During that time, evaluation of ground-based-skidding practices near riparian areas has been rated 92-percent effective, and these same practices have been found effective over 99 percent of the time from 1998 to present (DNRC 1990 through 2022). Since 1996, effectiveness of the SMZ width has been rated over 99 percent (DNRC 1990 through 2022). As a result, with the application of BMPs and the SMZ Law, proposed activities are expected to have a low risk of low impacts to sediment delivery.

- ***Direct and Indirect Effects of Action Alternative C to Sediment Delivery***

Direct and indirect effects of Action Alternative C to sediment delivery would include the maintenance or improvement of BMPs at several stream crossings. Erosion control and BMPs would be improved on up to 80 miles of existing road. This work would not substantially change the sediment delivery values in any of the project area watersheds. Nearly all of the road segments evaluated were meeting BMP standards, and those that are not meeting BMP standards are located away from stream crossings and present a low risk of sediment delivery. Proposed BMP improvements would create bare soil, increasing the risk of erosion and sediment delivery, but these risks would be offset by the improved function of surface drainage and erosion control measures.

These projected sediment delivery values are net values for each watershed. These values include the projected increases in sediment delivery from stream crossing replacements and new road construction, as well as projected sediment reductions from BMP improvements and road and stream-crossing improvement activity. A more detailed summary of sediment delivery estimates is found below in (TABLE III-37, TABLE III-38, TABLE III-39, and TABLE III-40).

Action Alternative C would also construct approximately 5.3 miles of new permanent road and reconstruct approximately 1.48 miles of existing low standard road. No new stream crossings would be installed with any of the proposed new road construction. Action Alternative C would also reclaim 7.2 miles of existing low standard road that is no longer necessary for current or future management. These roads would be decommissioned and left unusable by vehicle traffic, and all crossing structures would be removed and rehabilitated. The impacts of proposed new roads are discussed below and in TABLE III-37, TABLE III-38, TABLE III-39, and TABLE III-40. The remainder of

the impacts of new road construction is related to the risk of erosion resulting from exposure of bare soil. The risk of sediment delivery from new permanent roads is low where these roads are located away from stream crossings. As cut slopes and fill slopes revegetate, this risk would decrease. Installation of surface drainage and the implementation of other BMPs and Forest Management Rules would further reduce the risk of erosion or sediment delivery from new roads by routing road surface drainage through adequate filtration zones prior to entering a stream.

There is a high risk of low impacts to Project Area streams from the proposed replacement of 3 existing stream crossing structures and the removal and rehabilitation of 6 existing stream crossings in Action Alternative C. This alternative would propose to replace 3 existing stream crossings: 1 in the Goat Creek Watershed, 1 in the Squeezer Creek watershed and 1 in the Swan River Drainages analysis area. This alternative would propose to remove 6 existing stream crossing structures and restore the stream channels: 5 in the Goat Creek watershed, and 1 in the Swan River Drainages analysis area. The high risks of low impacts are related mainly to the exposure of bare soil on cut and fill slopes on and around the proposed crossing sites. As these sites re-vegetate in 2 to 3 years, these sites would become a low risk of low impacts to sediment delivery. The removal and rehabilitation of 6 existing stream crossing structures would reduce the potential for 30-50 cubic yards of fill material entering project area streams at each site should these poorly designed or decaying structures fail or wash out.

Action Alternative C would have a low risk of sediment delivery to streams as a result of proposed timber-harvesting activities. The SMZ law, Administrative Rules for Forest Management, and applicable BMPs would be applied to all harvesting activities, which would minimize the risk of sediment delivery to draws and streams. The Montana BMP audit process has been used to evaluate the application and effectiveness of forest-management BMPs since 1990; this process has also been used to evaluate the application and effectiveness of the SMZ Law since 1996. During that time, evaluation of ground-based-skidding practices near riparian areas has been rated 92-percent effective, and these same practices have been found effective over 99 percent of the time from 1998 to present (*DNRC 1990 through 2022b*). Since 1996, effectiveness of the SMZ width has been rated over 99 percent (*DNRC 1990 through 2022b*). As a result, with the application of BMPs and the SMZ Law, proposed activities are expected to have a low risk of low impacts to sediment delivery. **Cumulative Effects**

- ***Cumulative Effects of No-Action Alternative A to Sediment Delivery***

The cumulative effects would be very similar to those described in the *EXISTING CONDITIONS* portion of this analysis. All existing sources of sediment would continue

to recover or degrade as dictated by natural and preexisting conditions until a source of funding became available to repair them. Sediment loads would remain at or near present levels.

- ***Cumulative Effects of Action Alternative B to Sediment Delivery***

Cumulative effects to sediment delivery from Action Alternative B would be primarily related to roadwork and stream-crossing work. Sediment generated from the replacement or removal of stream crossing structures would increase the total sediment load in streams flowing through the Project Area and proposed haul routes for the duration of activity. These increases would not exceed any State water-quality laws and would follow all applicable recommendations given in the 124 and 318 permits. In the long term, the cumulative effects to sediment delivery would be unchanged in Cilly and Squeezer creeks, and there would be a projected reduction from approximately 0.84 tons of sediment per year to approximately 0.82 tons of sediment per year in Soup Creek and reduced from 0.26 tons per year to approximately 0.18 tons per year in Goat Creek. These values include projected increases from new road construction, potential increases from the replacement or removal of existing stream-crossing structures, and the projected reductions in sediment delivery from upgrading surface drainage, erosion control, and BMPs on existing roads. A summary of sediment-delivery estimates is found in *TABLE III-37*, *TABLE III-38*, *TABLE III-39*, and *TABLE III-40*. As the sites stabilize and revegetate, sediment levels resulting from BMP improvement sites would decrease further from projected levels as work sites are closed and bare soil re-vegetates and stabilizes. Over the long term, cumulative sediment loads would be reduced due to improvement of surface drainage and erosion control BMPs at crossing sites.

The construction of new roads and stream crossings and installation and improvement of erosion-control and surface-drainage features on existing roads associated with Action Alternative B would also affect the cumulative sediment delivery to Cilly, Soup, Goat and Squeezer creeks as described above (*Burroughs and King 1989*). In the short term, new road construction and the installation and improvement of surface drainage features would expose bare soil. This would increase the risk of short-term sediment delivery to the streams in and around the proposed Project Area. The application of all applicable BMPs during this work would minimize the risk of potential short-term sediment loading to downstream waters. Over the long term, cumulative sediment delivery to Cilly, Soup, Goat and Squeezer creeks are projected to be lower than existing conditions. Projected increases in sediment delivery from new road and stream-crossing construction would be less than the sediment-delivery decreases expected with the installation of more effective surface drainage and erosion control features on the

existing road system. The net long-term effect to sediment delivery from this alternative is expected to be a cumulative decrease from pre-project levels.

Action Alternative B would have an overall low risk of adverse cumulative impacts to sediment yield in Project Area watersheds and presents a low risk to adversely affect downstream beneficial uses. Although risk is elevated at site specific locations, overall risk of adverse cumulative effects to sediment loading is low. Implementation of BMPs, the SMZ Law, and Forest Management Rules would ensure low risk of increased sediment delivery, and improvements to the existing road system would substantially reduce cumulative levels of sedimentation compared to current levels. All activities would comply with applicable laws, rules, and regulations.

- ***Cumulative Effects of Action Alternative C to Sediment Delivery***

Cumulative effects to sediment delivery from Action Alternative C would be primarily related to roadwork and stream-crossing work. Sediment generated from the replacement or removal of stream crossing structures would increase the total sediment load in streams flowing through the Project Area and proposed haul routes for the duration of activity. These increases would not exceed any State water-quality laws and would follow all applicable recommendations given in the 124 and 318 permits. In the long term, the cumulative effects to sediment delivery would be unchanged in Cilly and Squeezer creeks, and there would be a projected reduction from approximately 0.84 tons of sediment per year to approximately 0.82 tons of sediment per year in Soup Creek and reduced from 0.26 tons per year to approximately 0.18 tons per year in Goat Creek. These values include projected increases from new road construction, potential increases from the replacement or removal of existing stream-crossing structures, and the projected reductions in sediment delivery from upgrading surface drainage, erosion control, and BMPs on existing roads. A summary of sediment-delivery estimates is found in *TABLE III-37*, *TABLE III-38*, *TABLE III-39*, and *TABLE III-40*. As the sites stabilize and revegetate, sediment levels resulting from BMP improvement sites would decrease further from projected levels as work sites are closed and bare soil re-vegetates and stabilizes. Over the long term, cumulative sediment loads would be reduced due to improvement of surface drainage and erosion control BMPs at crossing sites.

The construction of new roads and stream crossings and installation and improvement of erosion-control and surface-drainage features on existing roads associated with Action Alternative C would also affect the cumulative sediment delivery to Cilly, Soup, Goat and Squeezer creeks as described above (*Burroughs and King 1989*). In the short term, new road construction and the installation and improvement of surface drainage

features would expose bare soil. This would increase the risk of short-term sediment delivery to the streams in and around the proposed Project Area. The application of all applicable BMPs during this work would minimize the risk of potential short-term sediment loading to downstream waters. Over the long term, cumulative sediment delivery to Cilly, Soup, Goat and Squeezer creeks are projected to be lower than existing conditions. Projected increases in sediment delivery from new road and stream-crossing construction would be less than the sediment-delivery decreases expected with the installation of more effective surface drainage and erosion control features on the existing road system. The net long-term effect to sediment delivery from this alternative is expected to be a cumulative decrease from pre-project levels.

Action Alternative C would have an overall low risk of adverse cumulative impacts to sediment yield in Project Area watersheds and presents a low risk to adversely affect downstream beneficial uses. Although risk is elevated at site specific locations, overall risk of adverse cumulative effects to sediment loading is low. Implementation of BMPs, the SMZ Law, and Forest Management Rules would ensure low risk of increased sediment delivery, and improvements to the existing road system would substantially reduce cumulative levels of sedimentation compared to current levels. All activities would comply with applicable laws, rules, and regulations.

**TABLE III - 37 - CILLY DELIVERY.** *Estimates of sediment delivery in the Cilly Creek Watershed.*

	ALTERNATIVE		
	A	B	C
Existing delivery (tons/year) <sup>1</sup>	0.79	0.79	0.79
Estimated reduction <sup>2</sup>	0.0	0.0	0.0
Estimated increase <sup>3</sup>	0.0	0.0	0.0
Post-project delivery (tons/year)	0.79	0.79	0.79
Reduction (tons/year) <sup>1</sup>	0	0	0
Percent reduction <sup>4</sup>	0	0	0

**TABLE III - 38 - SOUP DELIVERY.** *Estimates of sediment delivery in the Soup Creek Watershed.*

	ALTERNATIVE		
	A	B	C
Existing delivery (tons/year) <sup>1</sup>	0.84	0.84	0.84
Estimated reduction <sup>2</sup>	0.0	0.02	0.02
Estimated increase <sup>3</sup>	0.0	0.0	0.0
Post-project delivery (tons/year)	0.8	0.82	0.82
Reduction (tons/year) <sup>3</sup>	0	0.02	0.02
Percent reduction <sup>4</sup>	0	2.4	2.4



**TABLE III - 39 - GOAT DELIVERY.** Estimates of sediment delivery in the Goat Creek Watershed.

	ALTERNATIVE		
	A	B	C
Existing delivery (tons/year) <sup>1</sup>	0.26	0.26	0.26
Estimated reduction <sup>2</sup>	0.0	0.09	0.09
Estimated increase <sup>3</sup>	0.0	0.0	0.0
Post-project delivery (tons/year)	0.26	0.18	0.18
Reduction (tons/year) <sup>1</sup>	0	0.08	0.08
Percent reduction <sup>4</sup>	0	31	31

**TABLE III - 40 - SQUEEZER DELIVERY.** Estimates of sediment delivery in the Squeezer Creek Watershed.

	ALTERNATIVE		
	A	B	C
Existing delivery (tons/year) <sup>1</sup>	0.06	0.06	0.06
Estimated reduction <sup>2</sup>	0.0	0.0	0.0
Estimated increase <sup>3</sup>	0.0	0.0	0.0
Post-project delivery (tons/year)	0.06	0.06	0.06
Reduction (tons/year) <sup>1</sup>	0	0	0
Percent reduction <sup>4</sup>	0	0	0

<sup>1</sup>These sediment-delivery values are estimates based on procedures outlined in Analysis Methods, and are not measured values.

<sup>2</sup>Includes projected decreases from rehabilitation and BMP work on existing roads and crossings.

<sup>3</sup>Includes projected increases from construction of new roads and new stream crossings.

<sup>4</sup>Percent reduction values are estimates based on procedures outlined in ANALYSIS METHODS, not on measured values.

## **WATER YIELD**

### **Direct and Indirect Effects**

- ***Direct and Indirect Effects of No-Action Alternative A to Water Yield***

No-Action Alternative A would have no direct or indirect effects on water yield. Water quantity would not be changed from present levels and the harvest units would continue to return to fully forested conditions as areas of historic timber-harvests regenerate.

- ***Direct and Indirect Effects of Action Alternative B to Water Yield***

Direct and indirect effects of Action Alternative B to water yield include a 1.2 percent increase in annual water yield in the Cilly Creek watershed, a 1.1 percent increase in annual water yield in the Soup Creek watershed, a 1.1 percent increase in annual water yield in the Goat Creek watershed and a 1.7 percent increase in annual water yield in the Squeezer Creek watershed. These levels of projected water yield increase are incremental values that refer only to water yield generated by this Action Alternative

and do not include water yield increases from past activities. The cumulative water yield increase will assess the impacts of the proposed Action Alternative when added to the impacts of past and planned future activities; this will be discussed in the *CUMULATIVE EFFECTS* portion of this analysis. These levels of water yield increases would produce a low risk of creating unstable channels in any of the Project Area streams. Peak flow volume and duration may be elevated, and the timing of peak flows may be slightly earlier as a result of the proposed harvest activities. These changes have a low risk of low impacts to the stream channels in each of the watersheds listed above.

- ***Direct and Indirect Effects of Action Alternative C to Water Yield***

Direct and indirect effects of Action Alternative C to water yield include a 0.7 percent increase in annual water yield in the Cilly Creek watershed, a 0.9 percent increase in annual water yield in the Soup Creek watershed, a 1.1 percent increase in annual water yield in the Goat Creek watershed and a 1.7 percent increase in annual water yield in the Squeezer Creek watershed. These levels of projected water yield increase are incremental values that refer only to water yield generated by this Action Alternative and do not include water yield increases from past activities. The cumulative water yield increase will assess the impacts of the proposed Action Alternative when added to the impacts of past and planned future activities; this will be discussed in the *CUMULATIVE EFFECTS* portion of this analysis. These levels of water yield increases would produce a low risk of creating unstable channels in any of the Project Area streams. Peak flow volume and duration may be elevated, and the timing of peak flows may be slightly earlier as a result of the proposed harvest activities. These changes have a low risk of low impacts to the stream channels in each of the watersheds listed above.

### Cumulative Effects

- ***Cumulative Effects of No-Action Alternative A on Water Yield***

No cumulative effects on water yield are expected as a result of this alternative. Existing timber-harvest units would continue to revegetate and move closer to pre-management levels of water use and snowpack distribution.

- ***Cumulative Effects of Action Alternative B on Water Yield***

Cumulative effects of Action Alternative B on water yield include removal of trees that would increase the annual water yield in the Cilly Creek Watershed from its current level of approximately 10.2 percent over a fully forested condition to an estimated 11.4 percent. This water yield increase, and its associated ECA level, includes the impacts of all past management activity, existing and proposed roads, proposed timber harvesting,

and vegetative hydrologic recovery in the Cilly Creek Watershed. The water yield increase expected from this alternative leaves the watershed below the established threshold of concern reported in the *EXISTING CONDITIONS* portion of this analysis. This cumulative level of water yield increase would produce a low risk of creating unstable channels in Cilly Creek or its tributaries.

Cumulative effects of Action Alternative B on water yield include removal of trees that would increase the annual water yield in the Soup Creek Watershed from its current level of approximately 6.2 percent over a fully forested condition to an estimated 7.3 percent. This water yield increase, and its associated ECA level, includes the impacts of all past management activity, existing and proposed roads, proposed timber harvesting, and vegetative hydrologic recovery in the Soup Creek Watershed. The water yield increase expected from this alternative leaves the watershed well below the established threshold of concern reported in the *EXISTING CONDITIONS* portion of this analysis. This cumulative level of water yield increase would produce a low risk of creating unstable channels in Soup Creek or its tributaries.

Cumulative effects of Action Alternative B on water yield include removal of trees that would increase the annual water yield in the Goat Creek Watershed from its current level of approximately 3.9 percent over a fully forested condition to an estimated 5.0 percent. This water yield increase, and its associated ECA level, includes the impacts of all past management activity, existing and proposed roads, proposed timber harvesting, and vegetative hydrologic recovery in the Goat Creek Watershed. The water yield increase expected from this alternative leaves the watershed well below the established threshold of concern reported in the *EXISTING CONDITIONS* portion of this analysis. This cumulative level of water yield increase would produce a low risk of creating unstable channels in Goat Creek or its tributaries.

Cumulative effects of Action Alternative B on water yield include removal of trees that would increase the annual water yield in the Squeezer Creek Watershed from its current level of approximately 2.8 percent over a fully forested condition to an estimated 4.5 percent. This water yield increase, and its associated ECA level, includes the impacts of all past management activity, existing and proposed roads, proposed timber harvesting, and vegetative hydrologic recovery in the Squeezer Creek Watershed. The water yield increase expected from this alternative leaves the watershed well below the established threshold of concern reported in the *EXISTING CONDITIONS* portion of this analysis. This cumulative level of water yield increase would produce a low risk of creating unstable channels in Squeezer Creek or its tributaries.

Action Alternative B is expected to have a low risk of cumulative impacts to water yield as a result of the proposed timber harvesting in Cilly Creek, Soup Creek, Goat Creek and Squeezer Creek. A summary of the anticipated water yield impacts of Action Alternative B to the Cilly, Soup, Goat and Squeezer creek drainages is found in *TABLE III-41, TABLE III-42, TABLE III-43, and TABLE III-44.*

- ***Cumulative Effects of Action Alternative C on Water Yield***

Cumulative effects of Action Alternative C on water yield include removal of trees that would increase the annual water yield in the Cilly Creek Watershed from its current level of approximately 10.2 percent over a fully forested condition to an estimated 10.9 percent. This water yield increase, and its associated ECA level, includes the impacts of all past management activity, existing and proposed roads, proposed timber harvesting, and vegetative hydrologic recovery in the Cilly Creek Watershed. The water yield increase expected from this alternative leaves the watershed below the established threshold of concern reported in the *EXISTING CONDITIONS* portion of this analysis. This cumulative level of water yield increase would produce a low risk of creating unstable channels in Cilly Creek or its tributaries.

Cumulative effects of Action Alternative C on water yield include removal of trees that would increase the annual water yield in the Soup Creek Watershed from its current level of approximately 6.2 percent over a fully forested condition to an estimated 7.1 percent. This water yield increase, and its associated ECA level, includes the impacts of all past management activity, existing and proposed roads, proposed timber harvesting, and vegetative hydrologic recovery in the Soup Creek Watershed. The water yield increase expected from this alternative leaves the watershed well below the established threshold of concern reported in the *EXISTING CONDITIONS* portion of this analysis. This cumulative level of water yield increase would produce a low risk of creating unstable channels in Soup Creek or its tributaries.

Cumulative effects of Action Alternative C on water yield include removal of trees that would increase the annual water yield in the Goat Creek Watershed from its current level of approximately 3.9 percent over a fully forested condition to an estimated 5.0 percent. This water yield increase, and its associated ECA level, includes the impacts of all past management activity, existing and proposed roads, proposed timber harvesting, and vegetative hydrologic recovery in the Goat Creek Watershed. The water yield increase expected from this alternative leaves the watershed well below the established threshold of concern reported in the *EXISTING CONDITIONS* portion of this analysis.

This cumulative level of water yield increase would produce a low risk of creating unstable channels in Goat Creek or its tributaries.

Cumulative effects of Action Alternative C on water yield include removal of trees that would increase the annual water yield in the Squeezer Creek Watershed from its current level of approximately 2.8 percent over a fully forested condition to an estimated 4.5 percent. This water yield increase, and its associated ECA level, includes the impacts of all past management activity, existing and proposed roads, proposed timber harvesting, and vegetative hydrologic recovery in the Squeezer Creek Watershed. The water yield increase expected from this alternative leaves the watershed well below the established threshold of concern reported in the *EXISTING CONDITIONS* portion of this analysis. This cumulative level of water yield increase would produce a low risk of creating unstable channels in Squeezer Creek or its tributaries.

Action Alternative C is expected to have a low risk of cumulative impacts to water yield as a result of the proposed timber harvesting in Cilly Creek, Soup Creek, Goat Creek and Squeezer Creek. A summary of the anticipated water yield impacts of Action Alternative C to the Cilly, Soup, Goat and Squeezer creek drainages is found in *TABLE III-41, TABLE III-42, TABLE III-43, and TABLE III-44.*

**TABLE III - 41 - CILLY WATER YIELD.** *ECA and percent water yield increase results for the Cilly Creek Watershed.*

	ALTERNATIVE		
	A	B	C
Allowable water yield increase	11.7%	11.7%	11.7%
Percent water yield increase	10.2	11.4	10.9
Acres harvested <sup>1</sup>	0	285	285
Miles of new road <sup>1</sup>	0	0	0
ECA generated	0	205	116
Total ECA	1,148	1,353	1,264
Allowable ECA	1,408	1,408	1,408

**TABLE III - 42 - SOUP WATER YIELD.** *ECA and percent water yield increase results for the Soup Creek Watershed.*

	ALTERNATIVE		
	A	B	C
Allowable water yield increase	9%	9%	9%
Percent water yield increase	6.2	7.3	7.1
Acres harvested <sup>1</sup>	0	628	577
Miles of new road <sup>1</sup>	0	0	0

ECA generated	0	441	385
Total ECA	1,716	2,157	2,101
Allowable ECA	2,181	2,181	2,181

**TABLE III - 43 - GOAT WATER YIELD.** ECA and percent water yield increase results for the Goat Creek Watershed.

	ALTERNATIVE		
	A	B	C
Allowable water yield increase	10%	10%	10%
Percent water yield increase	3.9	5.0	5.0
Acres harvested <sup>1</sup>	0	605	684
Miles of new road <sup>1</sup>	0	0.1	0.1
ECA generated	0	428	399
Total ECA	1,275	1,703	1,674
Allowable ECA	3,502	3,502	3,502

**TABLE III - 44 - SQUEEZER WATER YIELD.** ECA and percent water yield increase results for the Squeezer Creek Watershed.

	ALTERNATIVE		
	A	B	C
Allowable water yield increase	10%	10%	10%
Percent water yield increase	2.8	4.5	4.5
Acres harvested <sup>1</sup>	0	768	960
Miles of new road <sup>1</sup>	0	2.8	2.8
ECA generated	0	551	596
Total ECA	760	1,311	1,356
Allowable ECA	2,294	2,294	2,294

<sup>1</sup> Does not include acres or road segments located outside of watershed boundary

## FISHERIES ANALYSIS

### INTRODUCTION

The purpose of this analysis is to assess potential impacts to fisheries resources in the Squeezer Meadows proposed project area (see *CHAPTER I-PURPOSE AND NEED*) resulting from the implementation of one of the project alternatives (see *CHAPTER II-ALTERNATIVES*).

The project area is entirely within the Swan River watershed (Fifth Code HUC: 1701021103). Proposed actions under analysis include; up to 5,236 acres of total harvest, up to 5.3 miles of new permanent road construction, 1.5 miles of road reconstruction, 7.2 miles of road reclamation, and 80 miles of road maintenance. Road construction and maintenance would include up to 8 stream crossings being improved through replacement or removal and restoration of natural stream channels.

Native cold-water species known, or presumed, to be present in the project area include:

- bull trout (*Salvelinus confluentus*)
- westslope cutthroat trout (*Oncorhynchus clarki lewisi*)
- mountain whitefish (*Prosopium williamsoni*)
- largescale sucker (*Catostomous macrocheilus*)
- longnose sucker (*Catostomous catostomous*)
- longnose dace (*Rhinichthys cataractae*)
- redbelt shiner (*Richardsonius balteatus*)
- peamouth (*Mylocheilus caurinus*)
- northern pikeminnow (*Ptychocheilus oregonensis*)
- slimy sculpin (*Cottus cognatus*)

Nonnative species known, or presumed, to be present in the project area include:

- eastern brook trout (*S. fontinalis*)
- rainbow trout (*O. mykiss*)
- lake trout (*S. namaycush*)
- brook stickleback (*Culea inconstans*)
- kokanee (*O. nerka*)

The remainder of this introduction will focus on the life history and ecology of bull trout and westslope cutthroat trout. These species will be the focus of the following *EFFECTS ANALYSIS* (see *ANALYSIS METHODS*).

Bull trout and westslope cutthroat trout exhibit life history plasticity which includes resident, fluvial, and adfluvial forms. Fish species exhibiting resident life histories typically spend juvenile and adult periods in natal, or nearby connected, low order streams. Fluvial and

adfluvial life histories typically spend 1-3 years in natal streams before migrating downstream to higher order rivers or lake systems to mature (*Shepard et al. 1984, Fraley and Shepard 1989*). Following maturation, fluvial and adfluvial fish will return to headwater tributaries to spawn. Fluvial and adfluvial life forms of bull trout and westslope cutthroat trout are typically larger than resident forms, and bull trout have been observed returning to upstream reaches in successive or alternating years to spawn (*Fraley and Shepard 1989*). Overall, the life forms and stages of bull trout and westslope cutthroat trout are highly coevolved (*Pratt 1984, Shepard et al. 1984, Nakano et al. 1992*).

Fluvial and adfluvial bull trout generally mature at 5 to 6 years, begin upstream spawning migrations in April, and spawn between September and October in response to a temperature regime decline below 9–10 degrees Celsius (*C; Fraley and Shepard 1989*). Spawning bull trout construct redds in close association with upwelling groundwater and proximity to overhanging or instream cover (*Fraley and Shepard 1989, Baxter and Hauer 2000*). Naturally occurring stream temperature regimes and substrate compositions having low levels of fine material are closely related to embryo and juvenile survival (*Pratt 1984, Weaver and Fraley 1991, MBTSG 1998, USFWS 2015a*).

Bull trout have been found inhabiting streams with wetted width as low as 1.0 meter and gradients as high as 15.6 percent (*Rich et al. 2003*), while observed average measures have ranged from 3.1 to 12.4 meters for wetted width and 1.6 to 5.6 percent stream gradient (*Dunham and Chandler 2001, Rich et al. 2003*). Bull trout distribution and abundance are largely driven by stream thermal regimes (*Isaak et al. 2015, Kovach et al. 2015*). Bull trout appear to prefer average maximum seasonal stream temperatures ranging from approximately 14.0–16.0 degrees C (*Rieman and Chandler 1999, Sauter et al. 2001, Garnett 2002, Rich et al. 2003*). Laboratory studies have indicated maximum juvenile growth occurs at temperatures between 10.9 and 15.4 degrees C (*Selong et al. 2001*).

Historically, bull trout were found throughout the Columbia River Basin in the northwestern United States. The species was listed as threatened under the Endangered Species Act in 1999 (*USFWS 1999; 64 FR 58910*), with a recovery plan completed in 2015 (*USFWS 2015a*). The recovery plan identified six recovery units including the Columbia Headwaters Recovery Unit which encompasses the upper Clark Fork, Flathead, Kootenai, Lower Clark Fork and Coeur d'Alene rivers (*USFWS 2015b*). Historically, westslope cutthroat trout were found the headwaters of the Clark Fork, Missouri, and Saskatchewan rivers in Montana (*Behnke 1992*). The species occupies habitat ranging from first-order and larger streams and rivers, with the historical distribution likely defined by thermal regimes (*Behnke 1992, McIntyre and Rieman 1995*).

Resident westslope cutthroat trout have been observed maturing at 3 to 5 years (*Downs et al. 1997*), and all life forms are known to spawn during May and June (*Shepard et al. 1984*). Naturally occurring stream temperature regimes and substrate compositions having low levels



of fine material are closely related to westslope cutthroat trout embryo and juvenile survival (Pratt 1984). Spawning typically occurs in water depths of 12.9 cm with substrate size ranging from 6 to 110 mm (Schmetterling 2000). Thermal tolerance of westslope cutthroat trout has been reported to be 19.6 degrees C, with optimal juvenile growth occurring at 13.6 degrees C (Bear and McMahon 2007).

## **RELEVANT AGREEMENTS, LAWS, PLANS, RULES, AND REGULATIONS**

Bull trout are currently listed as threatened under the Endangered Species Act (USFWS 1999). The entirety of the project area is within the Columbia Headwaters Recovery Unit which includes the Swan River drainage. Designated critical habitat is present in the Swan River (foraging, migration, and overwintering; FMO) as well as in Squeezer, Goat, and Soup creeks which support spawning and rearing (SR) (USFWS 2010). Both bull trout and westslope cutthroat trout are listed as S2 Montana Animals Species of Concern, species in this classification are considered at risk because of very limited and/or potentially declining populations, range, and/or habitat, making the species vulnerable to global extinction or extirpation in the state (MTDFWP, *Montana Natural Heritage Program, Montana Chapter of the American Fisheries Society*). DNRC has also identified both bull trout and westslope cutthroat trout as sensitive species (ARM 36.11.436). DNRC is a cooperator and signatory on the Memorandum of Understanding for Westslope and Yellowstone cutthroat trout in Montana (2007), which outlines land management conservation strategies and action items utilized by DNRC as decision-making tools.

All waterbodies in the fisheries analysis areas are classified as B-1 in the Montana Surface Water Quality Standards (ARM 17.30.608 [b][i]). The B-1 classification is for multiple beneficial-use waters, including the growth and propagation of cold-water fisheries and associated aquatic life. Among other criteria for B-1 waters, a 1-degree Fahrenheit (F) maximum increase above naturally occurring water temperature is allowed within the range of 32–66 degrees F (0–18 degrees Celsius), and no increases are allowed above naturally occurring concentrations of sediment or suspended sediment that will harm or prove detrimental to fish or wildlife. In regard to sediment, naturally occurring includes conditions or materials present from runoff or percolation from developed land where all reasonable land, soil, and water conservation practices have been applied (ARM 17.30.602 [17]). Reasonable land, soil, and water conservation practices include methods, measures, or practices that protect present and reasonably anticipated beneficial uses (ARM 17.30.602 [23]). The State has adopted Best Management Practices (BMPs) through the Nonpoint Source Management Plan as the principle means of controlling nonpoint source pollution from silvicultural activities (MTDEQ 2017).

The 303(d) list is compiled by DEQ as required by the Federal Clean Water Act and the EPA Water Quality Planning and Management Regulations (40 CFR, Part 130). For further detail, refer to the WATERSHED and HYDROLOGY ANALYSIS. Swan Lake and Goat Creek are

currently the only listed waterbodies in the watershed (MTDEQ 2020). Goat Creek was initially listed in 1996 as limited due to suspended sediments. In 2004, a Water Quality Protection Plan and TMDLs were developed for the Swan Lake Watershed (MTDEQ 2004).

Fisheries specific forest management ARMs (36.11.425 and 36.11.427), the Streamside Management Zone Law and Rules (MCA 77.5.301–307), and other site-specific prescriptions would be implemented as part of any Action Alternative.

## **ISSUES AND MEASUREMENT CRITERIA**

Thirteen detailed concerns and issues regarding fisheries resources were raised through public participation during the scoping process (*TABLE I-1*). The broad issues raised during the scoping process are that proposed actions may adversely affect fisheries populations and fisheries habitat features, including flow regime (or annual flow characteristics), sediment, channel forms, riparian condition, large woody debris, and stream temperature, in fish bearing streams in the project area. The following brief rationales describe why these issues are important fisheries resource concerns:

- Population and genetics: Provides the status and distribution of fish species in the project area.
- Connectivity: Describes the potential for fish to migrate within and between available habitats.
- Flow Regime: Affects species migration, spawning, and embryo survival and is a direct contributor to the function of other features such as; sediment transport, channel form, and stream temperature.
- Sediment: Major habitat feature which can affect fish embryo survival, and the quality and quantity of channel form features.
- Channel Forms: Descriptor of the quantity of various fish habitat types
- Riparian Condition: Primary terrestrial feature affecting channel form and function through incorporation of large woody debris and stream shading which affects water temperature
- Large Woody Debris: Major contributing factor in the quality and quantity of channel form and feature.
- Stream Temperature: Major habitat factor affecting the distribution of a fish assemblage in a waterbody, and subsequently the abundance and survival of fish species in a waterbody.

Depending on the type and extent of the proposed actions, these issues will (or will not) be addressed separately for each analysis area under the *EXISTING ENVIRONMENT AND ENVIRONMENTAL EFFECTS* sections.

Issue variables, normal effect mechanisms, potential effects mechanisms and measurement criteria establish the foundation of analysis for each of the broad fisheries issues. Those descriptors are outlined in *TABLE III-45*, for each of the fisheries issues. The broad issues include those variables that have potentially measurable or detectable criteria and are expected to support the development of meaningful effects analysis.

For the purposes of this analysis, issue variables are primary factors that contribute to a broad environmental issue. Normal effect mechanisms describe the typical physical or biological processes that determine how issue variables are expressed in the environment. Potential effect mechanisms describe the processes through which the proposed actions may affect normal effect mechanisms and, consequently, issue variables.

### **ANALYSIS AREAS**

Five assessment areas that contain distinct fisheries distributions were identified in the project area (*FIGURE III-8*). The analysis areas of contributing area watersheds are delineated using sixth code HUC scale or smaller watershed boundaries.

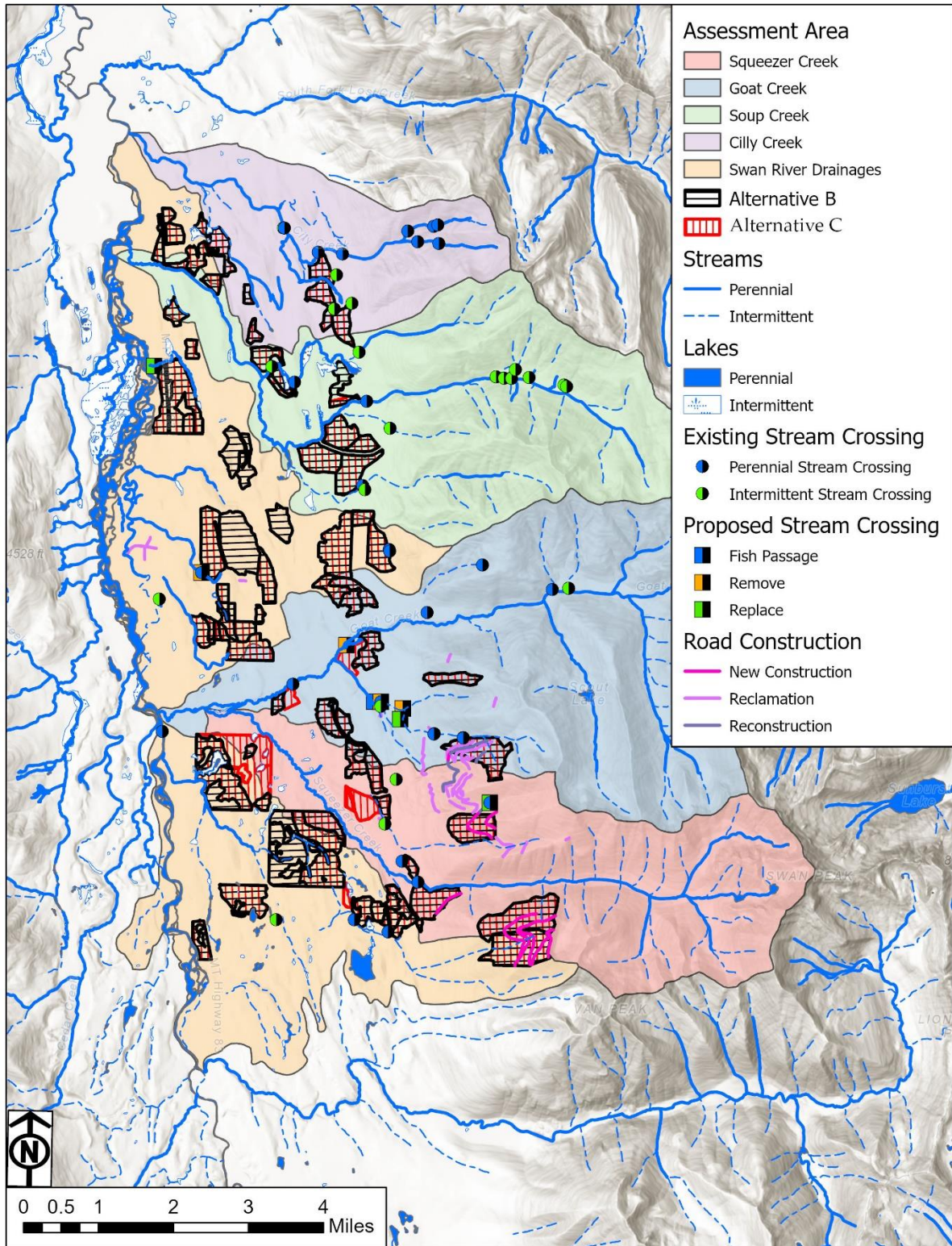
The analysis areas were chosen based on the following characteristics:

- The watershed or reaches of known or potential fish-bearing streams or lakes, and; the proposed harvest units and/or associated roads that could have foreseeable measurable or detectable impacts to those fish-bearing streams or lakes.
- The fisheries analysis areas closely coincide with the analysis areas for the *CHAPTER III - WATERSHED AND HYDROLOGY* and *SOILS* analyses of this document.

### **ANALYSIS METHODS**

The environmental analysis contained in this document will focus primarily on the populations and habitat variables affecting bull trout and westslope cutthroat trout, as these native species are the primary focus of fisheries related comments received during public and internal scoping. Furthermore, bull trout and westslope cutthroat trout are also the focus of many sensitive species listings and interagency agreements, indicating high intrinsic ecological and social value. The additional native species known or presumed to be in the project area are not listed as endangered, threatened, or sensitive (*MTNHP 2023*). Although each of these species contributes to a properly functioning aquatic ecosystem within the project area, any foreseeable issues or concerns regarding these species' populations or habitat variables can be adequately addressed through an effects analysis for bull trout and westslope cutthroat trout. Eastern

**FIGURE III - 8 - FISHERIES RESOURCE ANALYSIS AREAS**



**TABLE III - 45 - METHODS FOR EVALUATING EXISTING CONDITIONS.** *Potential effects of the proposed actions on fisheries resources in the squeezer meadows project area.*

Variable	Measurement Criteria	Normal Effect Mechanism	Potential Effect Mechanism
Species presence or absence	Species presence or absence, species density, and trend	Historic distribution, non-native species introduction, status	Species introduction, suppression, or removal, road-stream crossing
Genetics	Pure genetics, genetic introgression, or hybridization	Connectivity, non-native species introduction	
Accessible fish habitat (adult fish)	Miles of accessible fish habitat (adult fish)	Natural and artificial migration barriers	Road-stream crossing structure installation or removal
Accessible habitat (juvenile fish)	Miles of accessible fish habitat (juvenile fish)		
Gross annual flow volume	Annual water yield	Precip, ECA, Watershed area, elevation, climate	Increase in ECA
Peak seasonal flow volume	Peak seasonal flow volume		
Peak seasonal flow time	Peak seasonal flow time		
Peak seasonal flow duration	Peak seasonal flow duration		
Fine sediment	Percent fine sediment	Flow regime, sediment budget	Sedimentation from 1) road-stream crossings, 2) adjacent roads, 3) RMZ disturbance
Embeddedness	Substrate score		
Surface substrate size-class distribution	Relative percent of size classes per Rosgen channel type		
Channel type	Rosgen, Montgomery and Buffington channel types	Channel type, flow regime, sediment, LWD, stream gradient	Change in flow regime, sediment, and/or LWD
Fast/slow fish habitat frequency	Percent of slow habitats per stream reach		
Fast/slow fish habitat volume	Total volume of slow habitats per stream reach		
Channel bank stability	Percent of stable channel bank per stream reach		
Riparian stand characteristics	TPA, QMD, BA/Acre, SPTH	Precipitation + physiographic location + elevation + soils/geology	RMZ Timber Harvest
Riparian habitat type (climax)	Climax riparian type		
Riparian habitat type (regional functionality)	Functional riparian type		
Rate of riparian tree blowdown	Average rate of riparian tree blowdown		
Stream shading	Average angular canopy density in July and August		
In-stream LWD frequency	In-stream LWD frequency per 1,000 linear stream feet	Riparian condition	Altered flow regime, channel form, RMZ harvest
In-stream temperature rate of change	Change in mean weekly maximum temperature	Flow regime + channel forms + riparian condition	

brook trout and rainbow trout are nonnative species which are not a historical component of the regional biodiversity, however, any foreseeable issues or concerns regarding these species populations or habitat variables can also be addressed through an effects analysis of relevant fisheries resources related to bull trout and westslope cutthroat trout.

The existing environment and the ranges of existing conditions of bull trout and westslope cutthroat trout populations and habitat variables will be described in the *EXISTING ENVIRONMENT* section of this analysis. The analysis methods for evaluation of existing conditions are detailed in *SQUEEZER MEADOWS FISHERIES ANALYSIS–METHODS FOR EVALUATING ENVIRONMENTAL IMPACTS (ENVIRONMENTAL EFFECTS)*, which can be found in the project file.

Depending on the type and extent of the proposed actions, issues will (or will not) be carried through the analysis methods in each analysis area. The analysis methods detailed in *SQUEEZER MEADOWS FISHERIES ANALYSIS–METHODS FOR EVALUATING EXISTING CONDITIONS (EXISTING ENVIRONMENT)* and *SQUEEZER MEADOWS FISHERIES ANALYSIS–METHODS FOR EVALUATING ENVIRONMENTAL IMPACTS (ENVIRONMENTAL EFFECTS)* include the general methodologies considered for analysis throughout the project area; however, the actual relevance and degree of fisheries resource information that is assessed in each analysis area is a function of the scope and type of the proposed actions in each analysis area.

Throughout the *EXISTING ENVIRONMENT* and *ENVIRONMENTAL EFFECTS* sections, the risk of a particular impact to fisheries resources is described. All impacts described in *ENVIRONMENTAL EFFECTS* are short term (1 to 5-year duration) unless otherwise noted as long term. Positive impacts to fisheries resources will also be described, if applicable, using information on impact extent and duration.

- Very low impact: Unlikely to be detectable or measurable, and not likely to be detrimental to the resource.
- Low impact: Likely to be detectable or measurable, but not likely to be detrimental to the resource.
- Moderate impact: Likely to be detectable or measurable, and likely to be moderately detrimental to the resource.
- High impact: Likely to be detectable or measurable, and likely to be highly detrimental to the resource.

Cumulative impacts are those collective impacts on the human environment (e.g. fisheries resources) of the proposed action when considered in conjunction with other past, present, and future actions relative to the proposed action by location or generic type (MCA 75.1.220). The potential cumulative impacts to fisheries in the analysis areas are determined by assessing the

collective anticipated direct and indirect impacts, other related existing actions, and foreseeable future actions affecting the fish-bearing streams.

## **EXISTING ENVIRONMENT**

The existing environment assessment for each analysis area includes; affected fish species, fisheries resources (issues and variables) that may be affected by potential actions, existing conditions of potentially affected fisheries resources, and other existing information needed for the assessment of cumulative effects.

### **FISHERIES POPULATIONS**

Prior to European settlement, fisheries populations in the Swan River basin were comprised of native bull and westslope cutthroat trout and multiple non-game fish species (*TABLE III-46*). Following settlement and establishment of state agencies to manage fish species in the state, Montana Department of Fish, Wildlife, and Parks (DFWP) began stocking non-native sportfish into Swan Lake and multiple tributaries to the Swan River in, and adjacent to, the project area (*MTFWP 2023*). The resulting impacts of these actions, as well as illegal introductions by anglers are observed in the current fish assemblage, and include competition for food and habitat, displacement, predation on all life stages of native species, and hybridization between species of the same genus. Sympatric populations of bull, westslope cutthroat, rainbow, and brook trout will result in continued hybridization risk to bull trout (*Leary et al. 1993, Kanda et al. 2002, Rieman et al. 2006*) and competition for food and habitat potentially resulting in displacement of both juvenile bull trout and all life stages of westslope cutthroat trout (*Shepard 2010, Rieman et al. 2006*). Risk of hybridization with, and competition between rainbow trout and westslope cutthroat, is likely to continue to increase as anticipated stream temperature warming associated with climate change may result in increased upstream expansion of the rainbow trout populations where present, thereby increasing the risk of genetic introgression (*Hitt et al. 2003, Bear et al. 2007, Muhlfeld et al. 2014*).

Introduction of lake trout into large western waterbodies has largely resulted in significant disruptions to the existing aquatic and terrestrial food-webs (*Spencer et al. 1991, Fredenberg 2002, Koel et al. 2005, Tronstad et al. 2010, Koel et al. 2017*); increased competition with (*Donald and Alger 1993, Ferguson et al. 2012*), displacement of (*Donald and Alger 1993*), and increased predation on native species (*Ferguson et al. 2012*); and significant declines in native fishes (*Fredenberg 2002, Ruzycki et al. 2003, Koel et al. 2005, Martinez et al. 2009*). Introductions of lake trout in northwest Montana have largely followed similar trends, with lake trout rapidly colonizing available habitat and replacing bull trout as the major predatory fish in most waterbodies following introduction (*Fredenberg 2002, Meeuwig et al. 2008, Guy et al. 2011*).

Lake trout were first introduced to the Flathead River basin in 1905 (*Spencer et al. 1991*) and were first reported in the Swan River drainage in 1998 when adult fish were caught by anglers in both Swan Lake and the Swan River (*Rosenthal et al. 2017*). Reproduction and recruitment

were documented by 2003, during DFWP standard monitoring in Swan Lake. Initial monitoring efforts focused on evaluation of current population levels and identification of existing spawning areas in Swan Lake (Cox 2010, Syslo et al. 2013). Lake trout suppression began in 2009, using targeted gillnetting with approximately 20,000 juvenile and adult lake trout removed over the ensuing three years. Based on these results, DFWP extended suppression through 2016, after which the program was to be re-evaluated to determine if exploitation rates could be sustained at a sufficient level to reduce the lake trout population. Exploitation rates between 2012 – 2016 of both juvenile and adult lake trout remained relatively stable, indicating that the existing levels of suppression were not likely sufficient to reduce the lake trout population. Coincidental data on bycatch rates of bull trout during lake trout netting suggested possible declines in the abundance of bull trout in Swan Lake as indicated by reductions in bycatch from 2012 (334 bull trout) to 2016 (52 bull trout), assuming that the gillnetting samples are representative of the overall population abundance (Rosenthal et al. 2017). The presumed decline in adult bull trout populations based on bycatch is generally supported by declining redd counts in many of the Swan River tributaries during the same time period (FIGURE III-9). Future suppression efforts may occur in Swan Lake as conditions warrant and as funding becomes available.

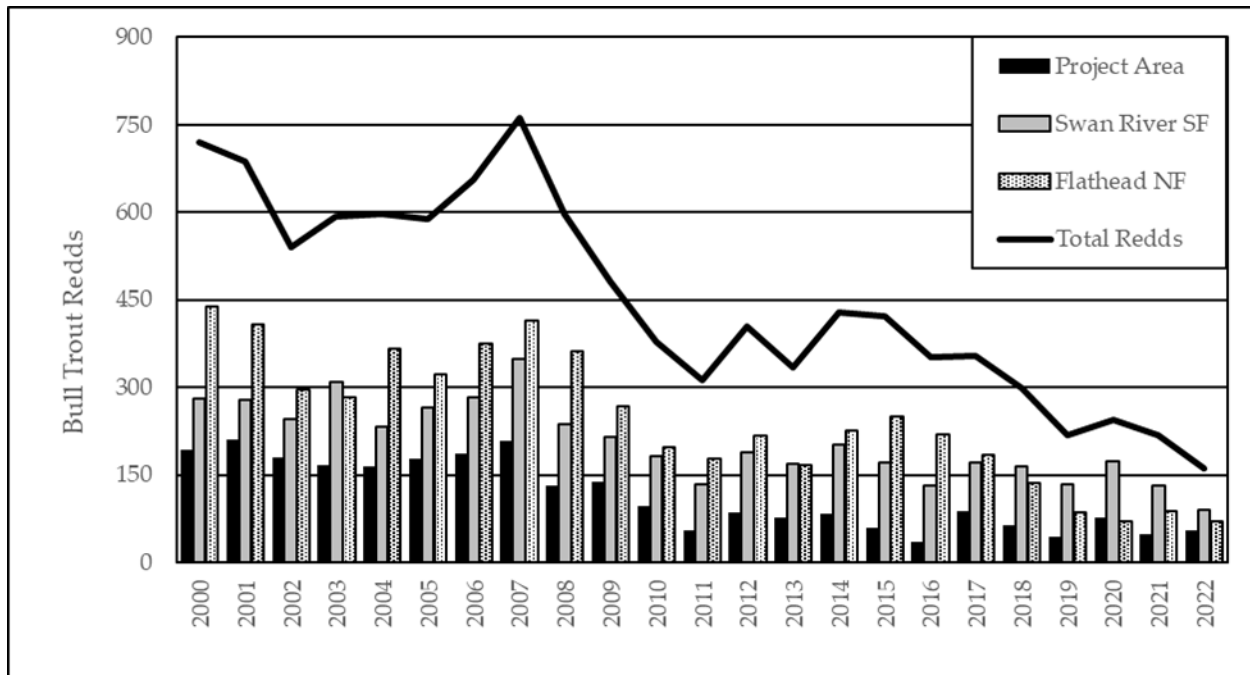
Fish species present in the Swan River Drainages assessment area are presented in TABLE III-46. Bull trout FMO critical habitat is present in the mainstem Swan River for approximately 17.0 miles, which includes the reach from the mouth of Lion Creek downstream to the mouth of Cilly Creek. Bull trout currently occupy all available critical habitat in the assessment area, no SR habitat is present in the assessment area. Westslope cutthroat are present in approximately 24.1 miles of available habitat, including the Swan River, and In-Pa-Ah Creek (TABLE III-46). Non-native species present in the assessment area comprise multiple game and non-game species including eastern brook trout, lake trout, and rainbow trout. Eastern brook trout were stocked in multiple tributaries to the Swan River as early as 1926, including in North Lost Creek, Cilly Creek, Woodward Creek, and Cedar Creek (MFISH 2023). Rainbow trout were also stocked from 1949 to 1950 in North Lost Creek, South Lost Creek, Soup Creek, Woodward Creek, and Goat Creek (MFISH 2023). The current bull trout distribution in the assessment area overlaps completely with eastern brook trout, which, in combination with documented phenotypic bull trout x eastern brook trout hybrids indicates a high-level existing impact on bull trout. Similarly, westslope cutthroat distribution largely overlaps the distribution of eastern brook trout, with the exception of the upper reach of In-Pa-Ah Creek. The upper 1.0 mile portion of In-Pa-Ah Creek is disconnected from the lower reach by a natural subsidence of discharge, with the upper reach losing flow for approximately 500 feet. No channel connection was noted during field review, suggesting that the upper and lower populations may have been isolated for multiple fish generations.



**TABLE III - 46 - FISH POPULATIONS.** Presence-absence and occupied stream miles in each of the squeezer meadows fisheries analysis areas.

Species		Swan River Drainages		Squeezer Creek		Goat Creek		Soup Creek		Gilly Creek	
		Presence	Occupied River Miles	Presence	Occupied River Miles	Presence	Occupied River Miles	Presence	Occupied River Miles	Presence	Occupied River Miles
Native	Bull trout	X	17.0	X	5.3	X	14.7	X	7.3		
	Westslope cutthroat trout	X	24.1	X	6.2	X	7.6	X	10.9		
	Mountain whitefish	X	17.0								
	Largescale sucker	X	17.0					X	6.8		
	Longnose sucker	X	10.9					X	6.8		
	Longnose dace	X	17.0					X	6.8		
	Redside shiner	X	17.0								
	Peanouth	X	10.9								
	Northern pike/minnow	X	17.0								
	Slimy sculpin	X	17.0			X	2.2	X	1.5		
Non-Native	Eastern brook trout	X	24.6	X	7.7	X	9.7	X	9.5	X	9.4
	Bull x Eastern brook trout hybrid	X	17.0	X	6.2	X	9.7				
	Rainbow trout	X	17.0			X	1.5				
	Westslope cutthroat x Rainbow trout hybrid							X	1.1		
	Lake trout	X	17.0								
	Brook stickleback	X	10.9								
	Kokanee	X	17.0								

**FIGURE III - 9 - SWAN RIVER BASIN BULL TROUT REDD COUNTS.** Trends observed in the swan river basin bull trout redd counts in the proposed project area and on federal and state ownership.



No bull trout spawning or habitat surveys have been conducted in this assessment area, as the majority of the habitat is FMO, and none of the tributaries are known to support resident or adfluvial populations of bull trout. Based on the current distribution, existing overlap between native and non-native species, the presence of hybrid individuals in the populations, there is an existing high impact to fisheries populations in the assessment area.

Fish species present in the Squeezer Creek assessment area are presented in *TABLE III-46*. Bull trout spawning and rearing critical habitat in Squeezer Creek extends from the confluence of Goat and Squeezer creeks upstream 5.3 miles. Bull trout redd counts have been conducted in Squeezer Creek annually since 1982. Prior to the introduction of lake trout in Swan Lake in 1998, redd counts averaged 81.6 redds/year (Range: 91–149). Following introduction of lake trout between 1998 and 2022, redd counts declined to 63.0 redds/year (Range 12–123), a reduction of nearly 25 percent. Bull trout and eastern brook trout distribution overlaps throughout SR critical habitat in Squeezer Creek. Westslope cutthroat trout currently occupy approximately 6.2 miles in the Squeezer Creek watershed, similar to the eastern brook trout population in the watershed. Genetic analysis of westslope cutthroat trout in Squeezer Lake in 2011 found no introgression in the individuals sampled. No other native or non-native species have been documented in the assessment area. Based on the degree of overlap between native and non-native populations, there is an existing high impact to fisheries populations in the assessment area.

Fish species present in the Goat Creek assessment area are presented in *TABLE III-46*. Bull trout spawning and rearing critical habitat in Goat Creek extends from the confluence of Goat Creek with the Swan River upstream 9.75 miles. Bull trout occupy all critical habitat as well as non-designated habitat in Scout Creek and Bethel Creek. Bull trout redd counts have been conducted in Goat Creek annually since 1982. Prior to introduction of lake trout in Swan Lake in 1998, redd counts averaged 44.4 redds/year (Range: 17–85). Following introduction of lake trout, redd counts have remained similar to levels observed prior to introduction, with an average of 45.2 redds/year (Range: 8–91). Genetic analysis of the bull trout population in Goat Creek in 1989 and 1993 found no evidence of hybridization with eastern brook trout (*MFISH 2023*). Westslope cutthroat trout are present in 7.6 miles of Goat Creek. No genetic analyses have been completed on westslope cutthroat trout in Goat Creek. Based on the existing overlap between native and non-native species, and continued risk of hybridization, competition, displacement, and predation, there is an existing high impact to fisheries resources in the assessment area.

Fish species present in the Soup Creek assessment area are presented in *TABLE III-46*. Bull trout SR critical habitat in Soup Creek extends from the confluence of Soup Creek and the Swan River upstream 6.9 miles. Bull trout area is present in all designated critical habitat, as well as an additional 0.5 miles in the headwaters of Soup Creek. Bull trout redd counts have been conducted in Soup Creek since 1991. Prior to introduction of lake trout in 1998, redd counts averaged 5.6 redds/year (Range: 2–12). Following introduction, no significant change in counts were noted, with redd counts averaging 5.9 redds/year (Range: 2–12). No genetic analyses of bull trout have been conducted in Soup Creek. Westslope cutthroat trout occupy 10.9 miles of habitat in the Soup Creek watershed. Genetic analyses in 1983 and 2012 noted low level introgression between westslope cutthroat trout and rainbow trout (2 percent). Based on the existing overlap between bull trout, westslope cutthroat trout and eastern brook trout, as well

as the presence of genetically introgressed westslope cutthroat, there is an existing high impact to fisheries resources in the Soup Creek assessment area.

Fish species present in the Cilly Creek assessment area are presented in *TABLE III-46*. No bull trout critical habitat is present in the watershed. The eastern brook trout population in Cilly Creek was established by 1950 at the latest, when approximately 1,000 adult brook trout were stocked in the stream (*MFISH 2023*). Stocking records also indicate that unspecified cutthroat trout were stocked regularly between 1933 –1953 in Cilly Creek (*MFISH 2023*). Historical utilization of Cilly Creek by bull trout and westslope cutthroat may have occurred prior to the introduction of eastern brook trout, which may have displaced both native species over time (*Rieman et al. 2006*). Alternatively, based on stocking records indicating stocking of nearly 400,000 cutthroat trout between 1933 – 1953, habitat suitability in Cilly Creek may not have been sufficient to support bull trout or westslope cutthroat trout. Fisheries surveys conducted in 1983 (*Leate et al. 1985*), 1996 and 2004 (*T. Weaver, DFWP*), and 2005 (*J. Bower, DNRC*) observed no bull or westslope cutthroat trout spawning and captured no fish during electrofishing surveys. These findings suggest that Cilly Creek may have been fishless or supported very small populations of native fish prior to introduction of brook trout. Regardless of the historical fish populations, the continued presence of eastern brook trout in Cilly Creek presents a moderate risk and long-term impact on native fish populations in the Swan River basin through episodic emigration from Cilly Creek into the Swan River.

### **CONNECTIVITY**

Six perennial road-stream crossings are present in the Swan River Drainages assessment area, of which two are on fish-bearing streams or rivers (*TABLE III-47*). The first is the Fatty Creek Road bridge over the Swan River which does not impede fish passage. The second is a native log culvert on the upper reach of In-Pa-Ah Creek. This structure likely prevents full passage of fish, as the habitat has been significantly altered at the site, with aggradation of sediment upstream from the crossing. The limitation to connectivity minimizes genetic exchange in the population for approximately 0.4 miles of available habitat. Based on these two sites, there is an existing moderate impact to fisheries connectivity in the Swan River Drainages assessment area.

Three perennial road-stream crossings are present in the assessment area, with one structure on the fish-bearing reach of Squeezer Creek. This crossing is a concrete full span bridge on upper Squeezer Creek that provides full fish passage to all life stages of fish in Squeezer Creek. Based on the current road system, there is no existing impact to fish passage in the assessment area.

Nine perennial road-stream crossings are present in the Goat Creek assessment area, of which four are on fish-bearing streams (*TABLE III-47*). The first is the Old Squeezer Loop Road bridge over Goat Creek which does not preclude any fish passage. The second is a native log culvert on a floodplain tributary to Goat Creek that does not prevent passage. Two existing corrugated

metal pipes (CMPs) are present on an unnamed tributary to Goat Creek in S15 23N 17W. Both structures are undersized for the stream and were installed at a gradient that did not meet existing stream grade. Currently both structures do not provide fish passage to all life stages, precluding access to approximately 0.9 miles of stream habitat. There is an existing moderate impact to fish connectivity in the assessment area as a result of two crossing structures.

Four perennial road-stream crossings are present in the Soup Creek assessment area, of which two are on fish-bearing streams. Both fish-bearing crossings are full span concrete bridges that provide full fish passage to all life stages of fish present in Soup Creek. Based on the current road system and road-stream crossings, there is no existing impact to fish passage in the assessment area.

Eight perennial road-stream crossings are present in the Cilly Creek assessment area, of which three are on fish-bearing streams. All crossings are CMPs that provide full fish passage to all life stages of fish present in Cilly Creek. Based on the current road system and road-stream crossings, there is no existing impact to fish passage in the assessment area.

#### **WATER YIELD**

Annual water yield changes due to timber harvest may affect fisheries resources through alteration of the volume, timing, and duration of flow events (*Hicks et al. 1991, Moore and Wondzell 2005*). These changes to the annual flow regime have varying impacts on fish species including, spawning migration, spawn timing, and spawning habitat quality and availability. Detailed descriptions of hydrologic data including water yield are found in the *WATERSHED AND HYDROLOGY ANALYSIS*. Water yield was analyzed in all assessment areas outside of the Swan River Drainages, as larger watershed and climatic processes drive annual discharge patterns. Existing water yield for each assessment area are found in *TABLE III-36* in *WATERSHED AND HYDROLOGY ANALYSIS*. Based on thresholds established under ARM 36.11.423, the existing levels of water yield increase have not reached a level where risk is elevated above low levels.

#### **SEDIMENT**

Sediment delivery to streams in the project area is primarily a factor of existing stream channel type and functional condition, and through road systems utilized to access, and transport forest products resulting from timber sales. Descriptions of in-channel sediment delivery are described in the *WATERSHED AND HYDROLOGY ANALYSIS*, which focused on functional condition (*Pfankuch 1975*) and stream type (*Rosgen 1996*). Sediment delivery can impact fisheries habitat through a variety of factors including alteration of spawning and rearing habitat (*Weaver and Fraley 1991*) and changes to the aquatic macroinvertebrate food base (*Haggerty et al. 2004*).

Current sediment delivery was not estimated for the Swan River Drainages assessment area due to the scope of the proposed actions in relation to the fluvial processes occurring at a larger basin-scale in the Swan River. Currently, 26.1 miles of road exist within 300 feet of classified waterbodies in the assessment area. Approximately 80 percent of the existing road meets forestry BMPs. Eight stream crossings are present in the assessment area, four do not currently meet BMPs, due to lack of surface drainage, structure failure, or improper sizing (*TABLE III-47*). Based on the current conditions, there is an existing moderate impact to sediment in the Swan River Drainages assessment area.

Current estimated sediment delivery in the Squeezer Creek assessment area is 0.06 tons per year (*TABLE III-35*) and is primarily occurring at a single stream crossing in the upper watershed. Approximately 15 percent of the roads in the assessment area are within 300 feet of a classified waterbody (*TABLE III-47*). Of the 7.7 miles of road within 300 feet of a classified waterbody, 95 percent currently meet BMPs. Five stream crossings are present in the assessment area, one does not currently meet BMPs due to improper sizing. Based on the current conditions, there is an existing low impact to sediment in the Squeezer Creek assessment area.

Current estimated sediment delivery in the Goat Creek assessment area is 0.26 tons per year (*TABLE III-35*). Approximately 20 percent of the roads in the assessment area are within 300 feet of a classified waterbody (*TABLE III-47*). Of the 17.3 miles of road within 300 feet of a classified waterbody, 85 percent currently meet BMPs. Seventeen stream crossings are present in the assessment area, of which three do not currently meet BMPs due to improper sizing, installation not meeting stream gradient, or are native log crossings that are prone to failure. Based on the current conditions, there is an existing moderate impact to sediment in the Goat Creek assessment area.

**TABLE III - 47 - ROAD SEDIMENT SOURCES.** Estimated road and stream crossing sediment sources in Squeezer Meadows Fisheries Analysis areas.

	Swan River Drainages			Squeezer Creek			Goat Creek			Soup Creek			Cilly Creek		
	Existing	Alt B	Alt C	Existing	Alt B	Alt C	Existing	Alt B	Alt C	Existing	Alt B	Alt C	Existing	Alt B	Alt C
<b>Existing Watershed Roads</b>															
Total	128.2	-	-	48.9	-	-	83.9	-	-	46.0	-	-	36.6	-	-
Within 300 feet of Classified Stream	26.1	-	-	7.7	-	-	17.3	-	-	13.0	-	-	9.1	-	-
<b>Haul Route Roads</b>															
Total	-	38.0	32.5	-	16.9	16.4	-	21.7	18.5	-	9.1	10.0	-	4.9	5.0
Within 300 feet of Classified Stream	-	7.4	6.9	-	0.9	1.0	-	4.8	4.6	-	3.1	3.4	-	1.0	1.0
<b>New Road Construction</b>															
Total	-	2.4	2.4	-	2.8	2.8	-	0.1	0.1	-	0.0	0.0	-	0.0	0.0
Within 300 feet of Classified Stream	-	0.4	0.4	-	0.1	0.1	-	0.0	0.0	-	0.0	0.0	-	0.0	0.0
<b>Road Reclamation</b>															
Total	-	0.9	0.9	-	3.6	3.6	-	2.7	2.7	-	0.0	0.0	-	0.0	0.0
Within 300 feet of Classified Stream	-	0.1	0.1	-	0.5	0.5	-	0.7	0.7	-	0.0	0.0	-	0.0	0.0
<b>Road-stream Crossings</b>															
Existing Fish-bearing Stream	2	-	-	1	-	-	4	-	-	2	-	-	3	-	-
Existing Fish Passage Barrier	1	-	-	0	-	-	1	-	-	0	-	-	0	-	-
Existing Perennial Stream	6	-	-	3	-	-	9	-	-	4	-	-	8	-	-
Existing Intermittent Stream	2	-	-	2	-	-	8	-	-	11	-	-	4	-	-
New Perennial Stream Crossing	-	0	0	-	0	0	-	0	0	-	0	0	-	0	0
New Intermittent Stream Crossing	-	0	0	-	0	0	-	0	0	-	0	0	-	0	0
Replacement/Removal for Fish Passage	-	1	1	-	0	0	-	1	1	-	0	0	-	0	0
Replacement for Water Quality	-	1	1	-	1	1	-	1	1	-	0	0	-	0	0
Removal and Restoration of Stream Channel	-	2	2	-	0	0	-	3	3	-	0	0	-	0	0

Current estimated sediment delivery in the Soup Creek assessment area is 0.84 tons per year (TABLE III-35). Approximately 28 percent of the roads in the assessment area are within 300 feet of a classified waterbody (TABLE III-47). Of the 13.0 miles of road within 300 feet of a classified waterbody, 67 percent currently meet forestry BMPs. Fifteen stream crossings are present in the assessment area, of which five do not meet forestry BMPs due to improper sizing and installation not meeting stream gradient. Based on the current conditions, there is an existing moderate impact to sediment in the Soup Creek assessment area.

Current estimate sediment delivery in the Cilly Creek assessment area is 0.79 tons per year (TABLE III-35). Approximately 25 percent of the roads in the assessment area are within 300 feet of a classified waterbody (TABLE III-47). Of the 9.1 miles of road within 300 feet of a classified waterbody, 85 percent currently meet forestry BMPs. Twelve stream crossings are present in the assessment area, of which three do not meet BMPs due to improper sizing, installation not meeting stream gradient, and inadequate road surface fill over the crossing structure. Based on the current conditions, there is an existing low impact to sediment in the Cilly Creek assessment area.

**FISHERIES HABITAT**

Fisheries habitat includes all in-stream physical characteristics required by a species to complete all aspects of life history. Stream habitat metrics are largely controlled by habitat type, flow regime, and large woody debris (LWD), with alterations to stream habitat potentially affecting instream sediment, habitat availability, and habitat stability. Alterations to each of these factors through timber harvest related activities may affect instream habitat quality and quantity,

stability, and complexity. Multiple habitat surveys have been completed in project area streams between 2002 and 2023 (*Overton et al. 1997, Kershner et al. 2004*).

Field reconnaissance during 2022 noted a large discharge event that likely occurred in June 2022. The majority of the large woody debris (LWD) jams were mobilized, and habitat conditions changed considerably due to scour and deposition in the channel. This was a result of a prolonged period of heavy precipitation during the latter stages of snowmelt-driven runoff. Surveys in 2023 indicated that debris jams had begun to reform, which will likely stabilize during the next several spring runoff events. Effects of increased discharge were noted in both Squeezer and Goat creeks, with deposition in the floodplain several feet above baseflow stream elevation. Effects were moderated in Soup Creek, although evidence of abnormally high discharge were also observed in portions of the upper drainage.

Assessment of fisheries habitat in the Swan River Drainages assessment area is primarily qualitative as the primary waterbody supporting fisheries resources is the Swan River. Existing large-scale fluvial processes are the primary determining factor for annual habitat availability and quality. These largely are characterized by the magnitude, duration and timing of high flow events associated with snowmelt and precipitation patterns in the watershed, and are likely within the historic range of variability. Fisheries habitat outside of the Swan River includes In-Pa-Ah and Perry creeks and Swan Pond. In-Pa-Ah Creek is a low gradient B-4c type channel (*Rosgen 1996*), habitat in the upper reach of the stream is primarily composed of slow habitat features separated by short riffle reaches. Large wood is the primary habitat forming feature, with evidence of stable channel migration around large diameter trees that have fallen into the channel. Gradient in the lower reach increases slightly as the stream approaches the Swan River. Perry Creek is also a B4 type channel (*Rosgen 1996*), the upper reach is confined in a narrow canyon before gradient decreases before the confluence with In-Pa-Ah Creek. Swan Pond is a 5-acre waterbody that is stocked annually with westslope cutthroat trout, but does not have a downstream connection to adjacent waterbodies. Based on the current condition of the fish-bearing streams in the project area, there is an existing low impact to fisheries habitat in the assessment area.

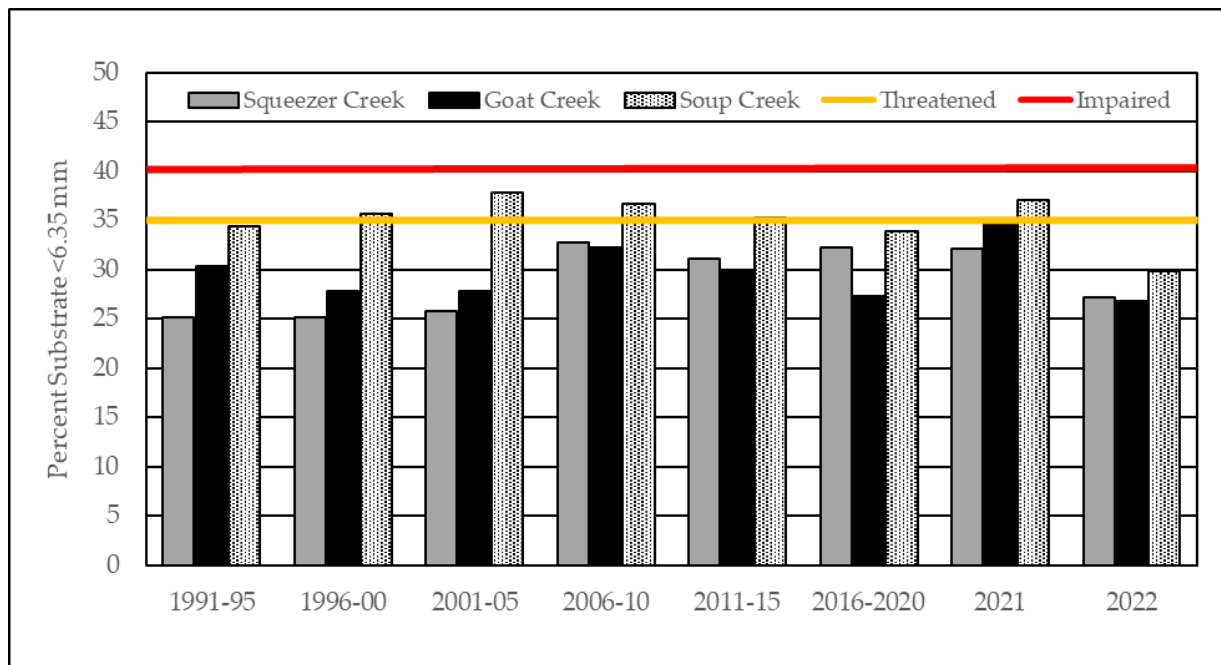
Fisheries habitat in the Squeezer Creek assessment area is limited to Squeezer Creek extending upstream to Squeezer Lake. Squeezer Creek is a B-3 type stream (*Rosgen 1996*). Fisheries habitat in Squeezer Creek was evaluated in 2022 and 2023 to determine the current conditions using modified R1R4 (*Overton et al. 1997*) and PacFish-InFish Biological Opinion Monitoring (PIBO; *Kershner et al. 2004*).

Approximately 3.8 miles of SR critical habitat is present in mainstem Squeezer Creek from the confluence with Goat Creek upstream to the boundary of S27 and S28. Habitat conditions for

bull trout spawning and rearing have been collected in Squeezer Creek annually since 1987 and 1988 respectively. McNeil core samples collected to evaluate spawning conditions and substrate score, a qualitative metric of rearing habitat suitability, collected to evaluate juvenile rearing habitat conditions. Spawning habitat quality in Squeezer Creek has historically been high (FIGURE III-10), with McNeil core samples collected from 1987 to 2022 averaging  $30.9 \pm 1.7$  (95% C.I.). During this 35-year dataset, spawning habitat has been rated threatened on three occasions as recently as 2008, and as impaired on three occasions as recently as 1992. Substrate score samples consistently rate Squeezer Creek as threatened  $9.9 \pm 0.2$  (FIGURE III-11), with only two samples noting rearing conditions that were not threatened. No impaired ratings have been observed during sampling.

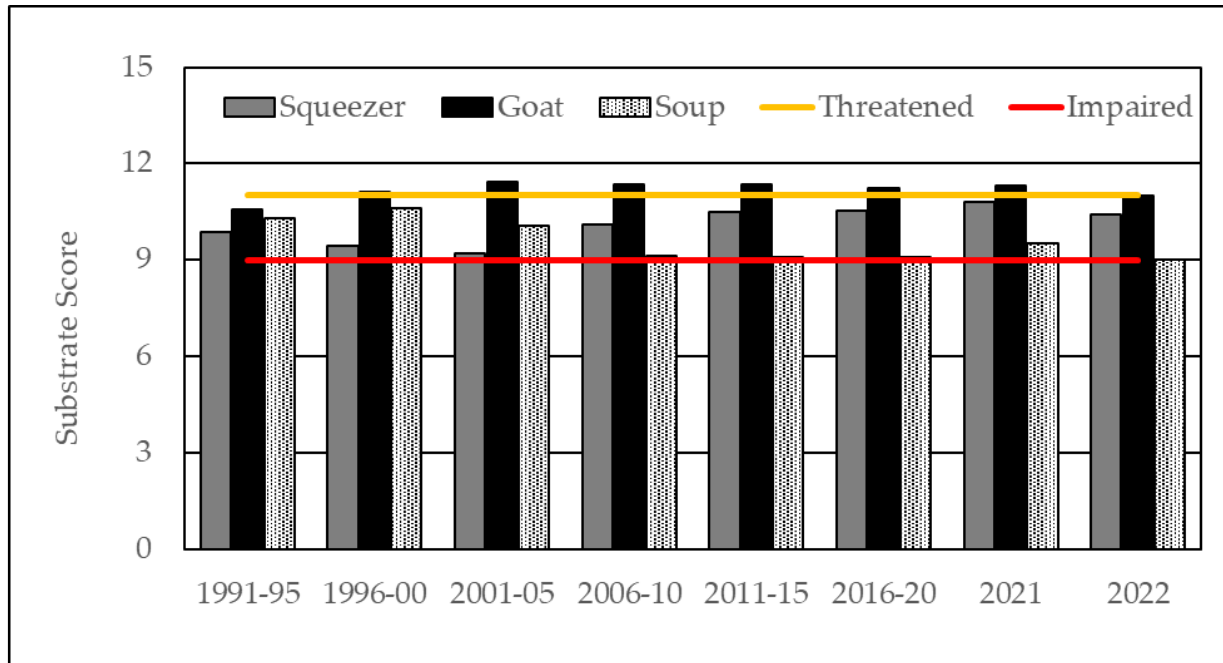
Slow habitat types comprised approximately 63 percent of the physical habitat available to fish, with residual pool depth averaging  $39 \pm 9.1$  cm. Large woody debris counts noted an average of  $101 \pm 17.4$  pieces/1,000 feet of stream. Streambank stability was found to be approximately 80 percent. Undercut banks were present at 47 percent of the transects, with an average depth of 41.6 cm (TABLE III-48). Based on the existing condition, considering channel form, water yield and sediment delivery, there is an existing moderate impact to fisheries habitat in the assessment area.

**FIGURE III - 10 - BULL TROUT SPAWNING HABITAT.** McNeil core sampling results 2000 – 2022.





**FIGURE III - 11 - BULL TROUT REARING HABITAT.** Substrate score sampling results 2000–2022.



Stream habitat conditions in the Goat Creek assessment area were evaluated in 2021 and 2022 through a modified R1R4 (*Overton et al. 1997*) and PIBO methodologies (*Kershner et al. 2004*). Fisheries habitat in the assessment area includes Goat Creek and several unnamed tributaries to Goat Creek in the lower watershed.

Approximately 8.25 miles of SR bull trout critical habitat is present in the assessment area, extending from the confluence with the Swan River upstream to the headwaters of Goat Creek in S9. Habitat conditions for bull trout spawning and rearing have been collected in Goat Creek annually since 1987 and 1988 respectively. Spawning habitat quality in Goat Creek has historically been high (*FIGURE III-10*), with McNeil core samples collected from 1987 to 2022 averaging  $29.4 \pm 1.1$  (95% C.I.). During this 35-year dataset, spawning habitat has been rated threatened on three occasions as recently as 2021, spawning habitat has not been rated as impaired during the monitoring dataset. Substrate score samples consistently rate Goat Creek as quality habitat  $11.1 \pm 0.2$  (*FIGURE III-4*), during the period between 1988 and 1996, Goat Creek was in the threatened range for rearing conditions, which accounts for approximately 30 percent of the total observations. The most recent threatened value was observed in 2018, which was 10.9, just below the threshold for quality rearing habitat. No impaired ratings have been observed during sampling.

Slow habitat types comprised approximately 62 percent of the physical habitat available to fish, with residual pool depth averaging  $49.8 \pm 13.8$  cm. Large woody debris counts noted an average

of  $112 \pm 16.3$  pieces/1,000 feet of stream. Streambank stability was found to be approximately 90 percent. Undercut banks were present at 15 percent of the transects, with an average depth of 52.8 cm (TABLE III-48). Based on the existing condition, considering channel form, water yield and sediment delivery, there is an existing moderate impact to fisheries habitat in the assessment area.

**TABLE III - 48 - STREAM HABITAT METRICS.** *In-stream habitat data for Squeezer Meadows Fisheries Analysis Areas.*

Stream Habitat Metric	Swan River Drainages	Squeezer	Goat	Soup	Cilly
Width:Depth Ratio	-	21.7	25.9	-	-
Slow Habitat (%)	-	63	62	19	-
Fast Habitat (%)	-	37	48	81	-
Residual Pool Depth (cm)	-	39.6	49.8	-	-
Undercut Banks (%)	-	47	15	-	-
Undercut Bank Depth (cm)	-	41.6	52.8	-	-
Bank Stability (%)	-	80	90	99.5	-
LWD/1000' stream	-	101	112	125	91
d16	-	54	26	-	-
d50	-	157	58.3	-	-
d84	-	403	103.8	-	-

Stream habitat conditions in Soup Creek were evaluated during field reconnaissance in 2019, 2021, 2022, and 2023. Fisheries habitat in the assessment area is limited to mainstem Soup Creek, North Fork Soup Creek, and Napa Creek.

Approximately 6.9 miles of SR bull trout critical habitat are present in Soup Creek, from the confluence with the Swan River, upstream to S26. Habitat conditions for bull trout spawning and rearing have been collected in Soup Creek annually since 1993 and 1992 respectively. Spawning habitat quality in Soup Creek has consistently been in the threatened range (*Weaver and Fraley 1991*), with McNeil core samples collected from 1993 to 2022 averaging  $35.5 \pm 0.8$  (95% C.I.) (FIGURE III-10). During this 30-year dataset, spawning habitat has been rated threatened 63 percent of the monitoring period, with the remaining 37 percent of the observations being less than 35 percent fine sediment. No impaired spawning habitat observations have been recorded during monitoring. Sampling in 2022 noted a substantial decline in fine sediment, likely due to increased stream discharge observed in 2022. Substrate score samples consistently rate Soup Creek as threatened habitat, with substrate scores averaging  $9.7 \pm 0.2$  (FIGURE III-11). One rating of impaired was noted in 2020 with a substrate score of 8.4. No observations of substrate score have exceeded 11 during the monitoring period. Based on the existing condition,

considering channel form, water yield and sediment delivery, there is an existing moderate impact to fisheries habitat in the assessment area.

Field review of Cilly Creek in 2019 indicated B4 and B5 stream channel types in the fish-bearing reach (Rosgen 1996). Qualitative assessment of stream habitat and observation of several size classes of eastern brook trout during field review indicated that existing conditions are suitable for all life stages of fish in Cilly Creek.

### **STREAM TEMPERATURE**

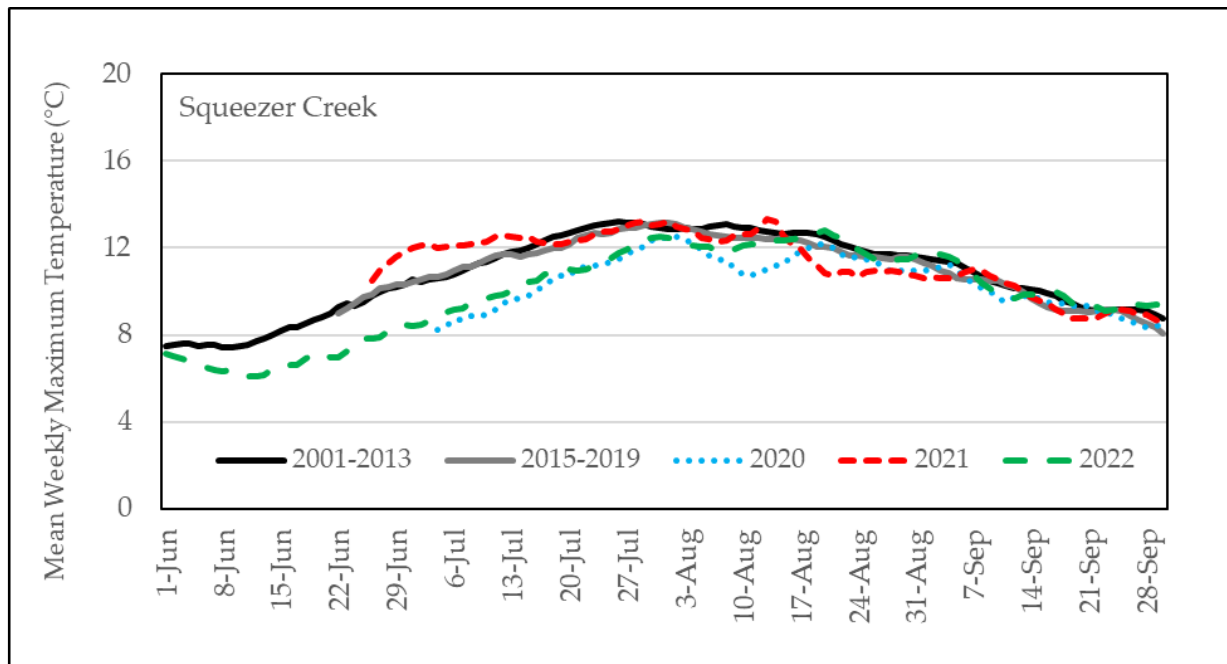
Stream temperature is a function of flow regime, channel form, and riparian condition (Poff *et al.* 1997). Alterations to each of these variables may occur as a result of riparian timber harvest, ultimately impacting stream temperature (Naiman and Decamps 1997, Sweeney and Newbold 2014). Alterations to stream temperature can affect native species through a number of mechanisms including; increased mortality, sub-optimal growth (Selong *et al.* 2001, Bear *et al.* 2007), decreased habitat availability (Rieman *et al.* 2007), and range expansion of non-native species resulting in competition (Muhlfeld *et al.* 2014, Al-Chokhachy *et al.* 2016), and hybridization (Muhlfeld *et al.* 2014, Muhlfeld *et al.* 2017).

Stream temperature in Squeezer Creek has been monitored annually since 2001, from June through September (FIGURE III-12). Thermal profiles in Squeezer Creek reflect a cold, stable temperature regime within the optimal range of bull trout (Selong *et al.* 2001). During the most recent ten-year period, the highest mean weekly maximum stream temperature observed in Squeezer Creek was 14.1 degrees C, observed in both 2015 and 2016. No hourly or daily temperature values have been observed during the monitoring period (TABLE III-49). Stream shade measurements collected in multiple reaches of Squeezer Creek found that average shade was 81.6 percent. Riparian buffer zones adjacent to classified waterbodies account for approximately 559 acres, less than 1 acre of riparian area was harvested in the assessment area between 1997 and 2022 (TABLE III-50). Riparian stands are well stocked, with less than 1 acre in the non-stock or seedling-sapling size classes (DNRC 2012c). Based on the existing flow regime, stream channel form, historic riparian timber harvest, and the existing thermal regime observed in Squeezer Creek, there is an existing low impact on stream temperature in the assessment area.

Stream temperature in Goat Creek has been monitored annually since 2001, from June through September (FIGURE III-13). Thermal profiles in Squeezer Creek reflect a cold, stable temperature regime within the optimal range of bull trout (Selong *et al.* 2001). During the most recent ten-year period, the highest mean weekly maximum stream temperature observed in Goat Creek was 13.4 degrees C, observed in 2015. No hourly or daily temperature values have been observed during the monitoring period (TABLE III-14). Stream shade measurements

collected in multiple reaches of Goat Creek found that average shade was 72.3 percent. Riparian buffer zones adjacent to classified stream segments account for approximately 743 acres, approximately 2.3 acres of riparian area have been harvested in the assessment area between 1997 and 2022 (TABLE III-51). Riparian stands are well stocked, with less than 2.3 percent of the riparian areas in the non-stock or seedling-sapling size classes (DNRC 2012c). Based on the existing flow regime, stream channel form, historic riparian timber harvest, and the existing thermal regime observed in Goat Creek, there is an existing low impact on stream temperature in the assessment area.

**FIGURE III - 12 - MEAN WEEKLY MAXIMUM STREAM TEMPERATURE.** Squeezer Creek.



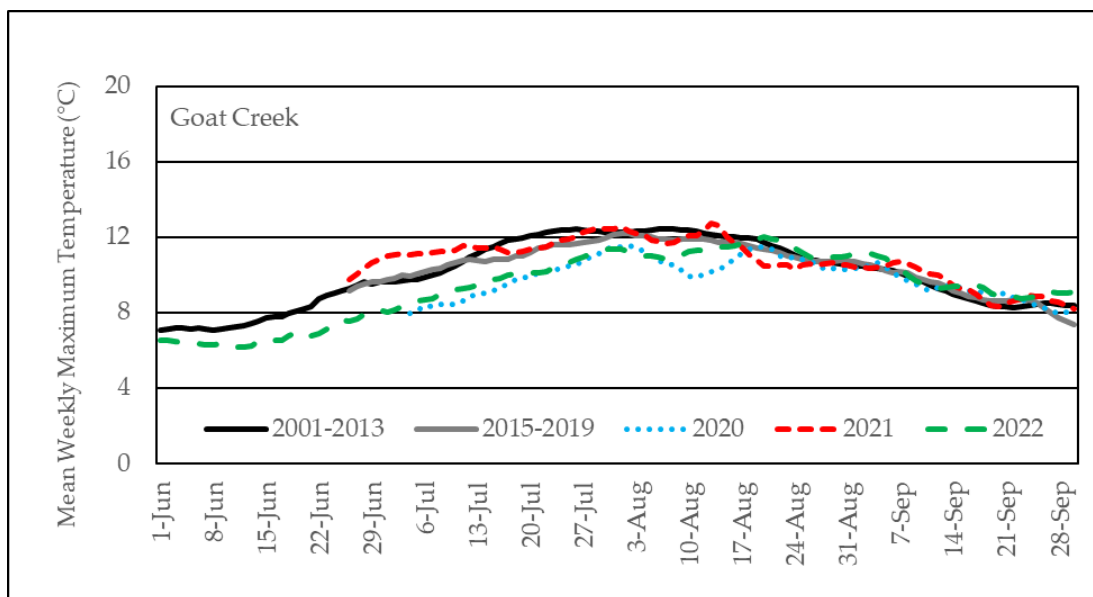
**TABLE III - 49 - SQUEEZER CREEK STREAM TEMPERATURE MONITORING.**

Stream	Year	Sampling Period		Daily Maximum		MWMT		Days >			Hours >		
		Start	End	Date	Temp	Date	Temp	10.0 C	15.0 C	21.1 C	10.0 C	15.0 C	21.1 C
Squeezer Creek	2012	29-Jun	31-Oct	9-Aug	13.4	11-Aug	12.9	65	0	0	536	0	0
	2013	28-Jun	14-Oct	9-Aug	13.8	11-Aug	13.4	81	0	0	930	0	0
	2015	12-Jun	21-Oct	21-Jul	14.9	1-Aug	14.1	93	0	0	1,058	0	0
	2016	12-Jul	18-Oct	29-Jul	14.4	28-Jul	14.1	58	0	0	641	0	0
	2017	6-Jul	27-Nov	30-Jul	13.6	31-Jul	13.3	70	0	0	765	0	0
	2018	19-Jun	2-Dec	10-Aug	13.1	9-Aug	12.6	64	0	0	522	0	0
	2019	6-Jun	27-Oct	1-Aug	13.4	4-Aug	13.2	67	0	0	590	0	0
	2020	1-Jul	20-Oct	2-Aug	13.1	2-Aug	12.5	53	0	0	442	0	0
	2021	23-Jun	11-Oct	16-Aug	13.9	13-Aug	13.3	77	0	0	862	0	0
	2022	8-May	28-Oct	20-Aug	13.0	20-Aug	12.8	62	0	0	598	0	0

**TABLE III - 50 - RIPARIAN ZONE CHARACTERISTICS.** *Estimated riparian characteristics in the Squeezer Meadows Fisheries Analysis areas.*

	Swan River Drainages	Squeezer Creek	Goat Creek	Soup Creek	Cilly Creek
<b>Watershed Acres</b>	16,037	9,203	14,022	9,694	4,813
<b>Streamside Management Zone Acres</b>	1,829	399	520	428	197
Acres Harvested 1997-2022	20.0	4.9	2.8	43.2	12.1
Alternative B Proposed Harvest Acres	0.0	0.0	0.0	0.0	0.0
Alternative C Proposed Harvest Acres	0.0	0.0	0.0	0.0	0.0
Percent Non-stock/Seedling-Sapling	<1.0	0.0	2.3	0.0	<1.0
<b>Riparian Management Zone Acres</b>	448	160	223	195	134
Acres Harvested 1997-2022	11.1	0.1	0.0	8.6	8.0
Alternative B Proposed Harvest Acres	0.0	0.0	0.0	0.0	0.0
Alternative C Proposed Harvest Acres	0.0	0.0	0.0	0.0	0.0
Percent Non-stock/Seedling-Sapling	<1.0	0.0	0.0	1.0	1.2
<b>Stream Shade</b>	-	81.6	72.3	86.3	72.7
June	-	78.5	67.0	85.7	62.4
July	-	78.1	69.1	86.2	65.3
August	-	80.2	72.3	86.7	76.7
September	-	89.7	80.8	86.4	86.3

**FIGURE III - 13 - MEAN WEEKLY MAXIMUM STREAM TEMPERATURE.** Goat Creek.



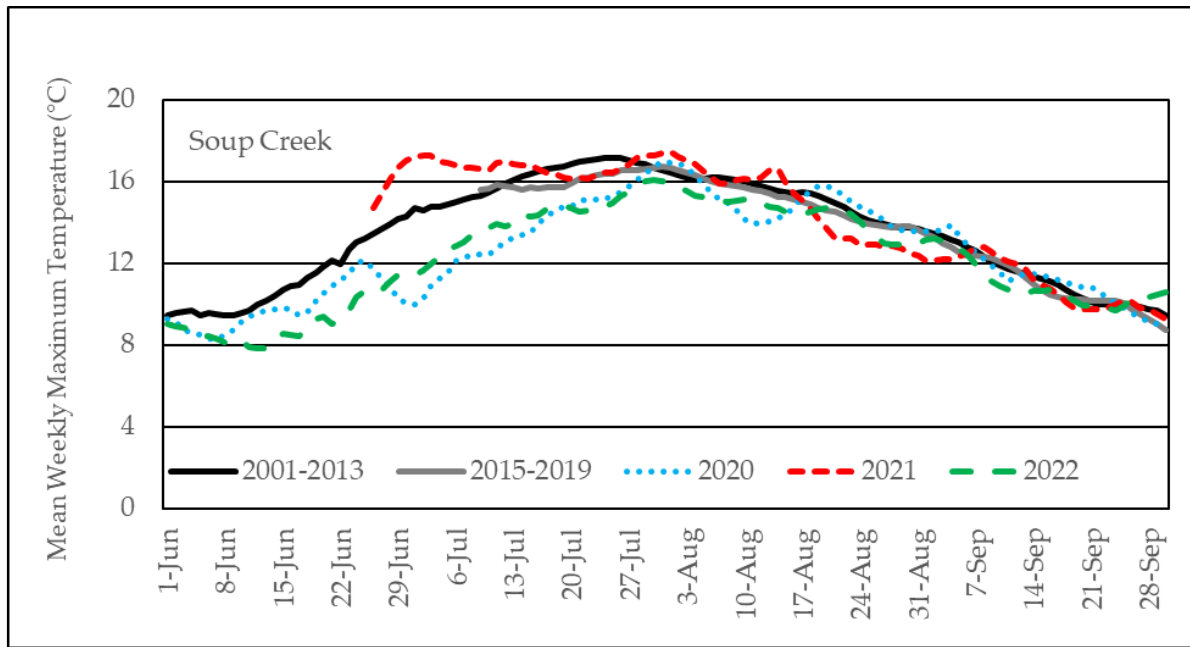
**TABLE III - 51 - GOAT CREEK STREAM TEMPERATURE MONITORING.**

Stream	Year	Sampling Period		Daily Maximum		MWMT		Days >			Hours >		
		Start	End	Date	Temp	Date	Temp	10.0 C	15.0 C	21.1 C	10.0 C	15.0 C	21.1 C
Goat Creek	2012	29-Jun	4-Nov	20-Aug	11.6	11-Aug	11.3	45	0	0	245	0	0
	2013	28-Jun	14-Oct	18-Aug	12.8	17-Aug	12.6	79	0	0	724	0	0
	2015	12-Jun	21-Oct	12-Aug	14.0	13-Aug	13.4	78	0	0	735	0	0
	2016	15-Jul	18-Oct	18-Aug	13.6	28-Jul	12.8	49	0	0	475	0	0
	2017	6-Jul	27-Nov	2-Aug	12.3	31-Jul	12.2	68	0	0	545	0	0
	2018	19-Jun	2-Dec	10-Aug	12.2	10-Aug	11.7	55	0	0	317	0	0
	2019	6-Jun	27-Oct	7-Aug	12.7	4-Aug	12.6	60	0	0	429	0	0
	2020	1-Jul	20-Oct	19-Aug	12.0	2-Aug	11.5	41	0	0	249	0	0
	2021	23-Jun	10-Oct	16-Aug	13.4	13-Aug	12.7	69	0	0	631	0	0
	2022	1-May	4-Oct	21-Aug	12.2	20-Aug	12.0	52	0	0	384	0	0

Stream temperatures in Soup Creek have been monitored annually since 2001 at a site in lower Soup Creek. In 2021 and 2022, additional monitoring was conducted on reaches upstream to identify where possible sources of warm water were influencing the thermal regime in Soup Creek, which may be limiting to bull trout during portions of the late summer. Thermographs were installed upstream and downstream from the confluences of Soup Creek and Napa and North Fork Soup creeks respectively. Monitoring in 2021 and 2022 noted significant increase in temperature in the reach between Napa and North Fork Soup creeks, likely due to relic beaver dams, which have impounded portions of both Soup and Napa creeks in S33. MWMT upstream from Napa Creek did not exceed 12.7 degrees C in 2021 or 2022, with no hourly or daily observations exceeding 15.0 degrees C in 2021 or 12.2 degrees C in 2022. Downstream from North Fork Soup Creek, MWMT peaked at 17.7 degrees C and 16.3 degrees C in 2021 and 2022 respectively. Additionally, hourly and daily observations exceeded 15.0 degrees C during large

portions of the monitoring periods in both 2021 and 2022. These findings indicate that while stream temperatures in the lower watershed are elevated and may be affecting fisheries populations in the watershed, the warming is largely a result of natural stream processes. Based on the current condition, there is an existing moderate impact on stream temperature in the Soup Creek assessment area.

**FIGURE III - 14 - MEAN WEEKLY MAXIMUM STREAM TEMPERATURE.** Soup Creek.



**TABLE III - 52 - SOUP CREEK STREAM TEMPERATURE MONITORING.**

Stream	Year	Sampling Period		Daily Max		MWMT		Days >			Hours >		
		Start	End	Date	Temp	Date	Temp	10.0 C	15.0 C	21.1 C	10.0 C	15.0 C	21.1 C
Soup Creek	2012	29-Jun	4-Nov	22-Jul	15.6	21-Jul	15.1	89	11	0	1,499	42	0
	2013	28-Jun	14-Oct	17-Jul	18.2	23-Jul	17.6	87	57	0	2,037	517	0
	2015	12-Jun	21-Oct	2-Jul	19.2	1-Jul	18.7	110	47	0	2,228	450	0
	2016	15-Jul	18-Oct	30-Jul	17.7	28-Jul	17.1	69	28	0	1,312	249	0
	2017	6-Jul	27-Nov	29-Jul	18.0	30-Jul	17.5	72	44	0	1,696	399	0
	2018	22-Jun	9-Nov	10-Aug	16.8	17-Jul	16.3	87	34	0	1,653	230	0
	2019	9-Jul	27-Oct	2-Aug	17.9	4-Aug	17.6	80	34	0	1,784	320	0
	2020	15-May	19-Oct	2-Aug	17.5	31-Jul	16.9	101	22	0	1,779	181	0
	2021	23-Jun	10-Oct	1-Aug	17.9	1-Aug	17.5	91	50	0	1,934	550	0
	2022	20-Apr	2-Nov	29-Jul	16.4	30-Jul	16.1	98	19	0	1,778	115	0

Stream shade measurements in Cilly Creek were collected during 2019 field reviews (TABLE III-51). Stream temperature monitoring has not been conducted in Cilly Creek in the last 5 years, however based on previous monitoring, mean weekly maximum stream temperature ranged from 6.0 to 12.1 degrees C between 2004 and 2006. Of the estimated 315 acres of RMZ along class 1 streams in the Cilly Creek analysis area, riparian timber harvest occurred in approximately 1.7 percent of the RMZ during timber sales between 2003 and 2019 (TABLE III-

51). Current stand stocking levels in the analysis area indicate less than 1.0 percent of the RMZ acres in non-stocked or seedling-sapling size classes. Based on historic stream temperature data, and current levels of stream shade and riparian stand conditions, there is a very low existing impact on stream temperature in the Cilly Creek analysis area.

## **ENVIRONMENTAL EFFECTS**

The proposed actions that may affect fisheries resources in the project area under both Action Alternatives include the following;

- Maintenance and utilization of existing forest roads and stream crossings from timber management activities
- Construction of new forest road
- Reclamation of existing forest road
- Construction of new stream crossings
- Removal of existing stream crossings
- Upland timber harvest

Issues dismissed from further analysis in the project area include the potential affects of riparian timber harvest on stream habitat characteristics including; stream shade and subsequent impacts on stream temperature, recruitment of large woody debris to stream channels, and sediment delivery from riparian disturbance. This issue was dismissed from further analysis as the primary effect mechanism impacting fisheries resources would be through harvest in Streamside (SMZ) or Riparian Management Zones (RMZ). No SMZ or RMZ harvest is proposed adjacent to classified waterbodies in the project area, as such the existing impacts would continue to occur as described in the *EXISTING CONDITIONS*.

### ***EFFECTS COMMON TO ALL ASSESSMENT AREAS***

- ***Direct and Indirect Effects of the No-Action Alternative A***

No direct or indirect impacts would occur to the affected fish species or other affected fisheries resources beyond those described in the *EXISTING ENVIRONMENT*. Existing impacts to native species resulting from interaction with non-native species will continue, resulting in a continued impacts as described in the *EXISTING ENVIRONMENT*.

- ***Cumulative Effects of No-Action Alternative A***

Relevant past and present factors and site-specific existing conditions described in *EXISTING ENVIRONMENT* would continue to occur. Other future related actions including those described in *CHAPTER 1-PURPOSE AND NEED* under *RELEVANT*



*PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS.* These relevant actions include moderate levels of timber harvest on private and federal lands, utilization of private and public forest road for recreational use, and climate change. Considering the collective impacts of these effects, a high cumulative effect to fisheries resources is present in the analysis area. The high cumulative effect is directly related to the continued presence of non-native species in the analysis area and associated risk of hybridization, competition, predation, and potentially displacement of native species.

#### **SWAN RIVER DRAINAGES ASSESSMENT AREA**

- ***Direct and Indirect Effects Common to both Action Alternatives on the Swan River Drainages Analysis Area***

No additional direct, indirect or cumulative effects to fisheries populations or genetics are anticipated to occur in the analysis area due to implementation of proposed actions identified in Action Alternatives B and C. No introduction or suppression of non-native species are proposed, resulting in continued high adverse cumulative effects to native populations and genetics in Swan River Drainages assessment area.

Fisheries connectivity would be improved by the removal of one existing stream crossing in In-Pa-Ah Creek, which would increase connectivity in the population by approximately 0.4 miles, a long-term moderate positive impact.

Increased vehicle traffic related to project activities would occur under both Action Alternatives. This increase may accelerate mobilization and erosion of road surface material at road-stream crossings (*Reid and Dunne 1984, Bilby et al. 1989, Coker et al. 1993, Luce and Black 2001*). Under both proposed Action Alternatives, 2.4 miles of new road construction would occur, of which 0.4 miles is within 300 feet of a classified waterbody. Road reclamation would occur on 0.9 miles of road in the assessment area, of which 0.1 miles is within 300 feet of a classified stream (*TABLE III-47*). No new stream crossings would be constructed in the assessment area, while three crossings would be replaced or removed to improve water quality. Corrective actions would be applied to existing road surfaces and stream crossings that do not meet forestry BMPs, which may result in reduced sediment delivery to fisheries habitat, however given the scope of the proposed actions in relation to fisheries resources, the potential impact is unlikely to be measurable in either a positive or negative direction. Utilization of existing road for timber hauling would occur on 30 percent and 25 percent of the total roads in the assessment area under Alternatives B and C, respectively. Of the haul routes proposed for use, 7.4 and 6.9 miles are within 300 feet of classified waterbodies in the assessment area. Implementation of either Action Alternative is anticipated to have similar low risk of low additional impact to sediment delivery in the assessment area.

Potential impacts to channel form under the proposed Action Alternatives are primarily a function of alterations to the flow regime, sediment conditions associated with stream crossings, road construction, and upland timber harvest. Considering the proposed actions in combination with existing fisheries habitat conditions, there is an anticipated low risk of low additional impacts to fisheries habitat in the assessment area from implementation of either Action Alternative.

- ***Cumulative Effects of Alternatives B and C on the Swan River Drainages Analysis Area***

Using the cumulative effects described for the No-Action Alternative as a baseline, the level of direct and indirect effects occurring due to implementation of either proposed Action Alternative is expected to result in an additional low risk of low impact to fisheries habitat resources. The continued presence of non-native species would result in continued high cumulative impacts on fisheries resources in the Swan River Drainages Analysis Area. The cumulative effects of non-native species would continue to occur irrespective of the selection of the No-Action or either Action Alternative.

Compared to No-Action Alternative A, both Action Alternatives B and C would result in:

- No additional impact on fisheries populations or genetics
- Moderate long-term improvement in fisheries connectivity
- Low risk of low additional direct and indirect impacts on fisheries habitat from sediment delivery
- Low risk of low additional impact to channel form through sediment delivery or alterations to the duration, magnitude and timing of discharge events

#### **SQUEEZER CREEK ANALYSIS AREA**

- ***Direct and Indirect Effects Common to both Action Alternatives in the Squeezer Creek Analysis Area***

No additional direct or indirect effects to fisheries populations, genetics, or connectivity are expected to occur in the analysis area as a result of proposed actions identified in Action Alternatives B and C. No introduction or suppression of non-native species are proposed, resulting in continued high impact to native populations and genetics in Squeezer Creek.

No new perennial road-stream crossings would be constructed either Action Alternative in the assessment area, with existing crossings providing full levels of passage to all life

stages of native species. Based on the proposed actions and existing conditions, there is no additional risk of elevated impacts to connectivity in the assessment area.

Increased water yield would be anticipated through implementation of either Action Alternative (*TABLE III-44*). The existing water yield increase in Squeezer Creek is a result of previous timber harvest in the assessment area and is currently 2.8 percent. Implementation of alternatives B or C would result in similar elevated water yield as a result of upland timber harvest. The anticipated increase in water yield would be approximately 1.7 percent, resulting in a total increase of 4.5 percent. This is below the established threshold of 10 percent for this assessment area. Given the magnitude of harvest proposed, there is a low risk of low additional impact to the duration, magnitude, and timing of discharge events in the assessment area.

Increased vehicle traffic related to project activities would occur under both Action Alternatives. This increase may accelerate mobilization and erosion of road surface material at road-stream crossings (*Reid and Dunne 1984, Bilby et al. 1989, Coker et al. 1993, Luce and Black 2001*). Under both proposed Action Alternatives, 2.8 miles of new road construction would occur, of which 0.1 miles is within 300 feet of a classified waterbody. Road reclamation would occur on 3.6 miles of road in the assessment area, of which 0.5 miles is within 300 feet of a classified stream (*TABLE III-47*). No new stream crossings would be constructed in the assessment area, while one crossing would be replaced to improve water quality. Corrective actions would be applied to existing road surfaces and stream crossings that do not meet forestry BMPs, which may result in reduced sediment delivery to fisheries habitat, however given the scope of the proposed actions in relation to fisheries resources, the potential impact is unlikely to be measurable (*TABLE III-40*). Utilization of existing road for timber hauling would occur on 34 percent and 33 percent of the total roads in the assessment area under alternatives B and C, respectively. Of the haul routes proposed for use, 0.9 and 1.0 miles are within 300 feet of classified waterbodies in the assessment area. Short-term elevated risk of sediment delivery may occur during the period immediately following replacement of stream crossings, which is expected to become a low risk of low impact as sites revegetate. Implementation of either Action Alternative is anticipated to have similar long-term low risk of low additional impact to sediment delivery in the assessment area.

Potential impacts to channel form under the proposed Action Alternatives are primarily a function of alterations to the flow regime, and sediment conditions associated with stream crossings, road construction, and upland timber harvest. Considering the proposed actions in combination with existing fisheries habitat conditions, there is an

anticipated low risk of low additional impacts to fisheries habitat in the assessment area from implementation of either Action Alternative.

- ***Cumulative Effects of Alternatives B and C on the Squeezer Creek Analysis Area***

Using the cumulative effects described for the No-Action Alternative as a baseline, the level of direct and indirect effects occurring due to implementation of either proposed alternative is expected to result in a moderate risk of low impact to fisheries habitat resources. The continued presence of non-native species would result in continued high cumulative impacts on fisheries resources in the Squeezer Creek Analysis Area. The cumulative effects of non-native species would continue to occur irrespective of the selection of the No-Action or either Action Alternative. Compared to Alternative A, both Alternatives B and C would result in:

- No additional impact on fisheries populations, genetics, or connectivity
- High risk of short-term low impacts to sediment delivery at stream crossing replacement sites
- Low risk of long-term low impact to sediment delivery
- Low risk of low impacts to the duration, magnitude, and timing of seasonal discharge
- Low risk of low impact to channel form

#### **GOAT CREEK ANALYSIS AREA**

- ***Direct and Indirect Effects Common to both Action Alternatives in the Goat Creek Analysis Area***

No direct or indirect effects to fisheries populations, genetics, or connectivity are expected to occur in the analysis area as a result of proposed actions identified in Action Alternatives B and C. No introduction or suppression of non-native species are proposed, resulting in continued high impact to native populations and genetics in Goat Creek.

No new perennial road-stream crossings would be constructed either Action Alternative in the assessment area. One existing crossing that prevents fish passage would be replaced to provide full passage to all life stages of salmonids. This action would reconnect approximately 0.9 miles of stream and would constitute a positive long-term moderate impact to connectivity in the assessment area.

Increased water yield would be anticipated through implementation of either Action Alternative (*TABLE III-43*). The existing water yield increase in Goat Creek is a result of

previous timber harvest in the assessment area and is currently 3.9 percent. Implementation of Alternatives B or C would result in similar elevated water yield as a result of upland timber harvest. The anticipated increase in water yield would be approximately 1.1 percent, resulting in a total increase of 5.0 percent. This is below the established threshold of 10 percent for this assessment area. Given the magnitude of harvest proposed, there is a low risk of low additional impact to the duration, magnitude, and timing of discharge events in the assessment area.

Increased vehicle traffic related to project activities would occur under both Action Alternatives. This increase may accelerate mobilization and erosion of road surface material at road-stream crossings (*Reid and Dunne 1984, Bilby et al. 1989, Coker et al. 1993, Luce and Black 2001*). Under both proposed Action Alternatives, 0.1 miles of new road construction would occur, none of which is within 300 feet of a classified waterbody. Road reclamation would occur on 2.7 miles of road in the assessment area, of which 0.7 miles is within 300 feet of a classified stream (*TABLE III-47*). No new stream crossings would be constructed in the assessment area. Two stream crossings would be improved to provide fish passage and improve water quality, while three crossings would be removed and restored to natural channel conditions. Replacement and removal will likely result in increased sediment delivery short-term as sites revegetate and stabilize post-construction, with long-term sediment delivery anticipated to be reduced slightly over the existing condition. Corrective actions would be applied to existing road surfaces and stream crossings that do not meet forestry BMPs, which may result in reduced sediment delivery to fisheries habitat. Implementation of either Action Alternative may result in reduction in sediment delivery over the existing condition by approximately 30 percent (*TABLE III-39*). Utilization of existing road for timber hauling would occur on 25 percent and 22 percent of the total roads in the assessment area under Alternatives B and C, respectively. Of the haul routes proposed for use, 4.8 and 4.6 miles are within 300 feet of classified waterbodies in the assessment area. Considering the short-term elevated risk of sediment delivery from stream crossing replacement and removal, long-term reduction in sediment through implementation of BMPs and road system improvements, there is an anticipated low risk of low additional impacts to fisheries habitat due to sediment delivery.

Potential impacts to channel form under the proposed Action Alternatives are primarily a function of alterations to the flow regime, and sediment conditions associated with stream crossings, road construction, and upland timber harvest. Considering the proposed actions in combination with existing fisheries habitat conditions, there is an

anticipated low risk of low additional impacts to fisheries habitat in the assessment area from implementation of either Action Alternative.

- ***Cumulative Effects of Alternatives B and C on the Goat Creek Analysis Area***

Using the cumulative effects described for the No-Action Alternative as a baseline, the level of direct and indirect effects occurring due to implementation of either proposed alternative is expected to result in a moderate risk of low impact to fisheries habitat resources. The continued presence of non-native species would result in continued high cumulative impacts on fisheries resources in the Goat Creek Analysis Area. The cumulative effects of non-native species would continue to occur irrespective of the selection of the No-Action or either Action Alternative. Compared to Alternative A, both Alternatives B and C would result in:

- No additional impact on fisheries populations or genetics
- Moderate long-term positive impact on fisheries connectivity
- High risk of short-term low impacts to sediment delivery at stream crossing replacement sites
- Low risk of long-term low impact to sediment delivery
- Low risk of low impacts to the duration, magnitude, and timing of seasonal discharge
- Low risk of low impact to channel form

**SOUP CREEK ANALYSIS AREA**

- ***Direct and Indirect Effects Common to both Action Alternatives in the Soup Creek Analysis Area***

No direct or indirect effects to fisheries populations, genetics, or connectivity are expected to occur in the analysis area as a result of proposed actions identified in Action Alternatives B and C. No introduction or suppression of non-native species are proposed, resulting in continued high impact to native populations and genetics in Soup Creek.

No new perennial road-stream crossings would be constructed either Action Alternative in the assessment area. All existing stream crossings provide full fish passage to all life stages of salmonids. Implementation of either Action Alternative would result in no additional risk of impacts to fisheries connectivity in the assessment area.

Increased water yield would be anticipated through implementation of either Action Alternative (*TABLE III-38*). The existing water yield increase in Soup Creek is a result of previous timber management activities in the assessment area and is currently 6.2

percent. Implementation of alternatives B or C would result in similar elevated water yield as a result of upland timber harvest. The anticipated increase in water yield would be approximately 1.1 percent under Alternative B and 0.9 percent under Alternative C. Both values are below the established threshold of 10 percent for this assessment area. There is unlikely to be measurable differences in water yield between the two Action Alternatives. Given the magnitude of harvest proposed, there is a low risk of low additional impact to the duration, magnitude, and timing of discharge events in the assessment area.

Increased vehicle traffic related to project activities would occur under both Action Alternatives. This increase may accelerate mobilization and erosion of road surface material at road-stream crossings (*Reid and Dunne 1984, Bilby et al. 1989, Coker et al. 1993, Luce and Black 2001*). No new road construction or road reclamation are proposed under either Action Alternative. No new stream crossings would be constructed, replaced, or removed in the assessment area. Corrective actions would be applied to existing road surfaces and stream crossings that do not meet forestry BMPs, which may result in reduced sediment delivery to fisheries habitat (*TABLE III-38*). Utilization of existing road for timber hauling would occur on 20 percent and 22 percent of the total roads in the assessment area under Alternatives B and C, respectively. Of the haul routes proposed for use, 3.1 and 3.4 miles are within 300 feet of classified waterbodies in the assessment area.

Potential impacts to channel form under the proposed Action Alternatives are primarily a function of alterations to the flow regime, and sediment conditions associated with stream crossings, road construction, and upland timber harvest. Considering the proposed actions in combination with existing fisheries habitat conditions, there is an anticipated low risk of low impacts to fisheries habitat in the assessment area from implementation of either Action Alternative.

- ***Cumulative Effects of Alternatives B and C on the Soup Creek Analysis Area***

Using the cumulative effects described for the No-Action Alternative as a baseline, the level of direct and indirect effects occurring due to implementation of either proposed alternative is expected to result in a moderate risk of low impact to fisheries habitat resources. The continued presence of non-native species would result in continued high cumulative impacts on fisheries resources in the Soup Creek Analysis Area. The cumulative effects of non-native species would continue to occur irrespective of the selection of the No-Action or either Action Alternative. Compared to Alternative A, both Alternatives B and C would result in:

- No additional impact on fisheries populations, genetics, or connectivity
- Low risk of low impacts to sediment delivery
- Low risk of low impacts to the duration, magnitude, and timing of seasonal discharge
- Low risk of low impact to channel form

#### **CILLY CREEK ANALYSIS AREA**

- ***Direct and Indirect Effects Common to both Action Alternatives in the Cilly Creek Analysis Area***

No direct or indirect effects to fisheries populations, genetics, or connectivity are expected to occur in the analysis area as a result of proposed actions identified in Action Alternatives B and C. No introduction or suppression of non-native species are proposed, resulting in continued high impact to native populations and genetics in Cilly Creek.

No new perennial road-stream crossings would be constructed either Action Alternative in the assessment area. All existing stream crossings provide full fish passage to all life stages of salmonids. Implementation of either Action Alternative would result in no additional risk of impacts to fisheries connectivity in the assessment area.

Increased water yield would be anticipated through implementation of either Action Alternative (*TABLE III-41*). The existing water yield increase in Cilly Creek is a result of previous timber management activities in the assessment area and is currently 10.2 percent. The anticipated increase in water yield would be approximately 1.2 percent under Alternative B and 0.7 percent under Alternative C. Both values are below the established threshold of 10 percent for this assessment area and are anticipated to have similar impacts on the duration, magnitude, and timing of seasonal discharge events. Given the magnitude of harvest proposed, there is a low risk of low impact to the duration, magnitude, and timing of discharge events in the assessment area.

Increased vehicle traffic related to project activities would occur under both Action Alternatives. This increase may accelerate mobilization and erosion of road surface material at road-stream crossings (*Reid and Dunne 1984, Bilby et al. 1989, Coker et al. 1993, Luce and Black 2001*). No new road construction or road reclamation are proposed under either Action Alternative. No new stream crossings would be constructed, replaced, or removed in the assessment area. Corrective actions would be applied to existing road surfaces and stream crossings that do not meet forestry BMPs, which may result in reduced sediment delivery to fisheries habitat (*TABLE III-37*). Utilization of existing road for timber hauling would occur on 13 percent of the total roads in the assessment area under Alternatives B and C. Of the haul routes proposed for use, 1.0 miles are within 300



feet of classified waterbodies in the assessment area. Based on the proposed Action Alternatives, there is an anticipated low risk of low additional impacts on fisheries habitat through sediment delivery.

Potential impacts to channel form under the proposed Action Alternatives are primarily a function of alterations to the flow regime, and sediment conditions associated with stream crossings, road construction, and upland timber harvest. Considering the proposed actions in combination with existing fisheries habitat conditions, there is an anticipated low risk of low additional impacts to fisheries habitat in the assessment area from implementation of either Action Alternative.

- ***Cumulative Effects of Alternatives B and C on the Cilly Creek Analysis Area***

Using the cumulative effects described for the No-Action Alternative as a baseline, the level of direct and indirect effects occurring due to implementation of either proposed alternative is expected to result in a moderate risk of low impact to fisheries habitat resources. The continued presence of non-native species would result in continued high cumulative impacts on fisheries resources in the Soup Creek Analysis Area. The cumulative effects of non-native species would continue to occur irrespective of the selection of the No-Action or either Action Alternative. Compared to Alternative A, both Alternatives B and C would result in:

- No additional impact on fisheries populations, genetics, or connectivity
- Low risk of low impacts to sediment delivery
- Low risk of low impacts to the duration, magnitude, and timing of seasonal discharge
- Low risk of low impact to channel form

## **WILDLIFE ANALYSIS**

### **INTRODUCTION**

The wildlife analysis is designed to disclose the existing condition of wildlife resources and the anticipated direct, indirect, and cumulative effects that may result from implementing the No-Action and Action Alternatives.

### **ISSUES AND MEASUREMENT CRITERIA**

Wildlife issues were identified through public and internal scoping and are listed in *TABLE I-1 – ISSUES STUDIED IN DETAIL (CHAPTER I)*. The issues carried forward in this analysis are reiterated at the beginning of each subsection. Differing measurement criteria were used to evaluate the effects of the alternatives, depending on the resource or habitat attribute analyzed. Quantifiable metrics were selected to describe the scope and scale of effects to a target species, habitat, or habitat parameter. The metrics used for evaluations are described in *ANALYSIS METHODS* under each issue topic.

### **ANALYSIS AREAS**

#### ***DIRECT AND INDIRECT EFFECTS***

The direct and indirect effects of the proposed activities on all species/habitat parameters were analyzed within the project area (*TABLE III-53, FIGURE III-15*).

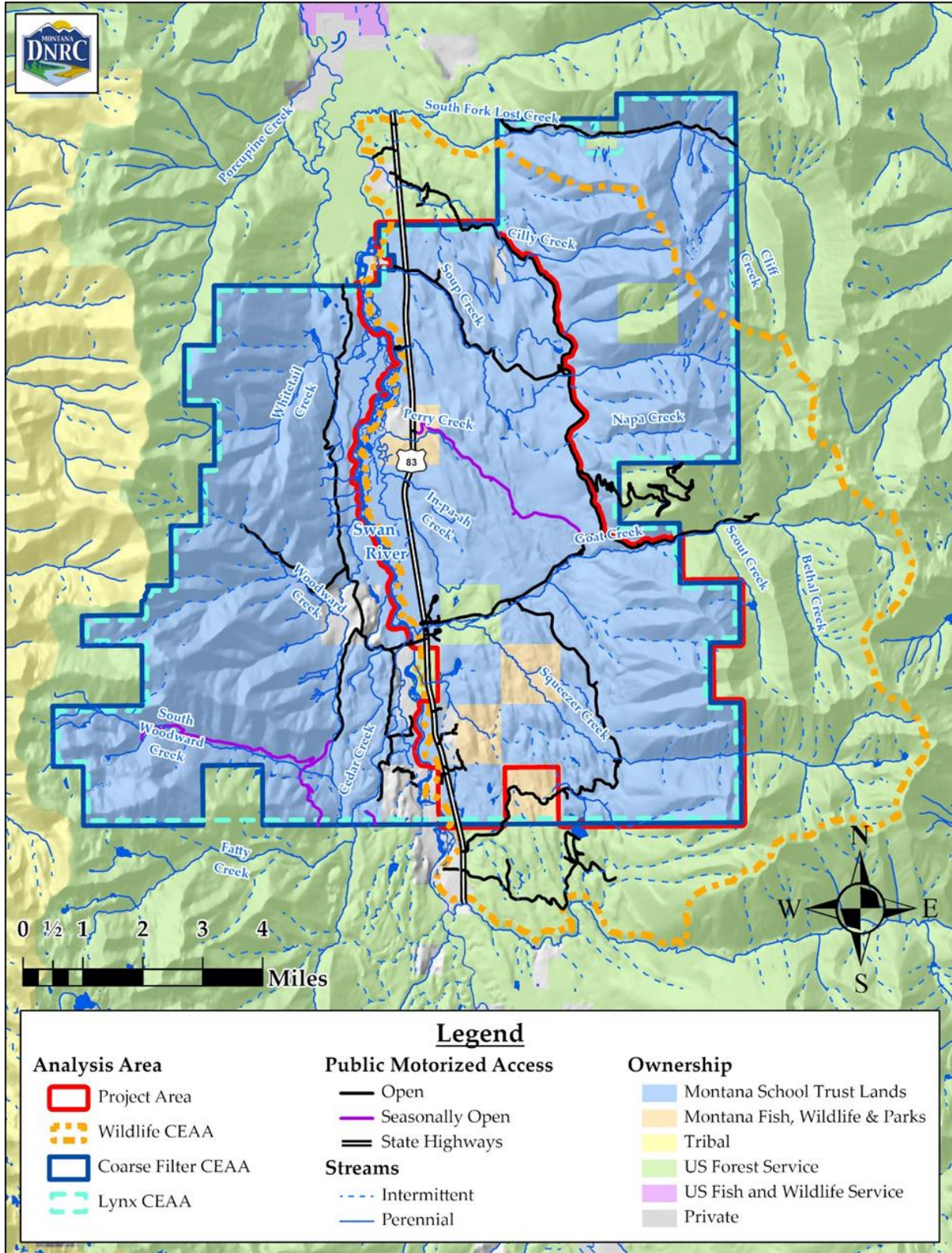
#### ***CUMULATIVE EFFECTS***

The cumulative effects of the proposed activities on all species/habitat parameters were analyzed at broad surrounding landscape scales that vary according to the issue being discussed. Cumulative effects analysis areas (CEAAs) are summarized in *TABLE III-53* and depicted in *FIGURE III-15*. CEAAs include the project area as well as lands managed by other agencies and private landowners. Detailed descriptions of each analysis area are in the *EXISTING ENVIRONMENT* section for each habitat parameter or species evaluated.

**TABLE III - 53 - ANALYSIS AREAS.** Descriptions of the project area and CEAs.

<b>ANALYSIS AREA NAME</b>	<b>DESCRIPTION</b>	<b>TOTAL ACRES</b>	<b>ISSUE(S)/SPECIES ANALYZED</b>
Project Area	Portions of DNRC-managed lands in T24N, R17W, Sections: 16, 17, 18, 19, 20, 21, 22, 27, 28, 29, 30, 32, 33, 34, in T24N, R18W, Sections: 24, 25, 36, T23N, R17W, Sections: 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 15, 16, 18, 20, 22, 23, 24, 25, 26, 27, 28, 30, 32, 34, 35, 36, T23N, R18W, Sections: 1, 12	25,436	direct and indirect effects for all issues/species
Wildlife CEAA	Portions of the Lost Creek, Middle Swan River (Metcalf Lake), Soup Creek Goat Creek, Middle Swan Creek (Van Lake) and Lion Creek huck 12 watersheds. Major ridgelines and drainages delineate the boundaries. The CEAA is managed primarily by DNRC (53.3%), the USFS (40.5%), and MFWP (3.8%).	58,521	grizzly bear, flammulated owl, fisher, pileated woodpecker, big game
Lynx CEAA	The <i>Swan Lynx Management Area</i> in addition to non-DNRC lands within this area.	62,853	Canada lynx
Coarse Filter CEAA	Swan River State Forest including non-DNRC checkerboard lands. The CEAA is managed primarily by the DNRC (90%).	62,279	old-growth, habitat connectivity and fragmentation, and linkage

**FIGURE III - 15 - ANALYSIS AREAS.** Project area and wildlife cumulative effects analysis areas for the Squeezer Meadow Multiple Timber Sale Project.



**ANALYSIS METHODS**

Analysis methods are based on the DNRC State Forest Land Management Plan, which is designed to promote biodiversity. The primary basis for this analysis includes information obtained by: field visits, review of scientific literature, Montana Natural Heritage Program (MNHP) data queries, DNRC Stand Level Inventory (SLI) data analysis, aerial photograph analysis, USDA Forest Service Vegetation Mapping (VMap) data analysis, Lidar data analysis, and consultation with professionals. The coarse-filter wildlife analysis section includes analyses of the direct, indirect, and cumulative effects of the proposed alternatives on old-growth forest, habitat connectivity and fragmentation, and linkage.

In the fine-filter analysis, individual species of concern are evaluated. These species include wildlife species federally listed under the Endangered Species Act, species listed as sensitive by DNRC, and species managed as big game by the Montana Department of Fish Wildlife and Parks (DFWP).

Cumulative effects analyses account for known past and current activities, as well as planned future agency actions. See *CHAPTER I - PURPOSE AND NEED* for a comprehensive listing of past DNRC vegetation management projects on the Swan River State Forest. Ongoing and proposed timber sales occurring in the project area and CEAs are listed in *TABLE III-53*. Changes to forest structure resulting from all completed and ongoing DNRC projects have been accounted for in SLI data used for this analysis through routine timber sale updating procedures. Timber sales that occurred on private lands and USFS lands are accounted for in analyses of aerial photographs. The USFS is proposing the Mid-Swan Landscape Restoration Project, which extends from Swan Lake to Condon, MT and may contribute additional cumulative effects; however, a final record of decision (ROD) selecting an alternative containing final harvest units are not available for further analysis (*USFS 2020*).

**TABLE III - 54 - ONGOING PROJECTS.** *Acreage of ongoing and proposed timber sales occurring in the project area and CEAs. Impacts from the Mid-Swan Project are excluded from grand totals considering that an alternative has not been chosen.*

<b>SALE NAME</b>	<b>AGENCY</b>	<b>HARVEST YEAR</b>	<b>PROJECT AREA</b>	<b>WILDLIFE CEAA</b>	<b>LYNX CEAA</b>	<b>COARSE FILTER</b>
Low Lion	DNRC	2022-2024	0	0	212	212
Wood Lion	DNRC	Not Sold	0	0	148	148
Soup Canyon	DNRC	2024-2026	0	885	885	885
Lost Ridge	DNRC	Not sold	0	196	503	503
Soup or Cilly	DNRC	2024-2026	0	327	327	327

North Soup Canyon	DNRC	2024-2026	0	270	270	270
Cilly to Lost	DNRC	2024-2026	0	112	117	117
Lost Again	DNRC	2024-2026	0	225	266	266
<i>Grand Total</i>			0	2015	2,728	2,728
<i>% of Analysis Area</i>	-	-	0%	3.4%	4.3%	4.4%

**RELEANT AGREEMENTS, LAWS, PLANS, RULES, AND REGULATIONS**

The following plans, rules, and practices have guided this project’s planning and/or will be implemented during project activities: *DNRC Forest Management Rules (ARMs), DNRC Forested Trust Lands Final Environmental Impact Statement and Habitat Conservation Plan (USFWS and DNRC 2010), Supplemental Environmental Impact Statement For the Proposed Amendment to the Endangered Species Act 10(a)(1)(B) Permit Associated with the Montana Department of Natural Resources and Conservation Forested State Trust Lands Habitat Conservation Plan (2018), the Endangered Species Act, Migratory Bird Treaty Act, and the Bald and Golden Eagle Protection Act.*

**COARSE FILTER WIDLIFE ANALYSIS  
OLD GROWTH**

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

**Introduction**

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

**Analysis Areas**

The analysis area selected to analyze direct and indirect effects is the 25,436-acre project area which includes 21,853 acres of forested DNRC lands. Cumulative effects were analyzed at the landscape scale of the 62,279-acre Coarse Filter CEEA, which includes 56,308 acres of forested DNRC lands, to provide an appropriate expanded scale comprised predominantly of DNRC-

managed lands, and to provide consistency with the discussion in *VEGETATION ANALYSIS*. The analysis areas are described in *TABLE III-53* and depicted in *FIGURE III-15*.

#### **Analysis Methods**

Old growth forest patches were identified using tree size, age, abundance and patch size as described in the *OLD GROWTH* section of the *VEGETATION ANALYSIS* based on the current DNRC stand level inventory (SLI). Factors considered in the analysis include: 1) the level of harvesting, 2) the acreage and distribution of existing old-growth patches, and 3) the abundance of old growth patches  $\geq 80$  acres.

#### **Existing Environment**

The project area contains 2,743 acres of old-growth (*TABLE III-55*; see No-Action Alternative A for *EXISTING CONDITIONS*). Old growth stands occur as large patches in the Goat Creek and Soup Creek drainages up to 358 acres in size (*TABLE III-55*) and smaller patches scattered throughout the project area. However, many of the old-growth patches in the project area share some of their boundaries with mature, dense forests. In these cases, the effective patch size for old-growth associated species is likely larger than for patches surrounded by younger-aged forest stands. These old-growth stands are composed primarily of Douglas fir and western larch.

The Coarse Filter CEAA contains 6,639 acres of old-growth on DNRC-managed lands (*TABLE III-55*; see No-Action Alternative A for *EXISTING CONDITIONS*). The amount of old-growth in the Coarse Filter CEAA is difficult to quantify because little is known about the abundance and distribution of old-growth on other ownerships, and approximations were not possible using aerial-photograph analysis. Landowners have had different approaches to the management of old growth in the Coarse Filter CEAA, which has affected its abundance and spatial distribution. In general, the USFS has retained much of the old growth on its land.

**TABLE III - 55 - OLD GROWTH CHARACTERISTICS.** Estimated acreage and average patch size (patches >5 acres) of old-growth stands that would remain post-harvest on DNRC-managed lands in the project area and the Coarse Filter CEEA.

<b>OLD-GROWTH ATTRIBUTE</b>	<b>PROJECT AREA</b>			<b>COARSE FILTER CEEA</b>		
	<b>NO-ACTION</b>	<b>ACTION</b>		<b>NO-ACTION</b>	<b>ACTION</b>	
	<b>A</b>	<b>B</b>	<b>C</b>	<b>A</b>	<b>B</b>	<b>C</b>
Old growth habitat affected (percent of available habitat)	0 (0)	760 (27.7)	717 (26.1)	0 (0)	760 (11.4)	717 (10.8)
Old growth removed (percent of available habitat)	0 (0)	435 (15.9)	296 (10.8)	0 (0)	435 (6.5)	296 (4.5)
Number of old growth patches	60	57	61	118	116	119
Average patch size (percent decrease in patch size)	46 (0)	40 (12.2)	40 (12.8)	56 (0)	54 (5)	53 (5.2)
Number of patches ≥80 acres	9	7	7	21	20	20
Average size of patches ≥80 acres (percent decrease in patch size)	186 (0)	161 (13.7)	167 (10.1)	206 (0)	193 (6.4)	195 (5.2)
Maximum patch size	358	336	358	549	549	549
Total acres of old growth post-harvest (percent of analysis area; DNRC-lands only)	2,743 (12.6)	2,308 (10.6)	2,447 (11.2)	6,639 (12.2)	6,204 (11.4)	6,343 (11.7)

**Environmental Effects**

- **Direct and Indirect Effects of No-Action Alternative A to Old Growth**

None of the proposed forest management activities would occur. In the short term, no changes to the amounts, quality, or spatial arrangement of old growth would occur. In the long term and in the absence of natural disturbance, the availability and connectivity of old growth wildlife habitat may increase as stands mature. Thus, no adverse direct or indirect effects to old growth associated wildlife would be anticipated as a result of No-Action Alternative A.

- **Direct and Indirect Effects of Action Alternative B to Old Growth**



Approximately 760 acres (27.7 percent) of the existing 2,743 acres of old growth in the project area would be harvested under Action Alternative B. Of these acres, 435 acres would be treated with seed tree, shelterwood, individual tree selection, overstory removal, and commercial thin treatments, and these stands would not be considered old growth post-harvest due to the low density of large-diameter trees (*TABLE III-55*). The remaining 325 acres would be treated with old growth maintenance treatments and these acres would continue to exceed the minimum old growth definitions described by *Green et al. (1992)* (see *VEGETATION ANALYSIS*). These stands may have improved resiliency and sustainability for several decades following treatment; however, habitat quality would be reduced for wildlife species that prefer dense old growth stands. The greatest impacts to old growth habitat would occur in the Soup Creek and adjacent drainages at lower elevation and be greater than those impacts associated with Alternative C. The number of old growth patches would decrease from 60 to 57, and average patch size would decrease by 6 acres (12.2 percent; *TABLE III-55*). The number of old growth patches  $\geq 80$  acres would decrease by from 9 to 7, and the average patch size of these stands would decrease by 25 acres (13.7 percent). Thus, since: 1) the abundance of old growth would be reduced by 435 acres (15.9 percent of existing old growth stands in the project area); 2) stand density would decrease on 325 acres (11.8 percent of old growth stands in the project area), which may adversely affect wildlife that prefer dense old growth stands; and 3) the abundance of patches  $\geq 80$  acres would decrease by 2 (22.2 percent) and average patch size would decrease by 25 acres (13.7 percent); moderate adverse direct and indirect effects to old growth associated wildlife species would be anticipated as a result of the Action Alternative B.

- ***Direct and Indirect Effects of Action Alternative C to Old Growth***

Approximately 717 acres (26.1 percent) of the existing 2,743 acres of old growth in the project area would be harvested under Action Alternative C. Of these acres, 296 would be treated with seed tree, shelterwood, overstory removal, individual tree selection, and commercial thin treatments, and these stands would not be considered old growth post-harvest due to the low density of large-diameter trees (*TABLE III-55*). The remaining 421 acres would be treated with an old growth maintenance treatment and would continue providing old growth habitat as defined by *Green et al. (1992)* (see *VEGETATION ANALYSIS*). The number of old growth patches would increase by one, but average patch size would decrease by 6 acres (12.8 percent, *TABLE III-55*). The number of old growth patches  $\geq 80$  acres would decrease from 9 to 7, and the average patch size of these stands would decrease by 19 acres (10.1 percent). Thus, since: 1) the abundance of old growth would be reduced by 296 acres (10.8 percent of old growth stands in the project area); 2) stand density would decrease on an additional 421 acres treated with maintenance treatments (15.3 percent of old growth stands); and 3) the abundance of patches  $\geq 80$  acres would decrease by 2 (22.2 percent), and the average size of these patches would decrease by 19 acres (10.1 percent); moderate adverse direct and indirect

effects to old growth associated wildlife species would be anticipated as a result of the Action Alternative C.

- ***Cumulative Effects of No-Action Alternative A to Old Growth***

None of the proposed forest management activities would occur. In the short term, no changes to the amounts, quality, or spatial arrangement of old growth would occur. In the long term and in the absence of natural disturbance, the availability and connectivity of old growth wildlife habitat may increase as stands mature. Thus, no adverse cumulative effects to old growth associated wildlife would be anticipated as a result of No-Action Alternative A.

- ***Cumulative Effects of Action Alternative B to Old Growth***

Approximately 760 acres (11.4 percent) of the existing 6,639 acres of old-growth available in the Coarse Filter CEAA would be harvested under Action Alternative B. Alternative B is anticipated to have greater adverse impacts on old growth considering that more old-growth removal would occur compared to Action Alternative C. Most of the acres proposed for treatment (435 acres) would not be old-growth post-harvest considering the low tree retention proposed. The remaining 325 acres would be treated with old growth maintenance treatments and would continue providing old-growth habitat as defined by Green et al. (1992) (see *VEGETATION ANALYSIS*). The greatest impacts to old growth habitat would occur in the Soup Creek and adjacent drainages at lower elevation and be greater than those impacts associated with Alternative C. The number of old growth patches would decrease from 118 to 116, and average patch size would decrease by 2 acres (5.0 percent, *TABLE III-55*). The number of old growth patches  $\geq 80$  acres would decrease from 21 to 20, and the average size of these large patches would decrease by 13 acres (6.4 percent). Overall, approximately 6,204 acres of old growth (11.4 percent of DNRC-managed lands in the CEAA) would be retained across the Swan River State Forest (*TABLE III-55*). The proposed activities would be additive to completed and ongoing activities in the Coarse Filter CEAA (see *RELEVANT PAST, PRESENT, AND REASONABLY FORESEEABLE ACTIONS* in *CHAPTER I-PURPOSE AND NEED* for a complete list of DNRC projects). The effects of these activities have been accounted for in this analysis. Thus, since: 1) the abundance of old growth would be reduced by 435 acres (6.5 percent of old growth stands in the Coarse Filter CEAA); 2) stand density would decrease on 325 acres (4.9 percent of old growth stands in the Coarse Filter CEAA), which may affect wildlife species that prefer dense old growth stands; 3) the abundance of patches  $\geq 80$  acres would decrease by 1 (4.8 percent) and the average size of these patches would decrease by 13 acres (6.4 percent); and 4) old growth would be retained on 11.4 percent of DNRC-managed lands in the Coarse Filter CEAA; low adverse cumulative effects to old growth associated wildlife species would be anticipated as a result of the Action Alternative B.

- Cumulative Effects of Action Alternative C to Old Growth**

Approximately 717 acres (10.8 percent) of the existing 6,639 acres of old-growth available in the CEAA would be harvested under Action Alternative C. Approximately 421 of these acres would be treated with old growth maintenance cuts. These stands would continue to exceed the minimum old growth definitions described by *Green et al. (1992)* (see *VEGETATION ANALYSIS*). However, habitat quality would be reduced for wildlife species that prefer dense old growth in these stands. The remaining 296 acres proposed for harvest would be treated with seed tree, shelterwood, overstory removal, and commercial thin treatments and would not be considered old growth post-harvest due to the low retention of large-diameter trees. The number of old growth patches would increase by from 118 to 119, and the average old growth patch size would decrease from 56 acres to 53 acres (*TABLE III-55*). The number of old growth patches  $\geq 80$  acres would decrease from 21 to 20, and the average size of these large patches would decrease from 206 acres to 195 acres. Overall, approximately 6,343 acres of old growth (11.7 percent of DNRC-managed lands in the Coarse Filter CEAA) would be retained across the Swan River State Forest (*TABLE III-55*). The proposed activities would be additive to completed and ongoing activities in the Coarse Filter CEAA (see *RELEVANT PAST, PRESENT, AND REASONABLY FORESEEABLE ACTIONS* in *CHAPTER I- PURPOSE AND NEED* for a complete list of DNRC projects). The effects of these activities have been accounted for in this analysis. Thus, since: 1) the abundance of old growth would be reduced by 296 acres (4.5 percent of existing old growth stands available in the Coarse Filter CEAA); 2) stand density would decrease on an additional 421 acres (6.3 percent of old growth in the Coarse Filter CEAA); 3) the abundance of patches  $\geq 80$  acres would decrease by 1 (4.8 percent), and the average size of these patches would decrease by 11 acres (5.2 percent); and 4) old growth would be retained on 11.7 percent of DNRC-managed lands in the Coarse Filter CEAA; low adverse cumulative effects to old growth associated wildlife species would be anticipated as a result of the Action Alternative C.

### **HABITAT CONNECTIVITY AND FRAGMENTATION**

*Issue:* The proposed activities could result in disturbance or alteration of forested corridors and connectivity, which could inhibit wildlife movements.

#### **Introduction**

Connectivity of forest cover is important to promote movements of species that are hesitant to cross unforested expanses. Effective corridors tend to be relatively wide, unfragmented, diverse, and associated with riparian areas or ridges (*Fischer and Fischenich 2000*). In general, wider corridors are more effective and provide connectivity for more wildlife species than narrower corridors. Narrow corridors can provide some connectivity, particularly for small mammals and amphibians; however, they can also act as funnels that increase predator efficiency (*Groom et al. 1999*). Habitat fragmentation, a landscape-level process in which a

specific habitat is progressively subdivided into smaller and more isolated patches (*McGarigal and Cushman 2002*), has a negative impact on wildlife movement. Historically, wildfires were the primary disturbance factor that shaped the forests of western Montana (*Fischer and Bradley 1987, Arno et al. 1995, Losensky 1997*). Thus, substantial portions of forested landscapes were fragmented naturally by young forests or unforested habitat (*Gruell 1983, Hart 1994*), and many species native to Montana evolved under conditions where habitat occurred in relatively small, isolated patches. Timber harvest can also fragment dense forested habitat and decrease patch size and shape. Forest management considerations to mitigate adverse effects to habitat connectivity include limiting small habitat islands that may cause extirpation of small subpopulations, treating and retaining fewer larger patches rather than many small patches, and reducing edge (boundary between habitats perceived by an animal to be different from one another) to reduce potential for nest parasitism and predation associated with edge habitat.

### **Analysis Areas**

The analysis area for direct and indirect effects is the 25,436-acre project area. Cumulative effects were analyzed at the scale of the 62,279-acre Coarse Filter CEAA. The analysis areas are described in *TABLE III-53* and depicted in *FIGURE III-15*.

### **Analysis Methods**

Connected forest was identified using DNRC *SLI* data and *National Agriculture Imagery Program (NAIP)* aerial imagery. Connected forest was defined as pole and sawtimber stands with moderate to closed canopies (40- to 100-percent canopy cover) greater than 300 feet wide. Stands meeting these requirements were assumed to provide conditions that would facilitate movement of wildlife species in the area. Factors considered in the analysis include: 1) the level of harvesting, 2) the availability of connected forest, 3) average patch size, and 4) miles of forest edge.

### **Existing Environment**

The project area contains connected forest habitat that facilitates movement for forest-associated wildlife (*TABLE III-56*; see No-Action Alternative A for *EXISTING CONDITIONS*). There is moderate forest connectivity throughout the project area. Connectivity is lower through the center and southeastern portions of the project area specifically between Napa Creek and Squeezer Creek, where mature forest was removed by intensive timber harvest on lands previously owned by timber companies (*FIGURE III-16*). Scattered patches and limited corridors are present in these areas.

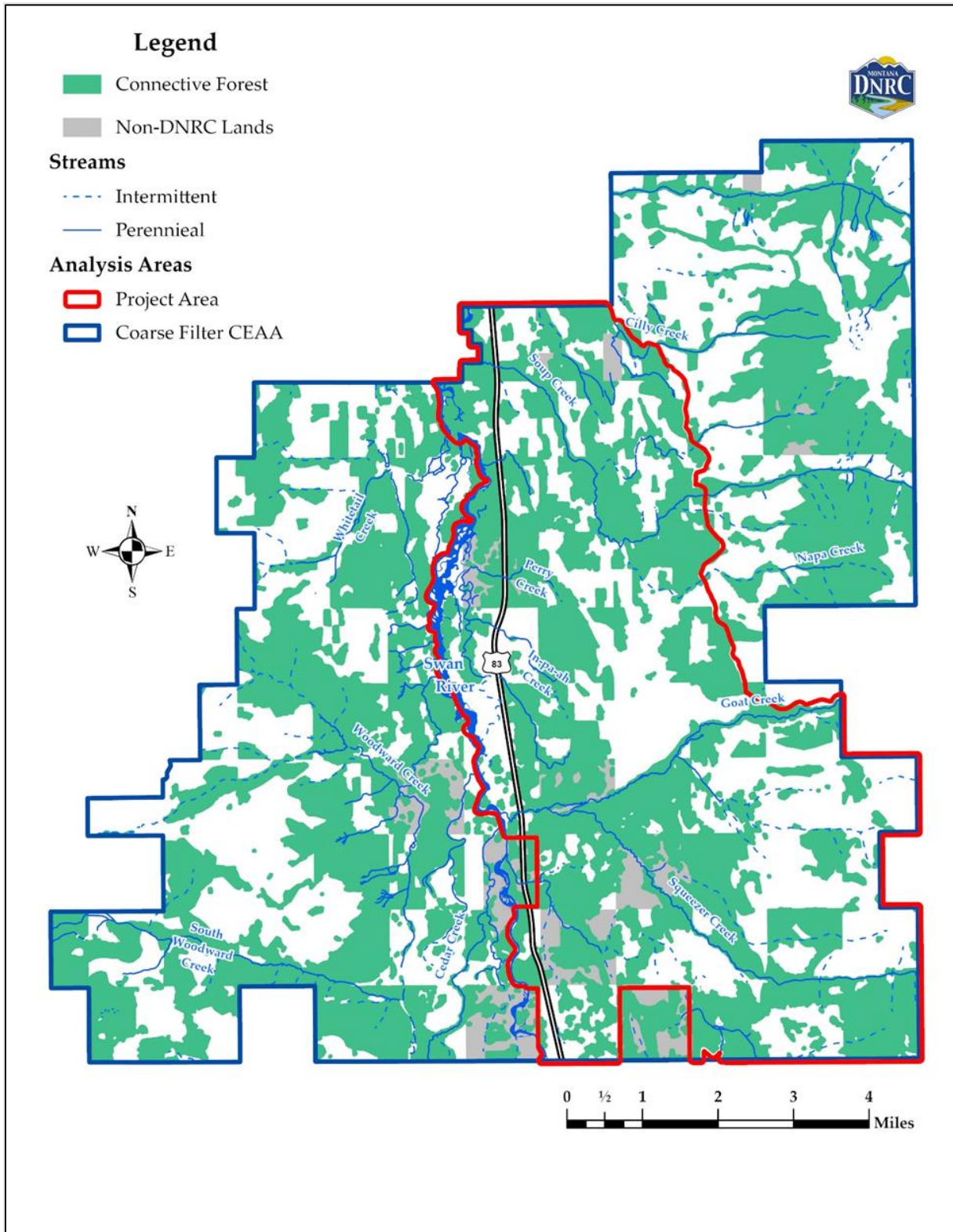
The Coarse Filter CEAA contains connected forest that facilitates movement of forest-associated wildlife (*TABLE III-56*; see No-Action Alternative A for *EXISTING CONDITIONS*). Throughout the Coarse Filter CEAA, connectivity of mature forest has been diminished due, in part, to the scattered historical ownership patterns where private industrial timberlands with large harvest units were interspersed with DNRC-managed and USFS lands (*FIGURE III-16*). Forest

management activities on DNRC-managed lands have also contributed to reduced connectivity. Additional gaps occur where natural openings (wet meadows, brush fields, and avalanche chutes) reduce patch width below 300 feet. In most cases, these openings contain at least some horizontal cover from shrubs or regenerating trees providing some structure for wildlife.

**TABLE III - 56 - CONNECTED FOREST.** Changes in connected forest habitat, patch size, and forest edge length in the project area and the Coarse Filter CEAA. The connected forest removed statistic accounts for direct removal of cover, as well as stands that would not meet the 300-foot minimum patch width requirement post-harvest.

<b>CONNECTED FOREST PARAMETER</b>	<b>PROJECT AREA</b>			<b>COARSE FILTER CEAA</b>		
	<b>NO- ACTIO N</b>	<b>ACTION</b>		<b>NO- ACTIO N</b>	<b>ACTION</b>	
	<b>A</b>	<b>B</b>	<b>C</b>	<b>A</b>	<b>B</b>	<b>C</b>
Connected forest habitat affected (percent of available habitat)	0 (0)	4,502 (31.6)	4,188 (29.4)	0 (0)	4,502 (13.3)	4,188 (12.3)
Connected forest removed (percent of available habitat)	0 (0)	2,620 (18.4)	1,924 (13.5)	0 (0)	2,623 (7.7)	1,927 (5.7)
Average patch size (percent decrease in patch size)	187 (0)	132 (29.5)	145 (22.7)	181 (0)	155 (14.1)	162 (10.4)
Miles of edge (percent change in edge habitat)	232 (0)	227 (-2.1)	229 (-1.4)	539 (0)	536 (-0.6)	537 (-0.3)
<i>Total connected forest habitat post- harvest</i> <i>(percent of analysis area)</i>	14,228 (55.9)	11,608 (45.6)	12,304 (48.4)	33,958 (54.5)	31,335 (50.3)	32,031 (51.4)

**FIGURE III - 16 - NO-ACTION ALTERNATIVE A CONNECTIVITY.** Existing patches of forest cover that provide connectivity for wildlife species in the project area and Coarse Filter CEAA. Non-cover areas on non-DNRC-managed lands are shaded gray.



## Environmental Effects

- ***Direct and Indirect Effects of No-Action Alternative A to Habitat Connectivity and Fragmentation***

None of the proposed forest management activities would occur. In the short-term, no changes to forest connectivity or habitat fragmentation would occur. In the long term and in the absence of natural disturbance, connectivity would increase and fragmentation would decrease as stands mature.

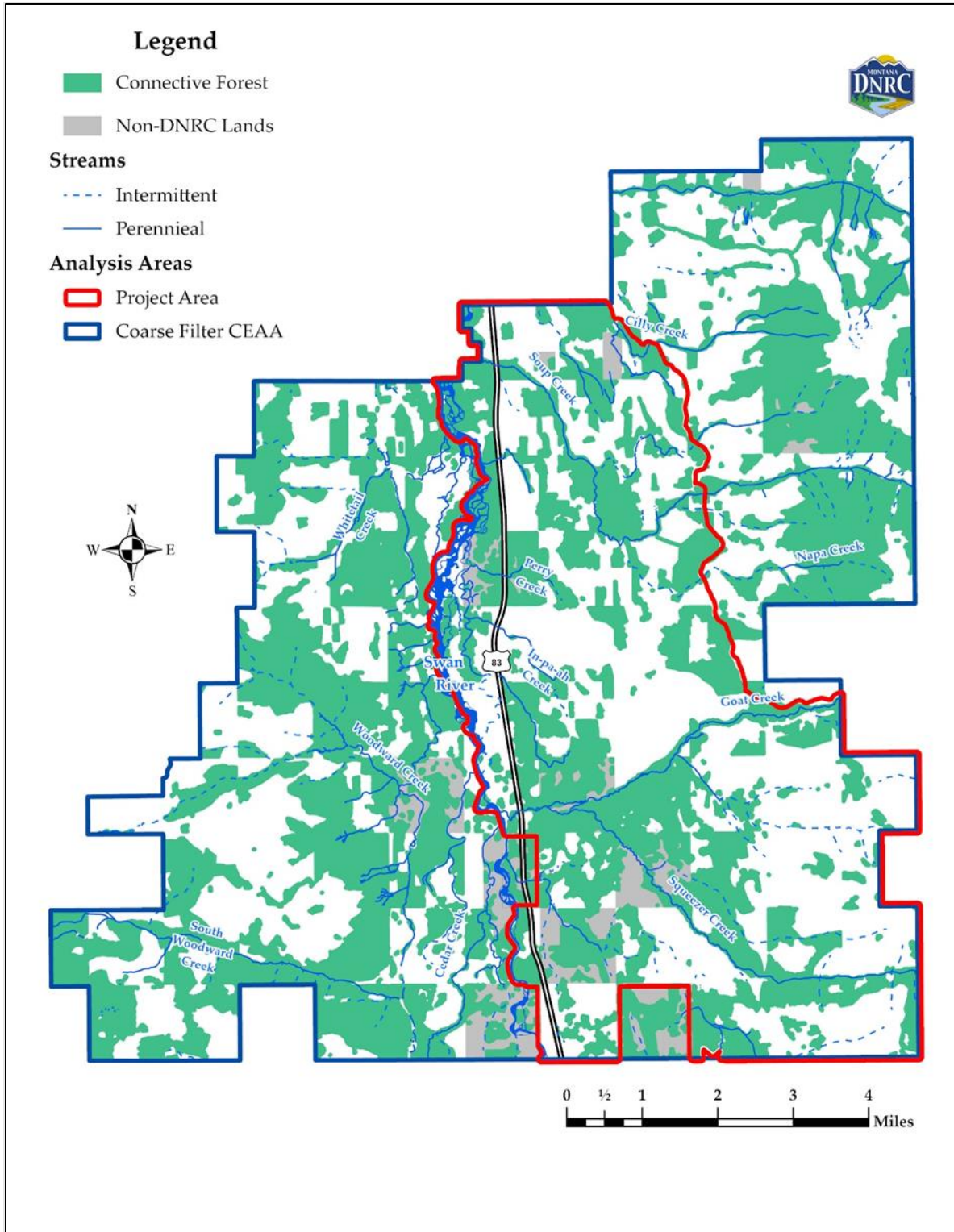
- ***Direct and Indirect Effects of Action Alternatives B and C to Habitat Connectivity and Fragmentation***

Approximately 4,502 or 4,188 acres of connected forest would be harvested under Action Alternatives B and C, respectively (TABLE III-56). Approximately 2,487 acres (Alternative B) or 1,844 acres (Alternative C) would retain less than 40 percent canopy cover, which would cause additional acres (2,620 acres total Alternative B; 1,924 acres total Alternative C) not to meet the 300-foot minimum width requirement established in the analysis. The remaining acres would continue providing connected forest habitat, albeit at reduced stand density. Overall, Action Alternative B would have slightly greater adverse effects to connected forest due to a higher level of removal of connected dense forest patches. Following logging, 11,608 acres (45.6 percent of the project area) or 12,304 acres (48.4 percent of the project area) of forest patches meeting the minimum connected patch criteria would be retained under Alternatives B and C, respectively (TABLE III-56). Under Alternative B, average patch size would decrease by 29.5 percent and total edge would decrease by 4.8 miles (TABLE III-56). Whereas under Alternative C, average patch size would decrease by 22.7 percent and total edge would decrease by 3.2 miles (TABLE III-56). A decrease in edge occurs when portions of patches are removed and the new geometry reduces edge length, or when the patch is entirely removed. After harvest, forest stands in the project area would continue to provide a mosaic of habitat conditions, and moderate to dense patches of connected forest cover would remain at moderate levels throughout most of the project area. (FIGURES III-17 and III-18). Both alternatives would retain corridors to facilitate travel through the Soup Creek, Goat Creek, and Squeezer Creek drainages. However, both Action Alternatives would degrade habitat conditions, which could inhibit movements of interior forest species in the project area. Thus, since: 1) connectivity would be maintained along the major drainages and most ridgelines where cover is available; 2) connected forest habitat would be reduced by 2,620 acres (Alternative B, 18.4 percent of connected forest in the project area) or 1,924 acres (Alternative C, 13.5 percent of connected forest in the project area); 3) connected forest would remain in 45.6 percent (Alternative B) or 48.4 percent (Alternative C) of the project area; 4) average patch size would be reduced by 29.5 percent (Alternative B) or 22.7 percent (Alternative C); and 5) forest edge would decrease by 2.1 percent or 1.4 percent (Alternatives B and C); moderate adverse direct

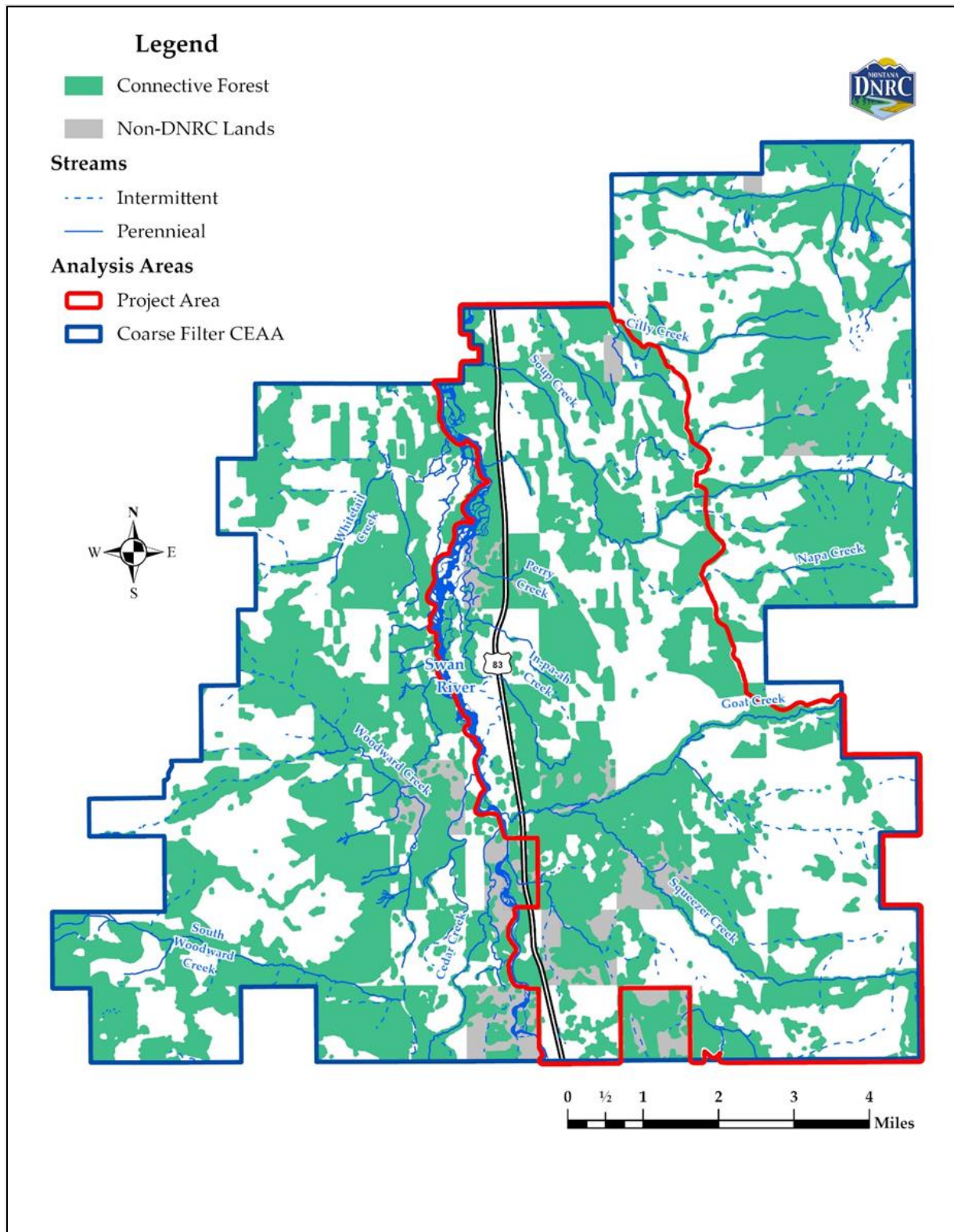
and indirect effects to wildlife habitat connectivity and fragmentation would be anticipated.



**FIGURE III - 17 - ACTION ALTERNATIVE B CONNECTIVITY.** Patches of forest cover that would provide habitat connectivity for wildlife in the project area and Coarse Filter CEAA following implementation of Action Alternative B. Non-cover areas on non-DNRC-managed-lands are shaded gray.



**FIGURE III - 18 - ACTION ALTERNATIVE C CONNECTIVITY.** Patches of forest cover that would provide habitat connectivity for wildlife in the project area and CEAA following implementation of Action Alternative C. Non-cover areas on non-DNRC-managed lands are shaded gray.



- ***Cumulative Effects of No-Action Alternative A to Habitat Connectivity and Fragmentation***  
None of the proposed forest management activities would occur on DNRC-managed lands. In the short term, no changes in forest connectivity or habitat fragmentation would be expected as no harvesting would occur. In the long term, connectivity of forest habitat would improve in the absence of natural disturbance or forest management activities on other ownerships.
- ***Cumulative Effects of Action Alternatives B and C to Habitat Connectivity and Fragmentation***  
Approximately 4,502 or 4,188 acres of connected forest would be harvested under Action Alternatives B and C, respectively (*TABLE III-56*). Of these acres, approximately 2,487 acres (Alternative B) or 1,844 acres (Alternative C) would retain less than 40 percent canopy cover post-harvest, which would cause additional acres (2,623 acres total Alternative B; 1,927 acres total Alternative C) to no longer meet the 300-foot minimum width requirement established in the analysis. The remaining acres proposed for harvest would continue providing connected forest habitat, albeit at reduced stand density. Overall, Action Alternative B would have slightly greater adverse cumulative effects to connected forest patches due to a greater amount of dense forest patch removed. Following logging, 31,335 acres (50.3 percent of the CEAA) or 32,031 acres (51.4 percent of the CEAA) of forest patches meeting the minimum connected patch criteria would be retained under Action Alternatives B and C, respectively (*TABLE III-56*). Under Alternative B, average patch size of connected forest would decrease by 14.1 percent and total edge would decrease by 3 miles. Under Alternative C, average patch size would decrease by 10.4 percent and total edge would decrease by 2 miles (*TABLE III-56*).

After harvest, forest patches in the CEAA would continue to provide a mosaic of habitat conditions, and connected forest cover would remain well-represented (*FIGURES III-17 and III-18*). Both alternatives would retain corridors to facilitate travel in the Soup Creek, Goat Creek, and Squeezer Creek drainages. However, movements of interior forest species in localized areas in the CEAA would be negatively affected. The proposed activities would be cumulative and additive to completed and ongoing activities in the Coarse Filter CEAA (see *RELEVANT PAST, PRESENT, AND REASONABLY FORESEEABLE ACTIONS* in *CHAPTER I- PURPOSE AND NEED* for a complete list of DNRC projects and *TABLE III-54* for acreage of ongoing timber sales). The related effects of these activities have been accounted for in the updated and current stand level inventory data used in this analysis. The USFS Mid-Swan Project may occur concurrently and is currently under analysis, although specific treatments outlines in a final Record of Decision are not currently available (*USFS 2020*). Thus, since: 1) connectivity would be maintained along major drainages and most ridgelines where cover is available; 2) connected forest habitat would be reduced by 4,502 acres (Alternative B, 13.3 percent reduction of existing connected forest in the CEAA) or 4,188 acres (Alternative C, 12.3 percent reduction of existing connected forest in the

CEAA); 3) connected forest would remain in 50.3 percent (Alternative B) or 51.4 percent (Alternative C) of the CEAA; 4) average patch size would be reduced by 14.1 percent in Alternatives B or 10.4 percent in Alternative C); and 5) forest edge would decrease by 0.6 percent or 0.3 percent (Alternatives B and C); minor adverse cumulative effects to wildlife habitat connectivity or fragmentation would be anticipated.

## **LINKAGE**

*Issue:* The proposed activities could increase open road densities, increase human developments, and reduce forested cover, which could adversely affect linkage habitat for wildlife.

### **Introduction**

Linkage zones are defined as “the area between larger blocks of habitat where animals can live at certain seasons and where they can find the security they need to successfully move between these larger habitat blocks” (*Servoheen et al. 2003*). Linkage zones differ from corridors in that the area is not just used for travel. Areas appropriate for linkage zones can occur at different spatial scales, particularly when considering the species of concern. For example, a linkage zone for a stream-breeding salamander may be the upland habitat between two first-order streams, whereas the linkage zone for a grizzly bear may be the large valley bottom between two mountain ranges. Increased linkage potential is found in areas with lower road densities, low densities of human-developed sites, higher vegetative hiding cover, and abundant riparian areas (*Servoheen et al. 2003*). In this analysis, linkage is discussed in terms of factors that would allow linkage for a variety of small, medium, and large wide-ranging terrestrial wildlife species, including grizzly bears.

### **Analysis Areas**

The analysis area for direct and indirect effects is the 25,436-acre project area (*TABLE III-53, FIGURE III-15*). Because large terrestrial species were used as focal species for determining the effects of the proposed project to linkage, the 62,279-acre Coarse Filter CEAA was used to analyze cumulative effects of the proposed alternatives. The CEAA provides linkage between the Mission Mountains to the west and the Swan Valley bottom to the east.

### **Analysis Methods**

Three measurement criteria were used to assess existing and predicted future-linkage potential under each alternative: 1) open-road densities (calculated using simple linear miles per square mile), 2) a qualitative assessment of human development, and 3) vegetative cover. Vegetative hiding cover was considered patches greater than 200 feet wide capable of hiding 90 percent or more of a large mammal at 200 feet (*DNRC 2015*). On non-DNRC-managed lands a conservative measure of mature or pole-sized connected forest with  $\geq 40$  percent crown closure was considered to provide hiding cover.

### **Existing Environment**

The project area contains 19,356 acres of vegetative cover (76.1 percent of the project area; *TABLE III-53*). In general, lands in the majority of the project area currently contribute to quality linkage habitat. However, linkage potential on the western portion of the project area is reduced by Highway 83, a narrow two-lane road with a 70-mph speed limit which some species may be hesitant to cross. Vehicle-related wildlife mortalities associated with Highway 83 in Swan Valley are also common (particularly white-tailed deer). Open roads can degrade linkage value; however, open and seasonally open road densities in the project area are moderate at 1.1 miles per square mile. Human development is relatively low in the project area, and most scattered homes and other buildings are located within 0.5 miles of Highway 83. Riparian areas are abundant in the project area and are protected in accordance with DNRC's HCP and other state and federal regulations.

In the CEAA, linkage values are also high, though some existing features reduce linkage potential. The CEAA contains approximately 44,104 acres of vegetative cover (70.8 percent of the CEAA; *TABLE III-57*). Highway 83, a narrow two-lane road with a 70-mph speed limit bisects the CEAA; this highway affects linkage potential as some species may be hesitant to cross a busy roadway. Vehicle-related wildlife mortalities associated with Highway 83 in Swan Valley are also common (particularly white-tailed deer). Open roads can degrade linkage value; however, open and seasonal road densities in the CEAA are relatively low at 0.9 miles per square mile. Human development is also low in the CEAA, and most scattered homes and other buildings are located within 0.5 miles of Highway 83. Riparian areas are abundant and heavily vegetated in the CEAA and are protected in accordance with DNRC's HCP and other state and federal regulations. Cover amounts have been influenced by logging over the last several decades on state, USFS, and previously-owned Plum Creek Timber Company lands. However, both the project area and the CEAA provide desirable linkage attributes for a variety of small, medium, and large wildlife species.

**TABLE III - 57 - LINKAGE HABITAT.** Changes in vegetative cover in the project area and the Coarse Filter CEAA. The vegetative cover removed statistic accounts for direct removal of cover, as well as stands that would not meet the 200-foot minimum patch width requirement post-harvest.

LINKAGE HABITAT PARAMETER	PROJECT AREA			COARSE FILTER CEAA		
	NO-ACTION	ACTION		NO-ACTION	ACTION	
	A	B	C	A	B	C
Vegetative cover affected (percent of available habitat)	0 (0.0)	4,932 (25.5)	4,590 (23.7)	0 (0.0)	4,932 (11.1)	4,590 (10.4)
Vegetative cover removed (percent of available habitat)	0 (0.0)	2,691 (13.9)	2,082 (10.8)	0 (0.0)	2,693 (6.1)	2,085 (4.7)
Total vegetative cover post-harvest (percent of analysis area)	19,356 (76.1)	16,665 (65.5)	17,274 (67.9)	44,104 (70.8)	41,410 (66.5)	42,019 (67.5)

**Environmental Effects**

- Direct and Indirect Effects of No-Action Alternative A to Habitat Linkage**  
None of the proposed forest management activities would occur and road densities would not change. No changes in human development would occur on DNRC-managed lands in the project area, and forest vegetation would not be affected in the short term. In the long term and in the absence of natural disturbance, linkage may improve as vegetative cover matures.
- Direct and Indirect Effects of Action Alternative B and C to Habitat Linkage**  
Approximately 4,932 acres (Action Alternative B) or 4,590 acres (Action Alternative C) would be harvested, which could deter movement or habitat use for species that prefer dense cover (TABLE III-57). Of these acres, 2,622 acres or 2,040 acres would be treated with prescriptions that would not provide vegetative cover to be considered linkage habitat post-harvest under Action Alternatives B and C, respectively. The removal of these acres would subsequently cause some patches to become smaller than 200 feet wide and thus, increasing the total acres of linkage habitat removed to 2,691 or 2,082 acres under Action Alternatives B and C, respectively. No roads open to public motorized use are planned for construction; however, 5.3 miles of restricted roads are proposed for construction under both alternatives. Additionally, both Action Alternatives propose the removal of 7.2 miles of roads restricted to public access. No additional human development would occur under either Action Alternative; thus, no additional effects to linkage associated with development would be anticipated. Thus,

since: 1) long-term open-road densities would not increase, but road usage would temporarily increase along the haul route for 5 to 7 years; 2) no additional human dwellings would be developed under this proposal; and 3) vegetative cover would decrease by 13.9 percent (Alternative B) or 10.8 percent (Alternative C); moderate short-term and minor long-term negative effects to linkage habitat would be anticipated under either of the Action Alternatives considered.

- ***Cumulative Effects of No-Action Alternative A to Habitat Linkage***

None of the proposed activities would occur and no changes in road densities, human developments, or forest cover would occur on DNRC-managed lands in the CEAA. Thus, no cumulative effects to wildlife linkage habitat would be anticipated. In the short term, no changes to linkage habitat would occur. In the long term and in the absence of natural disturbance or activity on other ownerships, linkage habitat may improve as stands mature and more cover develops over time.

- ***Cumulative Effects of Action Alternative B and C to Habitat Linkage***

Approximately 4,932 acres (Action Alternative B) or 4,590 acres (Action Alternative C) (TABLE III-57) of vegetative cover would be harvested. Of these acres, 2,622 acres (Action Alternative B) or 2,040 acres (Action Alternative C) would be treated with a prescription that would not provide enough vegetative cover to be considered linkage habitat post-harvest. Removal of these stands would cause additional areas not to meet the 200-foot width requirement so that 2,693 or 2,085 acres in total would be removed by the proposed activities under Action Alternatives B and C, respectively. Approximately 41,410 acres (66.5 percent of the CEAA, Alternative B) or 42,019 acres (67.5 percent of the CEAA Alternative C) of vegetative cover would remain post-harvest. Under both Action Alternatives, open-road densities would not increase in the CEAA. However, 5.3 miles of permanent restricted roads would be constructed under both alternatives. Both Action Alternatives propose the removal of 7.2 miles of roads restricted to motorized public access. Use of existing restricted roads would increase with administrative and commercial uses associated with the proposed Action Alternatives. No additional human development on DNRC-managed lands would occur under either Action Alternative; thus, no additional cumulative effects to linkage associated with development would be anticipated. The proposed activities would be cumulative and additive to completed and ongoing activities in the Coarse Filter CEAA (see *RELEVANT PAST, PRESENT, AND REASONABLY FORESEEABLE ACTIONS* in CHAPTER I-*PURPOSE AND NEED* for a complete list of DNRC projects and TABLE III-54 for acreage of ongoing timber sales). The related effects of these activities have been accounted for in the updated and current stand level inventory data used in this analysis. The USFS Mid-Swan Project may occur concurrently and is currently under analysis, but final harvest units were not available at the time of this analysis (USFS 2020). Thus, since: 1) long-term open-road densities would not increase, but road usage would temporarily increase for 5 to 7 years; 2) no additional human dwellings would be

constructed; and 3) vegetative cover would decrease by 6.1 percent (Alternative B) or 4.7 percent (Alternative C) within the CEAA; minor short and long-term cumulative adverse effects to linkage habitat would be anticipated under either of the Action Alternatives considered.

**FINE FILTER WILDLIFE ANALYSIS**

In the fine-filter analysis, individual species of concern are evaluated. These species include those listed as threatened or endangered under the Endangered Species Act of 1973, species listed as sensitive by DNRC, and animals managed as big game by Montana DFWP. TABLE III-58 provides an analysis of the anticipated effects for each species.

**TABLE III - 58 - FINE-FILTER.** Anticipated effects of the Squeezer Meadow Timber Sale on wildlife species.

SPECIES/HABITAT	[Y/N] Potential Impacts and Mitigation Measures N = Not Present or No Impact is Likely to Occur Y = Impacts May Occur (Explain Below)
<b>THREATENED AND ENDANGERED SPECIES</b>	
Canada lynx ( <i>Felis lynx</i> ) Habitat: Subalpine fir habitat types, dense sapling, old forest, deep snow zones	[Y] The project area contains 16,785 acres of suitable lynx habitat.
Grizzly bear ( <i>Ursus arctos</i> ) Habitat: Recovery areas, security from human activity	[Y] The project area is in the South Fork Lost Soup, Goat Creek, and Lion Creek Grizzly Bear Management Subunits of recovery zone habitat associated with the Northern Continental Divide Ecosystem (NCDE) (USFWS 1993).
Yellow-billed cuckoo ( <i>Coccyzus americanus</i> ) Habitat: open cottonwood riparian forest with dense brush understories (Lake and Flathead counties)	[N] Potentially suitable open cottonwood riparian habitat occurs along the western of the project area near the Swan River, however yellow-billed cuckoos have not been observed in the area (Montana Natural Heritage Program data, 19 December 2023). Additionally, no harvesting of riparian cottonwood galleries is proposed. Thus, negligible direct, indirect, or cumulative effects to yellow-billed cuckoo would be expected to occur.
Wolverine ( <i>Gulo gulo</i> ) Habitat: Alpine tundra and high-elevation boreal and coniferous forests that	[Y] Potentially suitable wolverine habitat exists within the proposed project area. Wolverines have been observed in the project area (Montana Natural Heritage Program data, 19 December 2023, Southwestern Crown Carnivore Monitoring Team 2023) and occasional use of the area by wolverines is possible. Timber harvest may occur in approximately 451 acres that retain persistent spring snowpack under Action Alternatives B and C per USFS data (Copeland et al.



<p>maintain deep persistent snow into late spring</p>	<p>2010). Most of these acres (373 acres) only retained persistent spring snow one year out of the seven monitored. No effects to potential denning habitat are anticipated. During the non-denning season, minor short-term displacement associated with logging disturbance could occur if wolverines are in the area. Approximately 5.3 miles of roads restricted to public use would be constructed under both Action Alternatives. Given the large home range area wolverines occupy (average 150 plus square miles), the long distances wolverines typically cover during their movements, lack of denning habitat, and that the proposed activities would not occur between April 1 and June 15 (part of the wolverine denning season), the proposed activities are not expected to measurably affect use of the area by wolverines. Thus, this species will not be considered further in the analysis. Negligible adverse direct, indirect, or cumulative effects to wolverines would be expected to occur as a result of either Action Alternative.</p>
<p><b>SENSITIVE SPECIES</b></p>	
<p>Bald eagles (<i>Haliaeetus leucocephalus</i>)</p> <p>Habitat: Late-successional forest less than 1 mile from open water</p>	<p>[Y] The Van Lake bald eagle territory is at the extreme south end of the Project Area. The project area also contains multiple streams including Swan River, Cilly Creek, Soup Creek Squeezer Creek, Goat Creek, and Napa Creek. However, nesting bald eagles have not been documented in the vicinity of these creeks (<i>Montana Natural Heritage Program data, 19 December 2023</i>). No timber harvest would occur within 100 feet of the Swan River and large emergent snags and trees would be retained. Bald eagles typically successfully nest at Van Lake, a relatively small (56 acres) lake with a well-used campground on it visible from the nest site. These eagles demonstrate habituation to human noise and disturbance. Approximately 23 acres of harvest under either Action Alternative could occur outside of nest side area but within the primary use area. Almost all these acres (21) are north of a well-used open road and at least 0.3 miles away from the nest site. Visual and topographic screening would also be present between the eagle nest site and any proposed harvesting activities; measurable effects to bald eagles would not be anticipated. Thus, negligible direct, indirect, or cumulative effects to bald eagles would be anticipated. This species will not be considered further in the analysis.</p>
<p>Black-backed woodpeckers (<i>Picooides arcticus</i>)</p> <p>Habitat: Mature to old burned or beetle-infested forest</p>	<p>[N] No recently (&lt;5 years) burned areas occur within 0.25 miles of the project area. Thus, no direct, indirect, or cumulative effects to black-backed woodpeckers would be expected to occur as a result of the alternatives.</p>

<p>Coeur d'Alene salamanders (<i>Plethodon idahoensis</i>)</p> <p>Habitat: Waterfall spray zones, talus near cascading streams</p>	<p>[N] Potentially suitable moist talus or streamside talus habitat may occur in the project area; however, these habitat types do not occur near the proposed harvest units. Thus, no direct, indirect, or cumulative effects to Coeur d'Alene salamanders would be expected to occur as a result of the alternatives.</p>
<p>Columbian sharp-tailed grouse (<i>Tympanuchus Phasianellus columbianus</i>)</p> <p>Habitat: Grassland, shrubland, riparian, agriculture</p>	<p>[N] No suitable grassland communities occur in the project area. Thus, no direct, indirect, or cumulative effects to Columbian sharp-tailed grouse would be expected to occur as a result of the alternatives.</p>
<p>Common loons (<i>Gavia immer</i>)</p> <p>Habitat: Cold mountain lakes, nest in emergent vegetation</p>	<p>[Y] Common loons regularly nest on Van Lake. No harvesting activities would occur within 0.3 miles of Van Lake. Thus, no direct, indirect, or cumulative effects to common loons would be expected to occur as a result of the alternatives. This species will not be considered further in the analysis.</p>
<p>Fishers (<i>Pekania pennanti</i>)</p> <p>Habitat: Dense mature to old forest less than 6,000 feet in elevation and riparian</p>	<p>[Y] Approximately 11,877 acres of suitable fisher habitat occur within the project area.</p>
<p>Flammulated owls (<i>Otus flammeolus</i>)</p> <p>Habitat: Late-successional ponderosa pine and Douglas-fir forest</p>	<p>[Y] Approximately 2,698 acres of preferred flammulated owl habitat types occur in the project area</p>
<p>Gray wolves (<i>Canis lupus</i>)</p> <p>Habitat: Ample big game populations, security from human activities</p>	<p>[N] Wolves may use habitat near the project area. Disturbance associated with timber sales at den and rendezvous locations can adversely affect wolves; however, timing restrictions would apply if den or rendezvous sites are documented (<i>ARM 33.11.430(1)(a)(b)</i>) in the vicinity of harvest activities. Thus, negligible adverse direct, indirect or cumulative effects to gray wolves would be anticipated.</p>
<p>Harlequin ducks (<i>Histrionicus histrionicus</i>)</p> <p>Habitat: White-water streams, boulder and cobble substrates</p>	<p>[N] Suitable high-gradient stream habitat does not occur within 0.5 miles of the project area. Additionally, harlequin ducks have not been observed in the Swan River State Forest (<i>Montana Natural Heritage Program data, 19 December 2023</i>). Thus, no direct, indirect, or cumulative effects to harlequin ducks would be anticipated.</p>
<p>Northern bog lemmings (<i>Synaptomys borealis</i>)</p>	<p>[N] Potentially suitable wetlands exist in the project area; however, harvest and heavy-equipment restrictions would apply (<i>ARM 36.11.436</i>) and such areas would be avoided. Thus, negligible direct,</p>

<p>Habitat: Sphagnum meadows, bogs, fens with thick moss mats</p>	<p>indirect, or cumulative effects to northern bog lemmings would be expected to occur as a result of the alternatives.</p>
<p>Peregrine falcons (<i>Falco peregrinus</i>)</p> <p>Habitat: Cliff features near open foraging areas and/or wetlands</p>	<p>[N] Potentially suitable cliffs/rock outcrops for nest sites were observed in the project area, particularly in the southeast corner (Bunker Hill). However, peregrine eyries have not been documented near the project area (<i>Montana Natural Heritage Program data, 19 December 2023</i>). Thus, no direct, indirect, or cumulative effects to peregrine falcons would be anticipated as a result of the alternatives.</p>
<p>Pileated woodpeckers (<i>Dryocopus pileatus</i>)</p> <p>Habitat: Late-successional ponderosa pine and larch-fir forest</p>	<p>[Y] Approximately 6,196 acres of pileated woodpecker habitat occur in the project area.</p>
<p>Fringed myotis (<i>Myotis thysanodes</i>)</p> <p>Habitat: low elevation ponderosa pine, Douglas-fir and riparian forest with diverse roost sites including outcrops, caves, mines</p>	<p>[N] No suitable caves or mine tunnels are known to occur in the project area. Small rocky outcrops are present in the far southeast corner of the project area at higher elevations. Recent or historical observations of fringed myotis within 10 miles of the project area are lacking, despite acoustic surveys conducted in the past (<i>Montana Natural Heritage Program data, 19 December 2023</i>). Thus, no direct, indirect, or cumulative effects to fringed myotis bats would be expected to occur as a result of either alternative.</p>
<p>Hoary bat (<i>Lasiurus cinereus</i>)</p> <p>Habitat: coniferous and deciduous forests and roost on foliage in trees, under bark, in snags, bridges</p>	<p>[Y] Hoary bats likely use habitat throughout the project area and have been documented (<i>Montana Natural Heritage Program data, 19 December 2023</i>). Because hoary bats typically roost in trees and snags, they could be temporarily disturbed by timber harvesting. Potential disturbance would only be expected from June through September, when hoary bats are in Montana. After the conclusion of activities, continued use of the project area, including harvested areas, by hoary bats would be anticipated. At least 2 large snags and 2 large snag recruitment trees per acre (&gt;21 inches dbh, or largest size class available) would be retained and could provide roosting habitat (ARM 36.11.411). Should any hoary bats be present within the Large CEAA, habitat alteration and potential disturbance under the Action Alternative would be additive to any activities occurring or planned on surrounding private and public lands within the Wildlife CEAA. Hoary bats are considered common and widespread throughout Montana, but wind energy and diseases such as white-nosed syndrome pose threats to their population (<i>Bachen et al 2020</i>). Thus, negligible direct, indirect, or cumulative effects to hoary bats would</p>

	be expected to occur as a result of either alternative. This species will not be considered further in the analysis.
Townsend's big-eared bats ( <i>Plecotus townsendii</i> )  Habitat: Caves, caverns, old mines	[N] No suitable caves or mine tunnels are known to occur in the project area. Thus, no direct, indirect, or cumulative effects to Townsend's big-eared bats would be expected to occur as a result of the alternatives.
<b>BIG GAME</b>	
Elk ( <i>Cervus canadensis</i> )	[Y] The project area contains potential elk, mule deer, and white-tailed deer winter range habitat as identified by DFWP (DFWP 2008). Elk security habitat also occurs in the project area.
Mule Deer ( <i>Odocoileus hemionus</i> )	
White-tailed Deer ( <i>Odocoileus virginianus</i> )	

**THREATENED AND ENDANGERED SPECIES**

*Canada Lynx*

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

**Introduction**

Canada lynx are medium-size cats that are federally listed as a threatened species (*Interagency Lynx Biology Team 2013*). Lynx foraging habitat in western Montana consists of a mosaic of young and mature forested stands of lodgepole pine, Engelmann spruce, and subalpine fir with high levels of canopy cover (*Squires et al. 2010, Squires et al. 2013, Holbrook et al. 2017*). Stand with these characteristics are likely to support snowshoe hare populations, which are the primary prey of Canada lynx. Retaining habitat connectivity of both summer and winter lynx foraging habitat is important since winter corridors may provide local connectivity while summer corridors are more likely to facilitate long-distance dispersal (*Squires et al. 2013*). Forest management considerations for lynx include providing a mosaic of well-connected young and mature lynx habitat patches containing high horizontal cover.

**Analysis Areas**

The analysis area for direct and indirect effects is the 25,436-acre project area (*FIGURE III-15*). The analysis area for cumulative effects is the 62,853-acre Lynx CEEA described in *TABLE III-53* and depicted in *FIGURE III-15*. The Lynx CEEA is the *Swan Lynx Management Area (DNRC 56,307 acres, other ownerships 6,546 acres)*, which is a designated portion of DNRC-managed land

where resident lynx populations are known to occur or where there is a high probability of periodic lynx occupancy over time (*USFWS and DNRC 2010*).

#### **Measurement Criteria**

Factors considered in the analysis include: 1) the level of harvesting, 2) the availability of suitable lynx habitat classes, and 3) landscape connectivity. Lynx habitat was subdivided into the following lynx habitat classes: 1) winter foraging, 2) summer foraging, 3) other suitable, and 4) temporary non-habitat. All habitat classes were identified according to DNRC's lynx habitat mapping protocols (*USFWS and DNRC 2010b*). Suitable habitat is the sum of winter foraging, summer, foraging, and other suitable habitat. Other suitable lynx habitat is defined as habitat that has the potential to provide connectivity and lower quality foraging habitat but does not contain the necessary attributes to be classified as winter or summer foraging habitat classes. The temporary non-habitat category consists of forested stands that are not expected to be appreciably used by lynx until suitable horizontal cover develops. On non-DNRC lands, pole and sawtimber stands with  $\geq 40\%$  conifer canopy cover were considered to provide potential lynx habitat. This habitat definition provides a conservative estimate of suitable lynx because it excludes young, dense stands that can also serve as suitable habitat for lynx but are difficult to quantify using aerial photographs.

#### **Existing Environment**

The project area contains 16,785 acres of suitable lynx habitat, or 85.9 percent of all potential DNRC lynx habitat in the project area (*TABLE III-59*; see No-Action Alternative A for *EXISTING CONDITIONS*). The remaining acres on DNRC lands in the project area consists of 2,756 acres of forest stands that do not contain suitable structure for lynx use, as well as approximately 3,174 acres of open areas like wet meadows or forest stands that are xeric cover types not likely to be used appreciably by lynx. Non-DNRC lands within the project area contain approximately 1,871 acres of suitable habitat; thus, total suitable habitat within the project area is 73.3 percent. Most suitable habitat is well-connected and distributed throughout the project area. Forested ridgelines and creeks including Goat, Soup, and Squeezer creeks also facilitate landscape connectivity in the project area (see *HABITAT CONNECTIVITY AND FRAGMENTATION* in the coarse filter analysis section for further information).

The Lynx CEAA contains a total of 40,014 acres of suitable lynx habitat on DNRC-managed forest lands (78.0 percent of forest stands on DNRC-managed portions of the Lynx CEAA) (*TABLE III-59*; see No-Action Alternative A for *EXISTING CONDITIONS*). The remaining acres in the Lynx CEAA that are managed by DNRC consist of approximately 11,275 acres of forest stands that do not contain suitable structure for lynx use and 5,019 acres of open areas and stands that are not preferred lynx cover types. On other ownerships in the Lynx CEAA, there are approximately 4,552 acres of forest habitat ( $\geq 40$ -percent canopy cover below 6,000 feet elevation) that are likely to provide suitable lynx habitat. DNRC manages approximately 90% of the lands within the CEAA. Modeling indicates that suitable lynx habitat is available, and

lynx may use or travel through the CEAA at any time (Squires et al. 2013). Specific use of the CEAA by lynx is unknown; however, lynx presence been documented (tracks, photograph and DNA) in the Swan River State Forest during winter carnivore survey efforts (Southwestern Crown Carnivore Monitoring Team 2023; USFS, unpublished data, Jan. 2017). This evidence indicates that lynx use of the CEAA regularly occurs, but is not extensive and consistent compared to habitat use observed farther south towards Seeley Lake area.

**TABLE III - 59 - LYNX HABITAT CLASSES.** Estimated acreage of lynx habitat by habitat class that would remain in the project area and Lynx CEAA post-harvest on forested DNRC-managed lands under the proposed alternatives. Values in parentheses refer to the percentage of the total potential lynx habitat on DNRC-managed lands that each lynx habitat class represents.

LYNX HABITAT CATEGORY	PROJECT AREA			LYNX CEAA		
	NO-ACTION	ACTION		NO-ACTION	ACTION	
	A	B	C	A	B	C
Summer Foraging	2,110	1,461	1,469	6,434	5,786	5,793
	(10.8)	(7.5)	(7.5)	(12.5)	(11.3)	(11.3)
Winter Foraging	11,695	9,542	9,770	26,208	24,055	24,283
	(59.8)	(48.8)	(50.0)	(51.1)	(46.9)	(47.3)
Other Suitable	2,981	2,730	2,806	7,372	7,121	7,197
	(15.3)	(14.0)	(14.4)	(14.4)	(13.9)	(14.0)
Temporary non-habitat	2,756	5,808	5,497	11,275	14,327	14,016
	(14.1)	(29.7)	(28.1)	(22.0)	(27.9)	(27.3)
<i>Total Potential Lynx Habitat</i>	19,541	19,541	19,541	51,289	51,289	51,289
<i>Grand Total Suitable Lynx Habitat<sup>b</sup> Post-harvest</i>	16,785	13,733	14,045	40,014	36,962	37,279
	(85.9)	(70.3)	(71.9)	(78.0)	(72.1)	(72.7)

**TABLE III - 60 - LYNX HABITAT.** Estimated acreage of lynx habitat that would be affected and removed in the project area and Lynx CEAA under the proposed alternatives. Values in parentheses refer to the percentage of the total existing suitable lynx habitat, which includes potentially suitable habitat on non-DNRC lands.

LYNX HABITAT CATEGORY	PROJECT AREA			LYNX CEAA		
	NO-ACTION	ACTION		NO-ACTION	ACTION	
	A	B	C	A	B	C
Suitable Habitat Affected by Harvest	0 (0.0)	4,639 (24.9)	4,328 (23.2)	0 (0.0)	4,639 (10.4)	4,328 (9.7)
Suitable Habitat Removed by Harvest	0 (0.0)	3,052 (16.4)	2,741 (14.7)	0 (0.0)	3,052 (6.8)	2,741 (6.2)
Suitable Habitat Remaining after harvest	18,656	15,604	15,915	44,565	41,513	41,825

**Environmental Effects**

- **Direct and Indirect Effects of No-Action Alternative A to Canada Lynx**

None of the proposed forest management activities would occur. In the short term, lynx habitat availability and connectivity would not change. In the long-term and in the absence of natural disturbance, winter foraging habitat availability would increase due to natural forest succession while summer foraging habitat availability would decrease due to the lack of young regenerating stands. Connectivity may also increase in the long term due to increasing canopy cover and horizontal cover over time.

- **Direct and Indirect Effects of Action Alternative B and C to Canada Lynx**

The proposed activities would occur on 4,761 acres (25.5 percent) or 4,447 acres (23.8 percent) of suitable lynx habitat in the project area under Action Alternatives B and C, respectively (TABLE III-60). Action Alternative B would convert 314 more acres (3,052 acres) of suitable lynx habitat to temporary non-suitable habitat post-harvest than Action Alternative C (2,741 acres) due to more even-age harvest prescriptions and canopy removal (TABLE III-59). These acres would be considered temporarily unsuitable for lynx use post-harvest due to lack of canopy cover in the understory and overstory. The remaining 1,709 acres or 1,706 acres of suitable lynx habitat proposed for harvest under Action Alternatives B and C, respectively, would be expected to retain adequate understory and overstory canopy cover to continue to meet the structural conditions suitable for use by lynx. Suitable lynx habitat would remain above 70% on

DNRC potential habitat and above 60% within the project area (TABLE III-60). To ensure that forest structural attributes preferred by snowshoe hares remain following harvest, dense patches of advanced regeneration would be retained where possible, particularly within lynx winter foraging habitat. Additionally, coarse woody debris would be retained in accordance with DNRC Forest Management Rules (ARM 36.11.414) and retention of downed logs  $\geq 15$ -inch diameter would be emphasized. Lynx habitat connectivity would be reduced under both Action Alternatives, but would differ according to the location of harvest units that are not likely to retain suitable habitat characteristics for lynx use post-harvest. Harvest units of Action Alternatives B and C are relatively evenly distributed within the project area; impacts to connectivity from either Action Alternative would not be concentrated in any one area. Action Alternative B would have greater adverse effects on connectivity and result in more fragmentation of lynx habitat. However, both Action Alternatives would retain 300-foot wide corridors along major creeks and prominent ridgelines to provide connectivity from the higher reaches of the Swan Range to the lower elevations of the Swan Valley. Overall, suitable lynx habitat would remain connected under both Action Alternatives. Additionally, as seedlings grow, harvested areas would likely become suitable lynx summer foraging habitat in approximately 10 to 20 years. If present near the project area, lynx could be temporarily displaced by forest management activities for approximately a 5- to 7-year period, including 5 to 6 years of timber harvest and one year of site preparation, which is a lower intensity disturbance. Consecutive summer and fall disturbance could only occur for 3 years and disturbance would generally occur for brief high-intensity periods, followed by inactivity throughout this 5- to 7-year period. Thus, since: 1) lynx suitable habitat availability in the project area would be reduced by 3,052 acres (16.4 percent) or 2,741 acres (14.7 percent) under Action Alternatives B and C, respectively; 2) habitat quality would be reduced within an additional 1,709 acres or 1,706 acres of suitable lynx habitat, but would remain suitable under Action Alternatives B and C, respectively; 3) some patches of advanced regeneration would be retained where available, particularly in winter foraging habitat; and 4) landscape connectivity would be reduced, but potential travel corridors would be retained along creeks and major ridgelines; moderate adverse direct and indirect effects to Canada lynx associated with landscape connectivity and availability of suitable habitat would be anticipated as a result of the Action Alternatives B and C.

- ***Cumulative Effects of No-Action Alternative A to Canada Lynx***

None of the proposed forest management activities would occur. In the short-term, lynx habitat availability and connectivity would not change. In the long-term and in the absence of natural disturbance, winter foraging habitat availability would increase due to natural forest succession while summer foraging habitat availability would decrease due to the lack of young regenerating stands. Connectivity may also increase due to increasing canopy cover in the understory and overstory.



- Cumulative Effects of Action Alternative B and C to Canada Lynx***

Action Alternatives B and C would affect 4,761 acres (10.7 percent) and 4,447 acres (10.0 percent), respectively, of potentially suitable lynx habitat in the Lynx CEAA (TABLE III-60). Action Alternative B would convert 314 more acres more acres of currently suitable lynx habitat to temporary non-suitable habitat post-harvest than Action Alternative C (TABLE III-59, TABLE III-60). Suitable lynx habitat, which is currently 71 percent of the overall CEAA, would remain on 66 percent (Alternative B) and 67 percent (Alternative C) of lands. Some advanced regeneration (horizontal understory cover) would be retained within lynx winter foraging habitat and coarse woody debris would be retained in accordance with DNRC *Forest Management Rules* (ARM 36.11.414) with an emphasis on the retention of downed logs  $\geq 15$ -inch diameter. Both Action Alternatives would impact connectivity primarily in the east and southeast half of the Lynx CEAA. However, connectivity would remain along prominent ridgelines and creeks in this area. Alternative B would have a greater impact on habitat connectivity due to more acres of habitat removal in areas that would get lighter intermediate treatments under Alternative C. Proposed harvest units of both alternatives are relatively evenly distributed across the eastern half of the CEAA and impacts are not noticeably concentrated in a particular area. Connectivity corridors would be retained along prominent ridgelines, creeks, and rivers under both alternatives. The proposed activities would be cumulative and additive to past and ongoing activities in the Lynx CEAA (see *RELEVANT PAST, PRESENT, AND REASONABLY FORESEEABLE ACTIONS* in CHAPTER I- PURPOSE AND NEED for a complete list of DNRC projects and TABLE III-54 for acreage of ongoing timber sales). The USFS Mid-Swan Project may occur concurrently and is currently under analysis/decision-making, thus specific treatments accompanied by a final Record of Decision are not currently available for analysis (USFS 2020). Disturbance associated with the DNRC Squeezer Meadows, Lost Napa, and USFS Mid-Swan forest management projects could directly displace and adversely affect Canada lynx for approximately a 5- to 7-year time period, including 5 to 6 years of timber harvest and one year of site preparation, which is a lower intensity disturbance. Consecutive summer and fall disturbance could only occur for 3 years and disturbance would generally occur for brief high-intensity periods, followed by inactivity throughout this 5- to 7-year period. Disturbance associated with Squeezer Meadows would be additive to disturbance associated with other ongoing timber sales (TABLE III-45), possibly including the USFS Mid-Swan Project. Thus, since: 1) lynx suitable habitat availability in the Lynx CEAA would be reduced by 4,761 acres (10.7 percent) or 4,447 acres (10.0 percent), under Alternatives B and C, respectively; 2) habitat quality would be reduced within an additional 1,709 or 1,706 acres of suitable lynx habitat under Action Alternatives B and C, respectively; 3) suitable lynx habitat would remain on at least 72 percent of potential habitat on DNRC lands and 66 percent of the CEAA; 4) patches of advanced regeneration would be retained where feasible, particularly in

winter forage habitat; and 5) landscape connectivity would be reduced under both Action Alternatives, but overall connectivity would remain high; minor adverse cumulative effects to Canada lynx associated with landscape connectivity and suitable habitat type availability would be anticipated as a result of the Action Alternatives B and C.

### ***Grizzly Bear***

*Issue:*

#### **Hiding Cover**

The proposed activities could reduce hiding cover important for grizzly bears, which could result in: 1) increased displacement of grizzly bears, 2) avoidance of otherwise suitable habitat, and or 3) increased risk of bear-human conflicts.

#### **Open Road Density**

The proposed activities could result in an increase in density of open roads, which could cause increased displacement of grizzly bears and increased risk of bear-human conflicts.

#### **Secure Habitat**

The proposed activities could result in a decrease in secure areas for grizzly bears, which could cause increased displacement of grizzly bears and increased risk of bear-human conflicts.

#### **Introduction**

Grizzly bears are native generalist omnivores that use a diversity of habitats found in western Montana, and they are currently federally listed as ‘threatened’ under the *Endangered Species Act*. Preferred grizzly bear habitats are meadows, riparian zones, avalanche chutes, subalpine forests, and big game winter ranges, all of which provide seasonal food sources. In the project area, primary habitat components include meadows, riparian areas, and big game winter ranges. Primary threats to grizzly bears are related to human-bear conflicts, habituation to unnatural foods, and long-term habitat loss associated with human development (*Mace and Waller 1997, Roberts and Costello 2016*). Forest management activities may affect grizzly bears by altering cover and/or by increasing human access into secure areas by creating roads (*Mace et al. 1997*). These actions could lead to the displacement of grizzly bears from preferred areas and/or result in an increased risk of human-caused mortality by bringing humans and bears closer together. The presence of roads may also make bears more detectable, which can increase their risk of being killed illegally. Displacing bears from preferred areas may also increase their energetic costs, which can in turn, lower their ability to survive and reproduce successfully. Recent research has found that grizzly bear habitat use and demographics within areas primarily managed for timber harvest depend on a complex array of factors such as: open road density, abundance of natural food sources, time since harvest, type of harvest and the presence or absence of natural disturbance (*Kearney et al. 2019, Lamb et al. 2018, Proctor et al. 2020*). Given

our understanding of bears in the Swan Valley based on a radio-collared sample of bears, population linkage has been successful between the Mission Range and the Swan Range, and bears commonly use active and inactive subunits during all seasons of the non-denning period (Hicks *et al.* 2010, Ruby 2014). The grizzly bear population of the Northern Continental Divide Ecosystem (NCDE), which includes the Swan Valley, continues to remain healthy and increase annually (Costello *et al.* 2016, NCDE Subcommittee 2020, Costello *et al.* 2023).

### **Analysis Areas**

Direct and indirect effects were analyzed for activities conducted in the 25,436-acre project area. Cumulative effects were analyzed on the 58,521-acre Wildlife CEAA, which contains the entire project area, the entire *Goat Creek Grizzly Bear Management Subunit* and portions of the *Lion Creek* and *South Fork Lost Soup Grizzly Bear Management Subunits*. Grizzly bear subunits approximate the annual home range size of a female grizzly bear (USFS 1995, Mace and Roberts 2011), and are generally accepted by state and federal agencies as an appropriate scale for analysis. The Wildlife CEAA includes all roads that could be used for Action Alternative harvesting activities, and a surrounding area to capture the potential for increased disturbance from harvest activities within seasonal movements of grizzly bear. Ownership of the CEAA is 53% DNRC, 41% USFS, 4% DFWP, and 2% private lands. The Wildlife CEAA contains a variety of habitats preferred by grizzly bears, from low-elevation riparian areas to high-elevation avalanche chutes. The analysis areas are described in *TABLE III-53* and depicted in *FIGURE III-15*.

### **Analysis Methods**

#### **Hiding Cover**

To assess hiding cover, DNRC's *SLI* data and field evaluations were used to map stands that would serve as hiding cover (DNRC 2006b). Hiding cover for bears was defined as vegetation blocks capable of obscuring a bear from human view at 200 feet. On non-DNRC lands, field visits, USDA Forest Service data, GEDI lidar data, and aerial photos in GIS were used to estimate hiding cover. Hiding cover blocks had to be at least 200 feet wide to be considered in the analysis. Using this metric, the smallest hiding cover patch within either analysis area was approximately 0.7 acres. Factors considered in the analysis include the amount of hiding cover impacted by proposed harvesting and available hiding cover in project area and Wildlife CEAA.

#### **Open Road Density**

Open road density was analyzed using a GIS and DNRC's *road inventory* data. Both year-round and seasonally open roads were considered open roads in the analysis. Results of road densities were provided in simple linear miles per a square mile. Residential access roads were also analyzed as open even though they are not open to everyone. Factors considered in the analysis include potential changes in open road density within the project area and Wildlife CEAA, both temporary and long-term.

### **Secure Habitat**

Secure habitat is defined as areas free of motorized human access greater than 0.3 miles (500 meters) from any open, restricted, or high-use roads and trails (IGBC 1998). Analysis was conducted using a GIS and DNRC's *road inventory* data to identify areas that provide secure habitats. Open and gated roads were buffered by 0.3 miles (500 meters), and the resultant area was removed from the analysis area to obtain the amount of secure habitat. Areas below 5,200 feet in elevation were considered to be spring habitat for grizzly bears (USFWS and DNRC 2010). Factors considered in the analysis include the amount of secure habitat and area of spring habitat restricted from commercial activities during the spring period within the project area and Wildlife CEAA. Total road densities (both open and restricted roads) were also estimated using simple linear calculations.

### **Existing Environment**

Lands in the Swan Valley have been heavily influenced by logging activity conducted on state, private and federal lands during the last 50 years. In addition to ongoing natural disturbances, logging has influenced the amount, density and distribution of forested stands on the landscape. Further, logging has driven the development and maintenance of an extensive system of open and restricted forest roads, all of which can pose added risk to grizzly bears in the Swan Valley. Recent or ongoing timber sale projects conducted on DNRC-managed lands during the last decade have altered vegetation and contributed to roads on the landscape. Changes to cover and forest structure resulting from all past completed and ongoing DNRC projects have been accounted for in SLI data used for this analysis through timber sale updating procedures and use of current road inventory data. Projects conducted under the Lost Napa Multiple Timber Sale Project (2021) are in progress. Ongoing and proposed timber sales occurring in the project area and CEAs are listed in TABLE III-54.

### **Hiding Cover**

Past timber harvesting and land ownership in the Swan Valley has resulted in a patchwork comprised of variously shaped forest stands of differing age that exist at differing stages of successional development. Hiding cover associated with this patchwork on DNRC-managed lands is relatively abundant and comprises 76.1 percent of the project area.

Some ongoing and recently completed forest management activities have altered hiding cover (e.g. *Lost Napa Timber Sale Project*), while others (e.g. *Cilly Ridge Salvage*) have not appreciably altered hiding cover due to the lack of cover provided by the salvaged material. Hiding cover is present on 71.6 percent of the CEAA, of which 38.8 percent occurs on DNRC-managed lands. High alpine habitat, avalanche paths, and steep, rocky south-facing slopes in the southeastern quarter of the CEAA are naturally lacking forest cover that provides hiding cover for bears. Dense brush likely provides hiding cover in some of these areas for a portion of the non-denning season, however these areas were not considered hiding cover in this analysis. The USFS has proposed the Mid-Swan Landscape Restoration Project, which extends from Swan

Lake to Condon, MT and may contribute additional cumulative effects associated with reductions in hiding cover within the CEAA. However, this USFS project does not have a final Record of Decision (ROD) and final harvest units were not available at the time of this analysis. Within the CEAA, timber management and development activities on privately-owned lands are possible and could also alter hiding cover in the future. However, only 2.8 percent of hiding cover within the CEAA is on private lands.

### **Open Road Density**

A network of roads has been constructed over the years to facilitate timber management and recreation within the Swan Valley. These road systems provide several access routes into otherwise remote areas. Presently, the project area has approximately 38.2 miles of open roads (including State Highway 83) and 4.0 miles of roads open seasonally to public access. Open road density, including seasonally open roads, is moderate at 1.1 miles per square mile.

At the larger scale, the Wildlife CEAA has approximately 67.7 miles of open and seasonally open roads, equating to an open road density of 0.7 miles per square mile (*TABLE III-61 – EXISTING GRIZZLY BEAR HABITAT PARAMETERS – CUMULATIVE EFFECTS ANALYSIS AREA*). No proposed or ongoing DNRC projects that would alter long-term open-road densities are occurring in the CEAA. Currently, the proposed USFS Mid-Swan Project within the CEAA could appreciably affect short-term open road densities and/or road use, however long-term open road density would not likely change (*USDA Forest Service 2020*). Development activities on privately-owned lands are possible and could increase road density. However, only 2.3 percent of the CEAA is comprised of private lands.

### **Secure Habitat**

Secure habitat currently exists on approximately 4.6 percent of the project area, most of which is included in large blocks that extend beyond the project area boundary. The Wildlife CEAA is comprised of approximately 27.4 percent secure habitat (*TABLE III-61*). Much of the existing secure habitat on DNRC lands within the project area and CEAA is located in eastern portions of the analysis area within the higher-elevation reaches of the Swan Range. Total road densities within the project area and CEAA are 5.6 miles and 3.9 miles per a square mile, respectively (*TABLE III-53*). Roads are more prevalent in the western half of the CEAA where topography is more gentle and timber management has historically occurred. Some extra measures of security during the spring are provided for grizzly bears through seasonal closure of an open road (4.0 miles) and by limiting commercial management activities on restricted roads during the spring period (April 1-June 15) below 5,200 feet of elevation; considerably restricting disturbance activity across spring habitat within the Swan Valley bottom. Additionally, the Swan River State Forest is divided into five subzones that are regulated by 3-year management, 6-year rest schedules. Because regular, extended commercial harvesting during the non-denning season is limited in rested management subzones for at least six years, disturbance factors for grizzly bears are reduced considerably in these areas during these windows of time. The CEAA

contains 8,492 acres of DNRC lands that would be in rested status during the proposed harvesting activities.

Timber harvesting in the past, including the most recent (and ongoing) Lost Napa Timber Sale Project, has altered some secure habitat and increased total road densities within the CEAA in the last decade. The proposed USFS Mid-Swan project could also alter grizzly bear secure habitat and total road densities within the CEAA (USDA 2020). However, that project would be required to also meet specific Forest Plan Standards pertaining to grizzly bear security, which would minimize impacts to grizzly bears from road building. Within the CEAA, management could also occur on private lands; however, these lands contain 0.2 percent of secure habitat within the CEAA.

**TABLE III - 61 - EXISTING GRIZZLY BEAR HABITAT PARAMETERS.** *Hiding cover acres and percent of analysis area, open-road density in miles per square mile, and secure habitat acres and percent of area within the project area and Wildlife CEAA. The project area is comprised of only DNRC-managed lands.*

Analysis Area	Hiding Cover Acres (%)		Open Road Density - mi/mi <sup>2</sup>		Secure Habitat Acres (%)	
	All Lands	DNRC	All Lands	DNRC	All Lands	DNRC
Project Area	19,356 (76.1)	17,506 (68.8)	1.1	0.9	1,181 (4.6)	1,171 (4.6)
Wildlife CEAA	41,927 (71.6)	22,721 (38.8)	0.7	0.5	16,009 (27.4)	2,886 (4.9)

**Environmental Effects**

- ***Direct and Indirect Effects of No-Action Alternative A to Grizzly Bear Hiding Cover***

No vegetation modification would occur in the project area, therefore, no changes to existing hiding cover would be anticipated. Thus, no direct and indirect effects to grizzly bear hiding cover or associated impacts to bears involving displacement, avoidance of habitat, or increased risk of bear-human conflicts in the project area would be anticipated.

**Open Road Density**

No changes to the open-road status, open-road densities, or risk of grizzly bear displacement or bear-human conflicts caused by vehicular noise or human access would

occur. Thus, no additional direct or indirect effects to grizzly bears associated with open-road densities in the project area would be anticipated.

#### **Secure Habitat**

No alteration of habitat attributes or increased human presence would occur. No changes to total road densities would occur. Therefore, no changes in grizzly bear secure habitat, increased displacement, or risk of human-caused mortality in the project area would be expected under this alternative.

- ***Direct and Indirect Effects of Action Alternative B and C to Grizzly Bear Hiding Cover***

The proposed harvesting would alter 4,932 (Action Alternative B) to 4,590 acres (Action Alternative C) of hiding cover from the existing 19,356 acres of hiding cover in the project area. Approximately 2,691 acres (15.4 percent) or 2,082 acres (11.9 percent) of existing hiding cover would be effectively removed by harvest treatments, with the greatest reduction in hiding cover occurring under Action Alternative B (TABLE III-62). To reduce the long-term avoidance of harvest units by grizzly bears and provide mitigation to offer some retained security, proposed seed tree and some shelterwood harvest units would be designed to ensure that no point in any unit would be greater than 600 feet to cover. Visual screening cover would also be retained within 100 feet of open roads where available. Proposed road construction would alter cover in one riparian area; however, road construction was designed to minimize riparian habitat loss. The proposed activities would be additive to altered hiding cover due to past harvesting in the project area, which primarily occurred on DNRC lands. Thus, minor adverse direct and indirect effects to hiding cover that would affect grizzly bears in the project area would be anticipated since: 1) hiding cover would be reduced across a portion of the project area, but considerable hiding cover would remain in the project area (16,665 acres [65.5 percent] Alternative B or 17,274 acres [67.9 percent] Alternative C), and 2) additional mitigations would ensure that no point in a proposed seed tree or heavy shelterwood unit is more than 600 feet to cover, 3) areas harvested in the past would continue to grow into hiding cover, and 4) greater than 65 percent of DNRC-managed lands would continue to provide hiding cover, which would maintain ample cover for bears in the project area.

#### **Open Road Density**

Under either Action Alternative, no new open roads would be constructed. However, proposed harvesting activities and associated road use could result in short-term displacement effects; while the construction of new restricted roads could result in both short- and long-term displacement effects (see analysis regarding *SECURE HABITAT* below for more detail). As all newly constructed roads would be managed as restricted, the amount of open roads and associated open-road densities would not change (TABLE

III-62). All newly constructed roads would be behind closure devices or berms, which would allow for future administrative and commercial uses, as well as non-motorized use by the public. Thus, since open-road densities would not change, negligible direct and indirect effects associated with open-road densities would be anticipated that would affect grizzly bears in the project area for the foreseeable future.

#### **Secure Habitat**

Under either Action Alternative, harvesting and road construction would affect secure habitat within the project area. Although no changes in open roads would be anticipated, reductions in secure habitat on 261 acres under both Alternatives B and C (2.2 percent of existing secure habitat) would be anticipated in the project area (TABLE III-62). Approximately 5.3 miles of new permanent restricted roads would be constructed under either Action Alternative adding to the existing 221 miles in the project area. However, approximately 7.2 miles of existing restricted road would be permanently reclaimed and closed. Thus, total road miles would be reduced by 3.4 percent. Proposed new restricted road amounts are within allowable capped amounts required under the DNRC Forest Management HCP (USFWS and DNRC 2018). No new temporary road would be built under either Action Alternative. A decrease in secure habitat and increase in disturbance levels associated with commercial timber harvesting would be anticipated (TABLE III-62). Additionally, the Action Alternatives would affect some secure habitat in the project area by clearing existing roads that are currently inaccessible to motorized use due to thick brush and debris. Collectively, the proposed new road construction, accessibility of existing roads that would be reconstructed, and the decrease in secure habitat could result in increased disturbance of grizzly bears via nonmotorized dispersed recreation, administrative activities (including motorized), salvage harvests during inactive periods, and commercial forest management activities during active periods. Projects conducted under the Lost Napa Multiple Timber Sale Project (2021) are ongoing but are not expected to occur concurrent with proposed Squeezer Meadow harvesting during the non-denning season. The increases in total road density and decreases in secure habitat could result in increased risks of avoidance of suitable habitat and bear-human conflicts. However, radio-instrumented grizzly bears in the Swan Valley showed little evidence of displacement from restricted roads or differential use of active or inactive management units associated with logging (Ruby 2014). Thus, continued use of the project area by grizzly bears would be expected, although bears may avoid areas where active harvesting and road use/construction would occur for up to 3 years. Additional motorized administrative activities associated with post-harvest site preparation could pose a minor risk of displacement for another 1 to 2 years. However, required spring timing/habitat restrictions, and stipulations placed on contractors and DNRC personnel that restrict carrying firearms, reduce the risk of additional mortality associated with commercial and administrative use. The



availability of newly constructed roads into the southeast part of the project area, as well as the improvements made to existing roads, could increase long-term nonmotorized use in the project area, although permanent reclamation of other roads may discourage some nonmotorized users (TABLE III-62). Nonmotorized recreational user days on new roads would likely be similar to other restricted road systems in the Swan Valley, which is very low except during big game hunting seasons. Therefore, the risk to bears associated with nonmotorized use would be moderate in the short term and decrease over time as lesser-used restricted roads fill in with brush and deadfall.

Vegetation removal in proposed harvest units could make grizzly bears more visible; however, maintaining new and existing roads as restricted, incorporating 600 feet to cover requirements, maintaining visual screening along open roads, and prohibiting contractors from carrying firearms while on duty would reduce the risk of human-caused mortality. Harvesting would not occur during the spring period (April 1 through June 15). This seasonal restriction would limit the potential for disturbance to grizzly bears during the spring period when they are more susceptible to disturbance. Because both alternatives have the same reduction in secure habitat and new road construction, similar adverse effects to grizzly bears would be expected. However, Action Alternative B would harvest more acres where hiding cover would be completely removed by regeneration harvest prescriptions.

Collectively, minor adverse direct and indirect effects to grizzly bear secure habitat and subsequent displacement, and bear-human conflict effects would be anticipated in the project area since: 1) secure habitat would be reduced by 2.2 percent; 2) total road densities would decrease slightly in the project area with the construction of 5.3 miles of new roads and removal of 7.2 miles of existing restricted roads; 3) new restricted roads in previously secure habitat would increase long-term risk of displacement and human-bear conflicts associated with nonmotorized recreational use and motorized administrative use; and 4) some increases in disturbance caused by commercial harvesting/post-harvest site preparation could occur during the non-denning period for 3 to 5 years.

**TABLE III - 62 - PROJECT AREA GRIZZLY BEAR HABITAT PARAMETERS.** *Proposed acres of hiding cover removed, acres of hiding cover retained; linear miles of permanent road, miles of open and restricted road construction, resultant miles of open and restricted roads; and acres of secure habitat expected under each alternative within the project area. Percentages provided in parentheses are described under each parameter description where applicable.*

HABITAT PARAMETER	ALTERNATIVES		
	NO ACTION	ACTION	
	A	B	C

Acres of hiding cover removed (percent of existing hiding cover removed)	0 0.0	2,691 (15.4)	2,082 (11.9)
Acres of hiding cover retained in the project area after implementation of each alternative (percent of project area)	19,356 (76.1)	16,665 (65.5)	17,274 (67.9)
Linear miles of new permanent, restricted road constructed	0	5.3	5.3
Linear miles of restricted road permanently reclaimed	0	7.2	7.2
Linear miles of permanent restricted road (percent change)	56.3	54.4 (-3.4)	54.4 (-3.4)
Miles of new permanent open road constructed	0	0	0
Miles of permanent open road (percent increase)*	42.2 (0.0)	42.2 (0.0)	42.2 (0.0)
Acres of secure habitat in the project area after implementation of each alternative (percent of project area providing secure habitat)	1,181 (4.6)	919 (3.6)	919 (3.6)

\* Residential access roads (driveways) were also analyzed as open even though they are not open to everyone.

- ***Cumulative Effects of No-Action Alternative A to Grizzly Bear Hiding Cover***

No vegetation modification would occur; therefore, no changes to existing hiding cover would be anticipated in the CEAA (TABLE III-63). Vegetation in the project area and CEAA that are providing hiding cover would be expected to continue providing this attribute for the foreseeable future. Recent, ongoing, and proposed projects affecting grizzly bear hiding cover within the Wildlife CEAA described in TABLE III-54 would continue and have been accounted for in the *Existing Environment* section. Thus, no additional cumulative effects to hiding cover or associated impacts to bears involving displacement or avoidance of habitat would be anticipated that would affect grizzly bears in the CEAA.

- **Open Road Density**

No changes in open road amounts or open-road density would be anticipated. Recent, ongoing, and proposed projects affecting open road density within the Wildlife CEAA described in TABLE III-54 would continue and have been accounted for in the *Existing*

*Environment* section. Thus, no additional cumulative effects to grizzly bears associated with open-road densities or increased risk of bear-human conflicts would be anticipated in the CEAA for the foreseeable future.

#### **Secure Habitat**

No changes to open roads, grizzly bear secure habitat, total road densities, or increased potential for displacement or bear-human conflicts would be anticipated. Recent, ongoing, and proposed projects affecting grizzly bear security within the Wildlife CEAA described in *TABLE III-54* would continue and have been accounted for in the *Existing Environment* section. No changes would be anticipated to the percentage of DNRC-managed lands in the CEAA that are currently providing secure habitat (*TABLE III-63*). Thus, no additional cumulative effects would be anticipated to secure habitat that would affect grizzly bears in the CEAA for the foreseeable future.

- ***Cumulative Effects of Action Alternative B and C to Grizzly Bear Hiding Cover***

Proposed activities would reduce the amount of hiding cover in the Wildlife CEAA by 6.4 (Alternative B) or 5.0 percent (Alternative C) (*see TABLE III-63*). Proposed road construction would alter hiding cover in one riparian area; however, the proposed road construction would be designed to minimize the acreage of riparian habitat affected. Vegetation elsewhere in the project area and CEAA that is providing hiding cover would be expected to continue providing this attribute for the foreseeable future. Ongoing harvesting and thinning on DNRC-managed lands, as well as lands on USFS and other ownerships would continue altering grizzly bear hiding cover (*see TABLE III-63*). Thus, reductions in hiding cover associated with these alternatives would be additive to proposed, ongoing and recently completed projects that would alter, or have altered, grizzly bear hiding cover. Reductions in hiding cover associated with timber harvesting and thinning are relatively short lived (10 to 20 years) and recovery of hiding cover in the vicinity of the CEAA is fairly rapid. For instance, many areas within the project area harvested 10-13 years ago with seed tree prescriptions have regenerated into hiding cover. The proposed harvesting would reduce the amount of hiding cover on DNRC-managed lands in the CEAA from 77.1 percent to 65.3 percent (Alternative B) or 67.9 percent (Alternative C) following proposed logging treatments (*TABLE III-63*). Overall, Action Alternative B would remove more hiding cover; therefore, a slightly higher adverse effect related to hiding cover would be anticipated under Action Alternative B. Continued appreciable use of the CEAA by grizzly bears would be anticipated under either Action Alternative. Thus, minor adverse cumulative effects to hiding cover that would influence grizzly bear displacement, avoidance of habitat, or increased risk of bear-human conflicts in the CEAA would be anticipated since: 1) hiding cover would be reduced by a measurable level on DNRC-managed lands; but 2) adequate hiding cover exceeding 65 percent would persist within the CEAA; and 3)

reductions in hiding cover would be additive to potential hiding cover effects on DNRC and non-DNRC lands, particularly the USFS Mid-Swan project.

#### **Open Road Density**

No changes in open-road amounts, open-road densities or the associated potential for human-caused mortality would be anticipated under the proposed Action Alternatives. No ongoing or proposed forest management projects on DNRC-managed lands would alter open-road densities. Any activities that would occur on other ownerships in the CEAA, such as the USFS Mid-Swan Project, could alter total road densities (see *TABLE III-54*), but changes to open roads would not be expected (*USDA Forest Service 2020*). The Wildlife CEAA would continue to have an open road density of 0.7 miles per a square mile (*TABLE III-63*). Thus, no further cumulative effects involving open-road densities and grizzly bears would be anticipated in the CEAA for the foreseeable future.

#### **Secure Habitat**

Secure habitat on DNRC-managed lands would be reduced in the Wildlife CEAA by 2.0 percent (Alternative B or Alternative C, *TABLE III-63*). Construction of new restricted roads under both Action Alternatives would increase total road densities, however all of these new roads would remain restricted to the public. Proposed road construction of 5.3 miles would not increase total-road density within the CEAA because 7.2 miles of existing road will be permanently reclaimed and closed. Road density would change from an existing level of 3.9 miles per square mile to 3.8 miles per a square mile (Action Alternatives B or C, *TABLE III-63*). Use of restricted roads in the CEAA (primarily in the project area) would increase substantially during the 3-year active period and then revert to levels similar to current levels for another inactive 6-year period. Proposed new restricted road amounts would be within allowable capped amounts required under the DNRC Forest Management HCP (USFWS and DNRC 2018). Collectively, the increases in total-road density, accessibility of existing roads that would be reconstructed, and the decrease in secure habitat could result in increased disturbance of grizzly bears via nonmotorized dispersed recreation, administrative activities (including motorized), salvage harvests during inactive periods, and commercial forest management activities during active periods. The increases in total-road density and decreases in secure habitat could result in increased risks of avoidance of suitable habitat and bear-human conflicts. However, recent studies examining the relationship between grizzly bears, road access management and timber harvest suggests that bears generally avoid open roads, but continue to use areas containing low-traffic, restricted roads and these areas can be utilized by bears as frequently as secure habitat when important food resources are present (*Lamb et al. 2018, Northrup et al. 2012, Proctor et al. 2020*). Furthermore, recently-harvested areas (5-20 years postharvest) may also provide similar food resources for grizzly bears as naturally-disturbed areas (e.g. wildfire) (*Kearney et al. 2019, Souliere et al. 2020*). In the Swan Valley, Ruby (2014) observed little evidence of displacement of

grizzly bears from restricted roads or differential use of active or inactive management units associated with logging. Nonmotorized recreational use associated with new restricted roads would be expected to increase proportionally with proposed increases in new roads; the number of user days would likely be similar to other restricted road systems in the Swan Valley. Therefore, the risk to bears associated with nonmotorized use would be moderate in the short term and decrease over time as lesser-used restricted roads fill in with brush and deadfall. Continued use of the CEAA by grizzly bears would be expected, although bears may avoid areas where active harvesting and road use/construction would occur for up to 3 years. Additional motorized administrative activities associated with post-harvest site preparation and tree planting would pose a minor risk of displacement for another 1 to 2 years. However, required spring road restrictions, management of attractants, and stipulations placed on contractors and DNRC personnel that restrict carrying firearms reduce the risk of additional mortality associated with commercial and administrative use. Harvesting would not occur during the spring period (April 1 through June 15). This seasonal restriction would limit the potential for disturbance to grizzly bears during the spring period when they are more susceptible to disturbance. The availability of newly constructed roads affecting secure habitat, as well as the improvements made to 62 miles of existing restricted roads (both Alternatives B and C), could increase long-term nonmotorized use in the CEAA (*TABLE III-63*). However, this nonmotorized use would not be expected to increase substantially because the new road segments are many miles behind existing public closures; therefore, the risk to bears associated with nonmotorized use would be minor.

Reductions in grizzly bear habitat quality and quantity would be additive to losses associated with past and current harvesting on all ownerships in the CEAA. Additionally, reductions in forest cover and increases in restricted roads under the Action Alternatives could be additive to the Mid-Swan proposed activities on USDA Forest Service lands within the CEAA (*USDA Forest Service 2020*). Forest Service lands comprise approximately 41% of the Wildlife CEAA and contain the majority of secure habitat for bears within the CEAA. An increase in grizzly bear disturbance levels associated with the proposed activities would be additive to any existing disturbance mechanisms in the CEAA, although Lost Napa activities would not likely be concurrent with Forest Service (Mid-Swan) activities during the grizzly bear non-denning period. Comparatively, both Action Alternatives would build the same amount of road and reduce the same amount of secure habitat, although Alternative B removes more hiding cover which increases bear vulnerability (*TABLE III-63*). Overall, adverse effects on grizzly bears related to secure habitat would be anticipated to be similar between the two Action Alternatives. Thus, moderate adverse cumulative effects to secure habitat for grizzly bears would be anticipated in the CEAA since: 1) secure habitat would be reduced by 2.0 percent (Alternatives B or C); 2) total-road density would decrease from 3.9 to 3.8 miles per square mile (Alternatives B or C); 3) new restricted roads reducing

previously secure habitat could increase long-term risk of displacement and human-bear conflicts associated with nonmotorized recreational use and motorized administrative use; 4) increased disturbance caused by commercial activities would occur for up to 3 years during the non-denning period and could be additive to other sources of disturbance within the CEAA, including DNRC and USDA Forest Service management actions; and, 5) some administrative motorized activities would also occur for up to 2 additional years during the non-denning period and would be additive to other sources of disturbance within the CEAA.

**TABLE III - 63 - CUMULATIVE EFFECTS ANALYSIS AREA GRIZZLY BEAR HABITAT PARAMETERS.** Anticipated changes to open-road densities, hiding cover, total-road densities, and secure habitat under each alternative within the cumulative effects analysis area (CEAA).

HABITAT PARAMETER	ALTERNATIVE		
	NO ACTION	ACTION	
	A	B	C
Open road density within the CEAA.	0.7	0.7	0.7
Open road density on DNRC-managed lands within the CEAA.	1.3	1.3	1.3
Percent of hiding cover retained on DNRC-managed lands within the CEAA (percent reduction).	40.4	35.6	36.7
	(0.0)	(11.8)	(9.1)
Percent of hiding cover retained on all lands within the CEAA (percent reduction).	71.6	67.0	68.1
	(0.0)	(6.4)	(5.0)
Total road density within the CEAA.	3.9	3.8	3.8
Percent of secure habitat on DNRC-managed lands remaining after implementation of each alternative (percent reduction).	4.9	4.5	4.5
	(0.0)	(9.1)	(9.1)
Percent of secure habitat within the CEAA remaining after implementation of each alternative (percent reduction).	27.4	26.8	26.8
	(0.0)	(2.0)	(2.0)

**SENSITIVE SPECIES**

*Fishers*

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

## **Introduction**

In the Rocky Mountains, fisher home ranges typically consist of mesic late-successional forests with complex vertical and horizontal structure, large-diameter trees, and >50 percent canopy cover of mature forested stands (Raley et al. 2012, Schwartz et al. 2013, Olson et al. 2014, Sauder and Rachlow 2014). Fishers typically avoid ponderosa pine and lodgepole pine stands, and large openings such as clearcuts; however, frequently used areas within home ranges contain high habitat heterogeneity (Schwartz et al. 2013, Sauder and Rachlow 2015). Fishers prey upon snowshoe hares, ungulate carrion, porcupines, birds, and small mammals, as well as seasonally available fruits and berries. Fisher resting and denning sites are found in cavities of live trees and snags, downed logs, brush piles, mistletoe brooms, squirrel and raptor nests, and holes in the ground. Forest-management considerations for fishers include retaining large trees and snags for resting and denning habitat, maintaining a network of travel corridors, and reducing trapping risk associated with motorized access.

## **Analysis Areas**

The analysis area for direct and indirect effects is the 25,436-acre project area (FIGURE III-15). The analysis area for cumulative effects is the 58,521-acre Wildlife CEAA described in TABLE III-53 and depicted in FIGURE III-15. The Wildlife CEAA is defined by geographic features, which are likely to influence movements of fishers near the project area. The CEAA is also potentially large enough to support a small population of fishers (Olson et al. 2014), thus providing a reasonable analysis area for fishers that could be influenced by project-related activities.

## **Measurement Criteria**

Analysis methods include field evaluations, aerial photograph interpretation, and GIS analysis of travel corridors, preferred fisher cover types (ARM 36.11.403(66)), and habitat structure. Stands were considered appropriate for fisher use if they were appropriate cover types and contained 40 to 100 percent stocking density. Additional fisher habitat classifications considered in the analysis include: 1) upland fisher habitat, and 2) riparian fisher habitat, which are defined according to proximity of the stand to streams. Riparian fisher habitat is located within 100 feet of class 1 streams or within 50 feet of class 2 streams. Potential fisher habitat (upland, riparian) on other ownerships was identified by examining moderate to densely stocked mature forest habitat ( $\geq 40$ -percent canopy cover) below 6,000 feet elevation and the proximity of closed-canopy forested habitat to perennial and intermittent streams. Factors considered in the analysis include: 1) the degree of harvesting, 2) availability and structure of preferred fisher habitats (upland, riparian), 3) landscape connectivity, and 4) human access.

## **Existing Environment**

Approximately 11,877 acres (46.7 percent) in the project area are considered suitable fisher habitat (TABLE III-65). These stands are likely to provide features necessary for use as fisher resting and denning sites and serve to maintain landscape connectivity. Of these 11,877 suitable

acres that occur in the project area, approximately 1,038 are fisher riparian habitat. The remaining acres in the project area consist of approximately 6,231 acres of young stands considered to be preferred cover types that could eventually become fisher habitat and 7,328 acres of xeric forest types and open areas that are typically avoided by fishers. The density of open roads is 1.1 miles/square mile and total road density is 5.6 miles/square mile, thus, there is moderate level of access that could facilitate trapping. However, fisher harvest in the FWP Continental Divide Fisher Management Unit is currently closed.

The Wildlife CEAA contains approximately 22,967 acres of fisher habitat (39.2 percent of the analysis area), including 11,971 acres of suitable fisher habitat on DNRC-managed lands (TABLE III-65) and 11,176 acres of forested habitat on other ownerships located below 6,000 feet elevation, which are likely to provide suitable fisher habitat. Of these acres of potential fisher habitat, approximately 2,002 acres are riparian fisher habitat including 1,093 acres of DNRC-managed fisher riparian habitat and approximately 909 acres of fisher riparian habitat on other ownerships. The remaining 35,554 acres in the Wildlife CEAA consist of young stands or poorly-stocked stands that are unsuitable for fisher use, as well as stands that are not appropriate cover types. Fisher habitat is distributed throughout the Wildlife CEAA with the largest patches located on north-facing slopes in the Goat Creek and Squeezer Creek drainages where cool-moist forest types are located, in addition to large patches throughout the lower elevation of the Swan Valley. According to trapping records, fishers were last documented in the Wildlife CEAA in the 1960s (*Montana Natural Heritage Program data, December 19, 2023*). Fishers were not detected in winter carnivore surveys of the Swan Valley conducted in the winter of 2012-2022 (*Southwestern Crown Carnivore Monitoring Team 2023; USFS unpublished data Jan. 2017*). The density of open and seasonally restricted roads is 0.7 miles/square mile and total road density is 3.9 miles/square mile; thus, there is a moderate level of access that could facilitate trapping at this scale.



**TABLE III - 64 - FISHER HABITAT.** Changes in fisher habitat under each alternative in the project area and the Wildlife CEAA; estimates include potential fisher habitat on non-DNRC lands.

<b>FISHER HABITAT PARAMETER</b>	<b>PROJECT AREA</b>			<b>WILDLIFE CEAA</b>		
	<b>NO- ACTION</b>	<b>ACTION</b>		<b>NO- ACTION</b>	<b>ACTION</b>	
	<b>A</b>	<b>B</b>	<b>C</b>	<b>A</b>	<b>B</b>	<b>C</b>
Riparian habitat affected by harvest (percent of available habitat)	0 (0)	23 (2.2)	25 (2.4)	0 (0)	23 (1.2)	25 (1.3)
Habitat affected by harvest (percent of available habitat)	0 (0)	2,840 (23.9)	2,546 (21.4)	0 (0)	2,840 (12.4)	2,546 (11.1)
Habitat Removed by harvest (percent of available habitat)	0 (0)	1,682 (14.2)	1,351 (11.4)	0 (0)	1,682 (7.3)	1,351 (5.9)
Total fisher riparian habitat post- harvest (percent of analysis area)	1,038 (4.1)	1,020 (4)	1,019 (4)	2,002 (3.4)	1,985 (3.4)	1,984 (3.4)
Total of upland and riparian fisher habitat post-harvest (percent of analysis area)	11,877 (46.7)	10,195 (40.1)	10,526 (41.4)	22,967 (39.2)	21,285 (36.4)	21,616 (36.9)

**Environmental Effects**

- Direct and Indirect Effects of No-Action Alternative A to Fishers**  
 None of the proposed forest management activities would occur. The level of motorized access would not change and no additional risk associated with trapping would be expected. In the short term, no changes to fisher habitat availability or connectivity would occur in the project area. In the long term and in the absence of natural disturbance, fisher habitat suitability and connectivity would increase as stands age.
- Direct and Indirect Effects of Action Alternative B and C to Fishers**  
 Overall, Action Alternative B is anticipated to have slightly greater adverse effects on fisher habitat due to the greater amount of habitat affected and removed. The proposed activities would affect 2,840 acres (23.9 percent) or 2,546 acres (21.4 percent) of the 11,877 acres of fisher habitat present in the project area under Action Alternatives B and C, respectively (TABLE III-65). Stands proposed for seed tree, shelterwood treatments, overstory removal, and some individual tree selection and commercial thin treatments would not retain suitable canopy cover for fisher use post-harvest, reducing habitat

availability. Approximately 1,682 or 1,351 acres of fisher habitat would be removed under Action Alternatives B and C, respectively. The remaining acres of fisher habitat proposed for harvest would retain at least 40-percent mature canopy cover post-harvest and these stands would remain suitable for fisher use post-harvest, although these stands may be of lower habitat quality due to reduced stand density. The availability of important habitat characteristics (i.e., snags, coarse woody debris) would likely be reduced by harvest activities; although retention of dead-woody material and live snag recruitment trees would meet DNRC Forest Management Rules (*ARM 36.11.411*, *ARM 36.11.414*), which would maintain a source of large legacy woody material across the affected landscape. Approximately 23 acres or 25 acres of fisher riparian habitat would be removed under Action Alternatives B and C, respectively; however, habitat would remain well-connected due to vegetation retention requirements (see *HABITAT CONNECTIVITY AND FRAGMENTATION* section in this analysis). No new roads open to public motorized use are planned for construction; however, 5.3 miles of restricted roads are proposed for construction under both Action Alternatives. Motorized administrative use and non-motorized public use would be permitted on these roads. Trapping risk would increase depending upon accessibility of the area via snowmobile; however, fisher harvest in the Continental Divide Fisher Management Area is currently closed. Both Action Alternatives propose obliteration of 7.2 miles of roads restricted to motorized public access. If present near the project area, fishers could be temporarily displaced by forest management activities associated with the Squeezer Meadows Multiple Timber Sales for a 5 to 7-year operating period, including 5 to 6 years of timber harvest and one year of site preparation, which is a lower intensity disturbance. Summer and fall activity could only occur for 3 consecutive years and disturbance would generally occur for brief high-intensity periods, followed by inactivity throughout this 5 to 7-year period. Thus, since: 1) approximately 2,840 acres (23.9 percent) or 2,546 acres (21.4 percent) of suitable fisher habitat in the project area would be affected by harvest under Action Alternatives B and C, respectively; 2) 1,682 acres (14.2 percent) or 1,351 acres (11.4 percent) of suitable fisher habitat in the project area would be removed by the proposed activities under Action Alternatives B and C, respectively; 3) 23 acres or 25 acres of riparian fisher habitat would be removed by the proposed activities under Action Alternatives B and C, respectively; 4) landscape connectivity would be reduced, but riparian travel corridors would remain intact; and 5) 5.3 miles of restricted roads would be constructed under both Action Alternatives, but open road density would not change; minor adverse direct and indirect effects to fisher associated with habitat suitability and trapping risk would be anticipated as a result of Action Alternatives B and C.

- ***Cumulative Effects of No-Action Alternative A to Fishers***  
None of the proposed forest management activities would occur. In the short term, no changes to fisher habitat availability or connectivity associated with the Squeezer

Meadow Multiple Timber Sales would occur. In the long term and in the absence of natural disturbance, fisher habitat suitability and connectivity may increase as stands age, the availability of large-diameter trees increases, and mature canopy cover increases.

- ***Cumulative Effects of Action Alternative B and C to Fishers***

The proposed activities would affect 2,840 acres (12.4 percent) or 2,546 acres (11.1 percent) of the 22,967 acres of potential fisher habitat in the Wildlife CEAA. A portion of these acres would be treated with regeneration or heavy thinning treatments and would not be suitable for fisher use post-harvest (*TABLE III-65*). Overall, Action Alternative B is anticipated to have slightly greater adverse effects on fisher habitat than Action Alternative C due to greater amounts of fisher habitat affected and removed. Under both Action Alternatives, 5.3 miles of restricted roads are proposed for construction, possibly increasing trapping risk depending upon accessibility of the area via snowmobile, although open road density would not change, and trapping of fisher in the Continental Divide Fisher Management Unit is currently closed. Within all harvest units, snags, snag recruits, and coarse woody debris, which are important fisher habitat elements, would be retained according to DNRC Forest Management Rules (*ARM 36.11.411, ARM 36.11.414*). However, some snags would be removed, and overall snag density would be reduced post-harvest. Approximately 23 acres or 25 acres of fisher riparian habitat would be removed under Action Alternatives B and C, slightly impacting connectivity. The proposed activities would be additive to past activities in the Wildlife CEAA (see *RELEVANT PAST, PRESENT, AND REASONABLY FORESEEABLE ACTIONS* in *CHAPTER I- PURPOSE AND NEED* for a complete list of DNRC projects and *TABLE III-54* for acreage of ongoing timber sales). Portions of the USFS Mid-Swan Project may occur concurrently, although specific treatments accompanied by a final Record of Decision are not available for analysis (*USFS 2020*). Fishers could be temporarily displaced by forest management activities associated with the proposed Mid-Swan Project and Squeezer Meadows Multiple Timber Sales for a 5 to 7-year timber period, including 5 to 6 years of timber harvest and one year of site preparation, which is a lower intensity disturbance. Summer and fall activity could only occur for 3 consecutive years and disturbance would generally occur for brief high-intensity periods, followed by inactivity throughout this 5 to 7-year period. Thus, since: 1) approximately 2,840 acres (12.4 percent) or 2,546 acres (11.1 percent) of potential fisher habitat in the Wildlife CEAA would be affected by harvest under Action Alternatives B and C, respectively; 2) 1,682 acres (7.3 percent) or 1,351 acres (5.9 percent) of potential fisher habitat in the Wildlife CEAA would be removed by the proposed activities under Action Alternatives B and C, respectively; 3) 23 acres or 25 acres of riparian fisher habitat would be removed by the proposed activities under Action Alternatives B and C, respectively; 4) landscape connectivity would be reduced, but riparian travel corridors would remain intact; and 5) 5.3 miles of restricted roads would be constructed under

both Action Alternatives, but open road density would not change; minor adverse cumulative effects to fisher associated with habitat suitability and trapping risk would be anticipated as a result of Action Alternatives B and C.

### *Flammulated Owl*

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

#### **Introduction**

Flammulated owls are small, migratory, insectivorous forest owls that inhabit old, open stands of warm-dry ponderosa pine and cool-dry Douglas-fir forests in the western United States (McCallum 1994). Flammulated owls are secondary cavity nesters, and typically nest in 12- to 25-inch dbh aspen, ponderosa pine, or Douglas-fir cavities excavated by pileated woodpeckers or northern flickers. In general, preferred habitat contains open-to-moderate canopy closure with at least 2 canopy layers and small clearings. In the absence of disturbance, Douglas-fir trees encroach upon ponderosa pine stands, resulting in increased stand density and decreased habitat quality for flammulated owls. Timber harvest may affect the structure of timber stands and reduce the availability of snags, potentially reducing habitat suitability for flammulated owls. Forest management considerations for flammulated owls include retaining open stands of ponderosa pine and Douglas-fir containing patches of regeneration used for roosting and retaining snags for nesting.

#### **Analysis Areas**

The analysis area for direct and indirect effects is the 25,436-acre Project Area (FIGURE III-15). The analysis area for cumulative effects is the 58,521-acre Wildlife CEAA described in TABLE III-53 and depicted in FIGURE III-15. The Wildlife CEAA is defined according to geographic features (i.e., ridgelines) and provides a reasonable analysis area for local flammulated owls that could be affected by project-related activities.

#### **Analysis Methods**

Analysis methods include field evaluations, aerial photograph interpretation, and GIS analysis of available habitat. *SLI* data were used to identify preferred flammulated owl habitat types on DNRC-managed lands (ARM 36.11.403[31]). Aerial photographs and field evaluations were used to determine which of these stands contained suitable habitat structure with a canopy cover of 25- to 50 percent. On non-DNRC-managed lands, data identifying suitable flammulated owl habitat are not readily available. Therefore, GIS analysis of USDA Forest Service vegetation maps and aerial photograph interpretation was used to identify stands dominated by preferred tree species with 25- to 60-percent canopy cover and composed primarily of trees >10-inches dbh, and below 6,000 feet in elevation. These stands are likely to contain habitat types preferred by flammulated owls as well as matrix habitat. Factors

considered in the analysis include: 1) the degree of harvesting, and 2) the structure of flammulated owl preferred habitat.

### **Existing Environment**

The stands in the project area are largely dominated by Douglas-fir/western larch, and mixed conifers. Spruce, lodgepole pine, ponderosa pine, and Western red cedar stands occur at lower proportions. The project area contains 2,698 acres (10.6 percent of the project area) of cover types preferred by flammulated owls which are composed primarily of dry Douglas-fir stands. Approximately 2,127 acres (8.3 percent of the project area) of the preferred flammulated owl cover types have the structural attributes that are likely to provide suitable habitat for flammulated owl use. The remaining 571 acres contain preferred cover types, but the stand structure is currently too open (455 acres) or too dense (116 acres) for flammulated owl use. Flammulated owl habitat is located primarily in the southern portion of the project area in the between Goat Creek and Squeezer Creek, with the largest patches found on steeper slopes with south and west aspects. The remaining 22,738 acres in the project area consist primarily of larch, subalpine fir, and mesic Douglas-fir stands that are not considered suitable flammulated owl habitat. Snag density in the project area is average for the habitat types present, and potentially suitable nesting trees are available in portions of the project area. There is one record of a flammulated owl using the project area in the vicinity of the Sprunger-Whitney Nature Trail (MTNHP, 2023). Overall, the availability of suitable flammulated owl habitat is low within the project area.

The Wildlife CEAA contains approximately 5,028 acres (8.6 percent of the Wildlife CEAA) of potential flammulated owl habitat including 3,045 acres of mature forest types preferred by flammulated owls on DNRC-managed lands and 1,983 acres of potential flammulated owl habitat on other ownerships that is scattered throughout the Wildlife CEAA. Approximately 12,267 acres (21.0 percent) of the Wildlife CEAA have an elevation over 6,000 feet which is considered non-suitable habitat for flammulated owls. The remaining acres consist of young stands and mature forest that are cool, moist cover types that are not suitable flammulated owl habitat. Open and seasonally restricted road density in the Wildlife CEAA is low (0.7 miles per square mile) and total road density is moderate (3.9 miles per square mile). Due to the low level of motorized access for firewood cutting, snags are likely available for flammulated owl nesting more than 300 feet from open roads. However, historic and ongoing timber harvest in the project area has limited the availability of snags in some areas (see *CHAPTER I- PURPOSE AND NEED* for a comprehensive listing of past DNRC projects) and collectively, the flammulated owl habitat availability in the Wildlife CEAA is somewhat limited due to the prevalence of cool, moist habitat types in the region. The area is likely capable of supporting several pairs of flammulated owls (*McCallum 1994*).

### **Environmental Effects**

- ***Direct and Indirect Effects of the No-Action Alternative A to Flammulated Owls***

None of the proposed forest management activities would occur. In the short term, no changes to flammulated owl habitat would occur. In the long term and in the absence of natural disturbance, timber stocking density would increase over time, potentially decreasing the suitability of stands for flammulated owl use.

- ***Direct and Indirect Effects of the Action Alternatives B and C to Flammulated Owls***

Approximately 475 acres (17.6 percent) and 414 acres (15.3 percent) of flammulated cover types would be harvested under Action Alternative B and C, respectively. Although Alternative B would affect more acres of flammulated owl habitat, Action Alternative C is anticipated to have slightly greater adverse effects due to the greater amount of habitat that would become temporarily unsuitable post-harvest. Harvest treatments that reduce mature canopy cover below 25 percent would become temporarily unsuitable for flammulated owl use, however, treatments that retain a mature canopy cover of 25 to 50 percent would likely improve habitat suitability for flammulated owls. Additionally, the proposed harvest would remove shade-tolerant trees, which is preferable for flammulated owls (*ARM 36.11.436(11)*). Under Action Alternative B, 243 acres (9.0 percent of preferred cover types) would be converted to temporarily unsuitable habitat. Post-harvest, habitat would remain suitable on 173 acres and harvest would improve habitat suitability on an additional 36 acres by decreasing stand density. Forest stands on 22 acres would continue to be too open for flammulated owl use. Action Alternative C would convert 260 acres (9.6 percent) of preferred flammulated owl cover types to temporarily unsuitable habitat. However, suitable habitat would remain on 94 acres and habitat suitability would improve on an additional 36 acres as a result of a more open forest post-harvest. The remaining 23 acres would continue to be too open for flammulated owl use. Some snags would be removed by the proposed harvest, but at least 2 large snag and 2 large snag recruitment trees per acre (>21-inches dbh) would be retained (*ARM 36.11.411*). Disturbance associated with the proposed harvest activities could occur for 5 to 7 years, including 5 to 6 years of timber harvest and one year of site preparation (e.g., piling, scarification). However, flammulated owls are tolerant of human disturbance (*McCallum 1994*), and timber harvest would likely occur for less than 1 year considering the small size of harvest units located in flammulated owl habitat. Thus, since: 1) harvesting would remove flammulated owl habitat on 243 acres or 260 acres under Action Alternatives B and C, respectively, 2) changes in structure and cover type from harvest would generally increase flammulated owl habitat suitability on 36 acres under both Alternatives B and C, 3) 1,921 acres (7.6 percent of project area) or 1,904 acres (7.5 percent of project area) of suitable habitat would remain in the project area under Action Alternatives B and C, respectively, and 4) snags would be retained that would provide legacy nesting substrates and would meet DNRC *Forest Management Rules* (*ARM 36.11.411*), minor adverse direct and indirect effects to flammulated owl habitat suitability would be anticipated as a result of the Action Alternatives B and C.

- Cumulative Effects of the No-Action Alternative A to Flammulated Owls***

None of the proposed forest management activities would occur. Flammulated owl habitat would not be affected by the proposed forest management activities associated with the DNRC; however, other forest management activities within the Wildlife CEAA may affect flammulated owl habitat suitability (*TABLE III-54*). In the short term, no additional changes to flammulated owl habitat would be anticipated. In the long term and in the absence of natural disturbance, timber stocking density would increase over time, potentially decreasing the suitability of stands for flammulated owl use.
- Cumulative Effects of the Action Alternatives B and C to Flammulated Owls***

The proposed activities would affect 475 acres (9.4 percent) or 414 acres (8.2 percent) of the 5,028 acres of potential flammulated owl habitat available in the Wildlife CEAA under Action Alternatives B and C, respectively. Although Action Alternative B would affect more acres of flammulated owl habitat, Action Alternative C is anticipated to have slightly greater adverse effects due to the greater amount of habitat that would be temporarily unsuitable post-harvest. Under Action Alternative B, 243 acres (4.8 percent) of preferred cover types in the Wildlife CEAA would be converted to temporarily unsuitable habitat. Post-harvest, 209 acres would retain mature canopy cover of 25 to 50 percent and would be suitable for flammulated owl use post-harvest. Stand density on 22 acres would remain too low for flammulated owl use. Action Alternative C would convert 260 acres (5.2 percent) of preferred flammulated owl cover types in the Wildlife CEAA to temporarily unsuitable habitat. Suitable habitat would remain on 130 acres where treatments retain canopy cover of 25-50 percent. The remaining 23 acres would continue to be too open for flammulated owl use. Some large trees suitable for nesting would be removed; however, at least 2 large snag and 2 large snag recruitment trees per acre (>21-inches dbh) would be retained across all harvest units (*ARM 36.11.411*). Changes in flammulated owl habitat suitability would be additive to completed, proposed, and ongoing activities in the Wildlife CEAA (see *RELEVANT PAST, PRESENT, AND REASONABLY FORESEEABLE ACTIONS* in *CHAPTER I- PURPOSE AND NEED* for a complete list of DNRC projects and *TABLE III-54* for acreage of ongoing timber sales). The related effects of these activities have been accounted for in the updated and current stand level inventory data used in this analysis. The USFS Mid-Swan Project may occur concurrently and is currently under analysis, but a final Record of Decision with final harvest units were not available at the time of this analysis (*USFS 2020*). Disturbance associated proposed activities could occur for 5 to 7 years, including 5 to 6 years of timber harvest and one year of site preparation. However, flammulated owls are tolerant of human disturbance (*McCallum 1994*), and harvesting would likely occur for less than 1 year considering the small size of harvest units located in flammulated owl habitat. Displacement resulting from activities associated with the proposed activities would be additive to disturbance associated with ongoing activities in the Wildlife CEAA. Thus, since: 1) harvesting

would remove flammulated owl habitat on 243 acres or 260 acres under Action Alternatives B and C, respectively, 2) changes in structure and cover type due to harvesting would generally increase flammulated owl habitat suitability on 36 acres under both Alternatives B and C, 3) 3,918 acres (6.7 percent of Wildlife CEAA) or 3,901 acres (6.7 percent of Wildlife CEAA) of suitable habitat would remain in the Wildlife CEAA under Action Alternatives B and C, respectively, and 4) snags would be retained that would provide legacy nesting substrates and would meet DNRC *Forest Management Rules* (ARM 36.11.411), minor adverse cumulative effects to flammulated owl habitat suitability would be anticipated as a result of the Action Alternatives B and C.

### ***Pileated Woodpecker***

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

#### **Introduction**

Pileated woodpeckers play an important role in mature forests by excavating large cavities that are often used in subsequent years by a variety of wildlife species for nesting and roosting. Pileated woodpeckers require mature forest stands with large-diameter ( $\geq 20$ -inch dbh) dead or defective trees for nesting and foraging and the density of pileated woodpeckers is positively correlated with the amount of dead and dying wood in a stand (McClelland 1979). Timber harvest may remove large-diameter trees necessary for nesting and fragmentation can make birds more vulnerable to predation as they travel between habitat patches (Bull and Jackson 2020). Forest management considerations for pileated woodpeckers include retaining dense patches of old and mature coniferous forest with abundant large snags and coarse-woody debris for foraging, roosting, and nesting.

#### **Analysis Areas**

The analysis area for direct and indirect effects is the 25,436-acre project area (FIGURE III-15). The analysis area for cumulative effects is the 58,521-acre Wildlife CEAA described in TABLE III-53 and depicted in FIGURE III-15. The Wildlife CEAA includes the project area and defined according to geographic features (i.e., ridgelines) and provides a reasonable analysis area for pileated woodpeckers that could be influenced by project-related activities. This scale provides a sufficient area to support multiple pairs of pileated woodpeckers (Bull and Jackson 2020).

#### **Measurement Criteria**

Factors considered in the analysis include: 1) the degree of harvesting and 2) the structure of pileated woodpecker preferred habitat types. On DNRC-managed lands, sawtimber stands  $\geq 100$  years old within preferred pileated cover types (ARM 36.11.403(63)) with  $\geq 40$  percent canopy closure were considered potential pileated woodpecker habitat. On non-DNRC lands, the stands considered potential pileated woodpecker habitat were mature forest stands ( $\geq 40$  percent canopy cover,  $> 9$  inches dbh average) below 6,000 feet elevation.



**Existing Environment**

The project area contains 6,196 acres (24.4 percent of the project area) of suitable pileated woodpecker habitat. This habitat is composed primarily of mature Douglas-fir-western larch stands. Habitat patches scattered throughout the project area, however suitable pileated woodpecker habitat is less abundant through the center and southeastern portions of the project area where industrial timber harvest took place and removed large areas of mature forest. The remaining acres in the project area consist primarily of poorly stocked stands or non-forested areas, relatively young stands <100 years in age, as well as subalpine fir and western red cedar stands that are less suitable cover types for pileated woodpecker use. Open and seasonally open road density in the project area is low (1.1 miles per square mile) and provides a low level of accessibility for firewood cutting.

The Wildlife CEAA contains 15,387 acres (26.3 percent of the CEAA) of potential pileated woodpecker habitat, which includes 7,314 acres of DNRC-managed pileated woodpecker habitat and an additional 8,073 acres of mature forested habitat (<6,000 feet elevation) on other ownerships. These habitat patches are scattered throughout the CEAA. Overall, road density in the Wildlife CEAA is low (0.7 miles per square mile open and seasonally restricted roads) and provides a low level of accessibility for firewood cutting. Additionally, the Wildlife CEAA is managed primarily by state and federal agencies (97.6 percent of the CEAA), which have retention guidelines for snags and coarse woody debris. Considering the low open road density and land ownership patterns, snags and coarse woody debris likely occur in sufficient amounts for pileated woodpeckers nesting and foraging in the Wildlife CEAA.

**TABLE III - 65 - PILEATED WOODPECKER.** Changes in pileated woodpecker habitat under each alternative in the project area and the Wildlife CEAA. Estimates for the Wildlife CEAA include potential habitat on other ownerships.

<b>PILEATED WOODPECKER HABITAT</b>	<b>PROJECT AREA</b>			<b>WILDLIFE CEAA</b>		
	<b>NO- ACTION</b>	<b>ACTION</b>		<b>NO- ACTION</b>	<b>ACTION</b>	
	<b>A</b>	<b>B</b>	<b>C</b>	<b>A</b>	<b>B</b>	<b>C</b>
Habitat affected by harvest (percent of available habitat)	0 (0)	1,798 (29.0)	1,529 (24.7)	0 (0)	1,798 (11.7)	1,529 (9.9)
Habitat removed by harvest (percent of available habitat)	0 (0)	1,713 (27.6)	1,483 (23.9)	0 (0)	1,713 (11.1)	1,483 (9.6)
Total habitat post-harvest (percent of analysis area)	6,196 (24.4)	4,483 (17.6)	4,713 (18.5)	15,387 (26.3)	13,674 (23.3)	13,904 (23.8)

## Environmental Effects

- ***Direct and Indirect Effects of No-Action Alternative A to Pileated Woodpeckers***

None of the proposed forest management activities would occur. In the short term, no changes to pileated woodpecker habitat would be anticipated. However, in the long term and in the absence of natural disturbance, pileated woodpecker habitat availability and habitat patch size may increase due to natural succession and aging of timber stands.

- ***Direct and Indirect Effects of Action Alternative B and C to Pileated Woodpeckers***

Overall, Action Alternative B is anticipated to have greater adverse effects on pileated woodpecker habitat than Action Alternative C since more acres of habitat would be removed. The proposed activities would affect 1,798 acres (29.0 percent) or 1,529 acres (24.7 percent) of pileated woodpecker habitat in the project area under Action Alternatives B or C, respectively (TABLE III-65). Of these acres, approximately 1,713 (Alternative B) or 1,483 acres (Alternative C) proposed for harvest would undergo harvest treatments which would reduce stand densities below levels suitable for pileated woodpecker use post-harvest (TABLE III-65). However, in the long term, seral tree species preferred by pileated woodpeckers would be recruited, creating future pileated woodpecker habitat in these stands and other stands proposed for treatment. The remaining 85 acres or 46 acres proposed for harvest under Action Alternatives B and C, respectively, would retain suitable stand characteristics for pileated woodpecker use, albeit at a reduced habitat quality due to reduced stand density. Proposed removal treatments would remove pileated woodpecker habitat for 30 to 100 years, depending on the density and growth rate of trees in the stand. Snags would be removed by the proposed harvest, but at least 2 large snags and 2 large snag recruitment trees per acre (>21-inches dbh) would be retained (ARM 36.11.411) in addition to coarse woody debris (ARM 36.11.414). Disturbance associated with the proposed harvesting could adversely affect pileated woodpeckers in portions of the project area for approximately 5 to 7 years, should they be present in the Project area. Timber harvest is anticipated to occur over a 5 to 6-year period (maximum of 3 consecutive summer/fall seasons) and site preparation, which is a lower intensity disturbance, may occur for 1 additional year. Thus, since: 1) stand density and habitat quality would be reduced within 85 acres (1.4 percent) or 46 acres (0.7 percent) of pileated woodpecker habitat in the project area under Action Alternatives B and C, respectively; 2) harvesting would reduce suitable pileated woodpecker habitat availability by 1,713 acres (27.6 percent) or 1,483 acres (23.9 percent) within the project area; and 3) important habitat attributes including snags and coarse woody debris would be retained according to ARM 36.11.411 and ARM 36.11.414; moderate adverse direct and indirect effects to pileated woodpecker habitat suitability in the project area would be anticipated as a result of Action Alternatives B and C.

- ***Cumulative Effects of No-Action Alternative A to Pileated Woodpeckers***

None of the proposed forest management activities would occur. In the short term, no changes to pileated woodpecker habitat would be anticipated. However, in the long term and in the absence of natural disturbance, pileated woodpecker habitat availability and habitat patch size may increase due to natural succession and aging of timber stands.

- ***Cumulative Effects of Action Alternative B and C to Pileated Woodpeckers***

The proposed activities would occur in 1,798 acres (11.7percent) or 1,529 acres (9.9 percent) of potential pileated woodpecker habitat in the Wildlife CEAA under Action Alternatives B or C, respectively (*TABLE III-65*). However, Action Alternative B is anticipated to have greater adverse effects on pileated woodpeckers since more habitat would be removed. The proposed activities would reduce mature canopy cover in 1,713 (Alternative B) or 1,483 acres (Alternative C) of existing habitat, such that the remaining habitat structure would be unsuitable for appreciable pileated woodpecker use post-harvest in these stands. The remaining acres proposed for harvest would retain stand structure required for suitable pileated woodpecker habitat post-harvest, albeit at a lower stand density resulting in reduced habitat quality. However, at least 2 large snags and 2 large snag recruitment trees per acre (>21-inches dbh) would be retained (*ARM 36.11.411*) in addition to coarse woody debris (*ARM 36.11.414*). Changes in pileated woodpecker habitat suitability would be additive to completed activities in the Wildlife CEAA (see *RELEVANT PAST, PRESENT, AND REASONABLY FORESEEABLE ACTIONS* in *CHAPTER I- PURPOSE AND NEED* for a complete list of DNRC projects and *TABLE III-54* for acreage of ongoing timber sales). The USFS Mid-Swan Project may occur concurrently and is currently under analysis, although specific treatments or estimates of impacts on pileated woodpeckers are not currently available (*USFS 2020*). Disturbance associated with the proposed activities could adversely affect pileated woodpeckers for a 5 to 7-year timber period, including 5 to 6 years of timber harvest and one year of site preparation, which is a lower intensity disturbance. Summer and fall activity would occur for a maximum of 3 consecutive years and disturbance would generally occur for brief high-intensity periods, followed by inactivity throughout this 5 to 7-year period. Thus, since: 1) stand density and habitat quality would be reduced in 85 acres (0.6 percent) or 46 acres (0.3 percent) of pileated woodpecker habitat in the Wildlife CEAA under Action Alternatives B and C, respectively; 2) harvesting would reduce suitable pileated woodpecker habitat availability by 1,713 acres (11.1 percent) or 1,483 acres (9.6 percent) within the Wildlife CEAA; and 3) important habitat attributes including snags and coarse woody debris would be retained according to (*ARM 36.11.411* and *36.11.414*); minor adverse cumulative effects to pileated woodpecker habitat suitability would be anticipated as a result of the Action Alternatives B and C.

## **BIG GAME ISSUES**

### **Big Game Winter Range**

The proposed activities could remove forest cover on important winter ranges, which could lower their capacity to support elk, mule deer, and white-tailed deer.

### **Elk Security**

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

## ***BIG GAME WINTER RANGE***

### **Introduction**

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

### **Analysis Areas**

The analysis area for direct and indirect effects is the 25,436-acre project area (*FIGURE III-15*). The analysis area for cumulative effects is the 58,521-acre Wildlife CEAA described in *TABLE III-53* and depicted in *FIGURE III-15*. The CEAA is centered on the project area, defined according to geographic features, and provides a reasonable analysis area for wintering big game that could be influenced by project-related activities.

### **Measurement Criteria**

Factors considered in the analysis include: 1) the degree of timber harvesting, 2) the availability and structure of cover on DFWP-defined big game winter range, and 3) the level of disturbance associated with timber harvest. Forested habitat ( $\geq 60$  percent canopy cover,  $> 9$ -inch dbh average) was considered capable of providing thermal cover for big game.

### **Existing Environment**

The project area provides potential elk, mule deer, and white-tailed deer winter range (*TABLE III-66*) with limited white-tailed deer winter range located in the valley, and elk and mule deer winter range located on west-facing slopes primarily below 5,500 feet. The project area is a part of a larger winter range extending north and south within the Swan Valley and the west-facing slopes of the Flathead Range with white-tailed deer winter range typically restricted to lower elevations. Desirable winter range habitat attributes found in the project area include low elevation riparian habitat, some south-facing aspects, and appreciable amounts of canopy cover. Thermal cover availability varies spatially according to the location of primary wintering areas for each big game species (*TABLE III-67*). Large patches of thermal cover comprised of dense,

mature forest (i.e., greater than 60-percent canopy cover) are generally more connected in the northern portions of the project area and scattered throughout the southern portions of the project area, primarily below 3,600 feet in elevation.

The Wildlife CEAA contains elk, mule deer, and white-tailed deer winter range (TABLE III-66). Elk winter range occurs primarily along the Swan River in the Wildlife CEAA and extends to the north and the south along west-facing slopes of the Flathead Range outside of the CEAA. White-tailed deer winter range also occurs primarily along the Swan River and valley bottom. Mule deer winter range is more limited in distribution and occurs mid-slope along west-facing slopes north and south of the CEAA. Mule deer winter range occurs along mid-elevation west-facing slopes, extending north and south outside the CEAA. Large patches of thermal cover comprised of dense (i.e., greater than 60-percent canopy cover), mature forest (>9-inch dbh average) are located at lower elevations near the Swan River and at higher elevations within the CEAA. High quality thermal cover at mid-elevation is scattered with small patches on DNRC lands and large intact patches located primarily on USFS lands within the CEAA (TABLE III-67). Most of the winter range in the CEAA occurs on DNRC and USFS lands. Across all ownerships, past timber-harvesting activities, human development, and road construction in big game winter range areas have likely reduced the quality of winter range habitat.

**TABLE III - 66 - EXISTING WINTER RANGE.** Existing big game winter range acres (and percent of analysis area) in the project area and Wildlife CEAA as identified by DFWP (2008).

<b>WINTER RANGE ACRES</b>		
<b>WINTER RANGE TYPE</b>	<b>PROJECT AREA</b>	<b>WILDLIFE CEAA</b>
Elk	23,519 (92.5)	38,537 (65.9)
Mule deer	6,143 (24.2)	14,177 (24.2)
White-tailed deer	20,706 (81.4)	29,752 (50.8)

**TABLE III - 67 - THERMAL COVER.** The acreage (and percent of winter range) of thermal cover on winter ranges delineated by DFWP (2008) for each species, which would remain under DNRC Squeezer Meadow Timber Sale alternatives in the project area and Wildlife CEAA.

THERMAL COVER ACRES						
WINTER RANGE TYPE	PROJECT AREA			WILDLIFE CEAA		
	NO-ACTION	ACTION		NO-ACTION	ACTION	
	A	B	C	A	B	C
Elk	4,418 (18.8)	3,360 (14.3)	3,390 (14.5)	9,198 (23.9)	8,140 (21.1)	8,179 (21.2)
Mule deer	434 (7.1)	422 (6.9)	410 (6.7)	2,716 (19.2)	2,704 (19.1)	2,692 (19)
White-tailed deer	4,291 (20.7)	3,241 (15.7)	3,280 (15.8)	7,751 (26.1)	6,702 (22.5)	6,740 (22.7)

**TABLE III - 68 - WINTER RANGE ROAD DENSITY.** Estimates of total road density using simple linear calculation (mi/mi<sup>2</sup>) within big game winter range habitat by species following implementation of each Squeezer Meadows Multiple Timber Sale alternative in the project area and Wildlife CEAA. Total road density includes all open and administratively accessible restricted roads.

TOTAL ROAD DENSITY						
WINTER RANGE TYPE	PROJECT AREA			WILDLIFE CEAA		
	NO-ACTION	ACTION		NO-ACTION	ACTION	
	A	B	C	A	B	C
Elk	5.7	5.6	5.6	5.3	5.2	5.2
Mule deer	7.6	7.3	7.3	6.0	5.8	5.8
White-tailed deer	5.2	5.2	5.2	5.0	5.0	5.0

**TABLE III - 69 - WINTER RANGE ACTIVE ROADS.** Miles of active system roads including open, seasonally open, residential access and restricted roads associated with haul routes for each alternative of the DNRC Squeezer Meadows Multiple Timber Sale.

WINTER RANGE TYPE	ACTIVE LINEAR ROAD MILES					
	PROJECT AREA			WILDLIFE CEAA		
	NO-ACTION	ACTION		NO-ACTION	ACTION	
	A	B	C	A	B	C
Elk	42.2 (1.1)	99.6 (2.7)	99.7 (2.7)	65.2 (1.1)	122.6 (2.0)	122.7 (2.0)
Mule Deer	8.8 (0.9)	34.7 (3.6)	35.8 (3.7)	18.2 (0.8)	44.1 (2.0)	45.2 (2.0)
White-tailed deer	41.9 (1.3)	79.5 (2.5)	79.6 (2.5)	61.8 (1.3)	99.3 (2.1)	99.4 (2.1)

**Environmental Effects**

- Direct and Indirect Effects of No-Action Alternative A to Big Game Winter Range**  
 None of the proposed forest management activities would occur. No changes in disturbance levels would occur. In the short term, no change in the availability of thermal cover would occur. In the long term and in the absence of natural disturbance, thermal cover may increase as stands age and canopy cover increases. Thus, no direct or indirect impacts to any big game species would be anticipated.
- Direct and Indirect Effects of Action Alternative B and C to Big Game Winter Range**  
 The availability of thermal cover in the project area would be reduced by relatively similar areas under Action Alternatives B and C, with Action Alternative B affecting additional acres of thermal cover located within the Soup Creek drainage and alternative C affecting additional acres of thermal cover within the Squeezer Creek drainage (TABLE III-67). The amount of thermal cover affected by the proposed harvest varies according to the big game species. Under Action Alternative B, the availability of thermal cover in the project area would be reduced by 1,058 acres, 12 acres, or 1,050 acres for elk, mule deer, and white-tailed deer, respectively (23.9 percent, 2.8 percent, 24.5 percent of available elk, mule deer, and white-tailed deer thermal cover, TABLE III-67). Action Alternative C would reduce the availability of thermal cover in the project area by 1,019 acres, 24 acres, or 1,011 acres for elk, mule deer, and white-tailed deer,

respectively (23.1 percent, 5.6 percent, 23.6 percent of available elk, mule deer, and white-tailed deer thermal cover, *TABLE III-67*). Following logging, forest patches in the project area would continue to provide a mosaic of habitat conditions. Under both alternatives, large mature forest stands in the project area would be reduced in size and become more fragmented. Stands considered to provide marginal thermal cover (40 - 60 percent canopy cover, >9-inch dbh average) would generally remain well connected and provide a suitable network of cover capable of facilitating movement of wintering animals across the local landscape, particularly along riparian areas. New forest openings created by logging could provide minor benefits for elk and deer for foraging during mild winters and early and late portions of each winter. Minor positive, short-term benefits would be anticipated during harvest operations as deer and elk may feed on felled tree tops, limbs, and slash piles. However, these benefits would be offset by disturbance effects to wintering deer and elk as well as removal of thermal cover. New roads open to public motorized use would not be constructed, and 5.3 miles of restricted roads that allow administrative use and non-motorized public use would be constructed under both Action Alternatives B and C, increasing road density. However, both Alternatives B and C propose to reclaim 7.2 miles of restricted roads within the project area, reducing total road density by up to 0.3 miles per square mile within the project area (*TABLE III-68*). Additionally, traffic would increase on roads used in conjunction with logging activities for the duration of the project (up to 5 to 7 years) (*TABLE III-69*). Both Alternatives B and C would potentially increase traffic similarly on roads located in big game winter range (*TABLE III-69*). Disturbance would generally occur for high-intensity periods, followed by inactivity throughout this 5 to 7-year period. Thus, since: 1) thermal cover availability would be reduced up to 24.5 percent on big game winter range in the project area impacting up to 1,058 acres of thermal cover; 2) the proposed harvest could occur during winter, potentially displacing wintering big game; 3) open roads would not be constructed, and restricted roads would be constructed; however, restricted road reclamation would reduce total road density up to 0.3 miles per square mile (*TABLE III-68*), 4) activity would temporarily increase on haul roads in winter range under Action Alternatives B and C, respectively potentially displacing big game; and 5) the availability of thermal cover would remain low ranging from 6.7 percent (mule deer) to 15.8 percent (white-tailed deer) of winter range in the project area (*TABLE III-67*), moderate adverse direct and indirect effects to big game winter range habitat suitability, particularly for elk and white-tailed deer, would be anticipated as a result of Action Alternatives B and C.

- ***Cumulative Effects of No-Action Alternative A to Big Game Winter Range***

None of the proposed forest management activities would occur. In the short term, no change in the availability of thermal cover associated with the Squeezer Meadows Multiple Timber Sales would occur. Thus, measurable adverse cumulative effects to elk



or deer would not be anticipated. In the long term and in the absence of natural disturbance, thermal cover would increase as stands age and canopy cover increases.

- ***Cumulative Effects of Action Alternative B and C to Big Game Winter Range***

Overall, Action Alternative B would have a slightly greater impact on thermal cover in the Wildlife CEAA than Action Alternative C (*TABLE III-58*). Under Action Alternative B, the availability of thermal cover in the Wildlife CEAA would be reduced by 1,058 acres, 12 acres, or 1,050 acres for elk, mule deer, and white-tailed deer, respectively (11.5 percent, 0.5 percent, or 13.5 percent of available elk, mule deer, and white-tailed deer thermal cover, *TABLE III-67*). Under Action Alternative C, the availability of thermal cover in the Wildlife CEAA would be reduced by 1,019 acres, 24 acres, or 1,011 acres for elk, mule deer, and white-tailed deer, respectively (11.1 percent, 0.9 percent, or 13.0 percent of available elk, mule deer, and white-tailed deer thermal cover, *TABLE III-67*). Mature forest stands on DNRC lands would be reduced in size and become more fragmented. Stands considered to provide marginal thermal cover (40 to 60 percent canopy cover, >9-inch dbh average) would generally remain well connected and provide a suitable network of cover capable of facilitating movement of wintering animals across the landscape to larger patches of higher quality thermal cover within the CEAA, primarily on USFS lands. Slash, tree tops, and limbs associated with harvest units may increase short-term forage availability during harvest operations. However, wintering deer and elk may be either attracted to this food source or displaced by disturbance depending upon tolerance for disturbance and the availability of food in the vicinity. New roads open to public motorized use would not be constructed, and roads that allow administrative use and non-motorized public use would be constructed under both Action Alternatives B and C, increasing road density. However, both Alternatives B and C propose to reclaim a portion of restricted roads within the Project Area, reducing total road density by up to 0.2 miles per square mile within the CEAA (*TABLE III-68*). Additionally, traffic would increase temporarily (up to 5 to 7 years) on roads used in conjunction with timber harvest for the duration of the project, with both Alternatives B and C potentially increasing traffic by similar amounts within big game winter range (*TABLE III-69*). Changes in winter range habitat suitability would be additive to previous timber sales in the Wildlife CEAA (see *RELEVANT PAST, PRESENT, AND REASONABLY FORESEEABLE ACTIONS* in *CHAPTER I- PURPOSE AND NEED* for a complete list of DNRC projects and *TABLE III-54* for acreage of ongoing timber sales). The USFS Mid-Swan Project may occur concurrently and is currently under analysis, although specific treatments or estimates of impacts on winter range are not currently available (*USFS 2020*). Thus, since: 1) thermal cover availability would be reduced by 0.5 percent to 13.5 percent on big game winter range in the Wildlife CEAA impacting up to 1,058 acres of thermal cover; 2) the proposed harvest could occur during winter, potentially displacing wintering big game and displacement would be additive to any ongoing activities in the Wildlife CEAA; 3) open roads would not be constructed, and

restricted roads would be constructed increasing road density; however, restricted road reclamation would reduce total road density up to 0.2 miles per square mile (*TABLE III-68*); 4) activity would increase on haul roads in winter range under either actional alternative, potentially displacing big game; and 5) the availability of thermal cover would remain low ranging from 19.0 percent to 22.7 percent of winter range, moderate adverse cumulative effects to big game winter range habitat suitability would be anticipated as a result of Action Alternatives B and C.

## ***ELK SECURITY HABITAT***

### **Introduction**

Elk security habitat provides hiding areas during hunting season by reducing visibility and accessibility in forested landscapes, reducing the likelihood that an animal will be observed and harvested (*Hillis et al. 1991*). Because the female segment of elk populations is normally carefully regulated during hunting seasons, primary concerns are related to a substantial reduction of the male population and subsequent decrease in hunter opportunity. Open road density is of concern because it is well documented that elk avoid areas adjacent to open roads, and elk survival rates in areas adjacent to open roads are much lower than for elk using unroaded habitats (*McCorquodale 2013*). Forest management considerations for elk security habitat include providing adequate cover and restricting motorized access.

### **Analysis Areas**

The analysis area for direct and indirect effects is the 25,436-acre project area (*FIGURE III-15*). The analysis area for cumulative effects is the 58,521-acre Wildlife CEAA described in *TABLE III-53* and depicted in *FIGURE III-15*. The CEAA is centered on the project area, defined according to geographic features, and provides a reasonable analysis area for big game that could be influenced by project-related activities. The Wildlife CEAA would provide enough area for a local elk herd to avoid hunting pressure during the general hunting season.

### **Measurement Criteria**

Factors considered in the analysis include: 1) the degree of timber harvesting, 2) the availability and density of mature forest cover patches, and 3) changes to open road and restricted road density using simple linear calculation. Big game security habitat was defined as forest habitat ( $\geq 40$ -percent canopy cover) that is  $\geq 250$  acres and located  $>0.5$  miles from open roads (*Hillis et al. 1991*).

### **Existing Environment**

Approximately 3,840 acres (15.1 percent of the project area) of security habitat occur in the project area (*TABLE III-70*). Most of the security habitat is in one large 1,189-acre patch along the upper elevations of the Squeezer Creek drainage. The remaining acres in the project area consist of 11,020 acres of mature stands that are too close to open roads to provide security habitat as well as stands that are too open to provide security. The density of open and

seasonally open roads is 1.1 miles per square mile and total road density is 5.6 miles per square mile, thus, there is a low level of motorized access for hunters.

The Wildlife CEAA is in hunting district 130 and is a part of the Bob Marshall Elk Management Unit (EMU) (DFWP 2004). The EMU is currently under objective for elk numbers and was estimated to contain 102 animals in 2019 (DFWP 2016). Approximately 14,457 acres (24.7 percent of the Wildlife CEAA) meet the distance, cover, and size requirements of elk security habitat patches (TABLE III-70). This amount of security habitat falls below the suggested level for retention necessary to limit bull elk vulnerability (Hillis et al. 1991). However, DFWP (2004) describes the EMU as exceeding objectives for maintaining elk security habitat due in part to road closures implemented for grizzly bears and the inclusion of the wilderness area in the EMU. An additional 18,680 acres of forested habitat occur in the CEAA, but do not meet the size or distance from roads requirements to technically be considered security habitat, however they likely provide hiding and escape cover of importance during normal hunting seasons. Hunter access in the Wildlife CEAA is low, with open roads primarily at low-elevation areas and some non-motorized access on closed roads. The density of open and seasonally open roads is 0.7 miles per square mile and total road density is 3.9 miles per square mile.

**TABLE III - 70 - ELK SECURITY.** Elk security habitat metrics under DNRC Squeezer Meadow Timber Sale alternatives in the project area and Wildlife CEAA. The 'security habitat removed' statistic accounts for direct removal of cover, as well as for stands affected that would not meet the 250-acre minimum patch size requirement post-harvest.

SECURITY HABITAT  PARAMETER	PROJECT AREA			WILDLIFE CEAA		
	NO-ACTION	ACTION		NO-ACTION	ACTION	
	A	B	C	A	B	C
Total road density – mi/mi <sup>2</sup>	5.6	5.4	5.4	3.9	3.8	3.8
Security habitat affected - acres (percent of existing security habitat)	0 (0)	1,598 (41.6)	1,547 (40.3)	0 (0)	1,598 (11.1)	1,547 (10.7)
Security habitat removed - acres (percent of existing security habitat)	0 (0)	1,354 (35.3)	1,196 (31.1)	0 (0)	1,354 (9.4)	1,196 (8.3)
Total security habitat post-harvest - acres (percent of analysis area)	3,840 (15.1)	2,486 (9.8)	2,644 (10.4)	14,457 (24.7)	13,103 (22.4)	13,261 (22.7)

## Environmental Effects

- ***Direct and Indirect Effects of No-Action Alternative A to Elk Security Habitat***

No changes in elk security cover would be expected. No changes to accessibility of the project area for hunters would occur. Existing cover would continue to provide security habitat. Thus, no adverse direct or indirect effects regarding the reduction of elk security habitat would be anticipated. In the long term and in the absence of natural disturbance, elk security habitat availability would likely increase due to natural succession of timber stands.

- ***Direct and Indirect Effects of Action Alternatives B and C to Elk Security Habitat***

Approximately 1,598 acres (41.6 percent) or 1,547 acres (40.3 percent) of elk security habitat in the project area would be harvested under Action Alternatives B and C, respectively (TABLE III-70). Post-harvest a total of 1,354 (Action Alternative B) or 1,196 (Action Alternative C) of acres of security habitat would not retain adequate canopy cover or would fall below the 250-acre minimum patch size requirement. Harvested acres would not provide security habitat for at least 20 to 30 years until trees and shrubs provide screening cover. However, layout of seed tree units must meet 600 feet to cover requirements for grizzly bear mitigations (no point in a unit can be >600 feet to hiding cover; see *HIDING COVER* under *GRIZZLY BEAR*). No increase in roads open to motorized public access would occur under either Action Alternative. However, restricted roads, which are open to administrative use and non-motorized public use are proposed for construction. Both Action Alternative B and C propose 5.3 miles of restricted road construction and both alternatives propose 7.2 miles of road reclamation. Overall, Action Alternative B affects and removes more acres of security habitat but results in the same amount of fragmentation when compared to Action Alternative C. Thus, since: 1) no changes in open roads or motorized access for the general public would be anticipated that would increase hunter access; 2) increases in non-motorized access could increase hunter access on 5.3 miles of new restricted roads under Action Alternative B and C; 3) high amounts of elk security habitat would be affected under Action Alternatives B and C; 4) approximately 35.3 percent or 31.1 percent of available elk security habitat available in the project area would be removed under Action Alternative B and C, respectively; and 5) reductions in elk security habitat would be temporary and last approximately 20 to 30 years; moderate adverse direct and indirect effects associated with elk vulnerability and security habitat would be anticipated under both Action Alternatives B and C.

- ***Cumulative Effects of No-Action Alternative A to Elk Security Habitat***

None of the proposed forest management activities would occur. No changes to accessibility of the project area for hunters would occur. Existing cover would continue to provide security habitat. Thus, cumulative adverse effects to elk security and elk would not be anticipated. In the long term and in the absence of natural disturbance, elk

security habitat availability would likely increase due to natural succession of timber stands, reducing elk vulnerability.

- ***Cumulative Effects of Action Alternative B and C to Elk Security Habitat***

The proposed activities would occur in 1,598 acres (11.1 percent) or 1,547 acres (10.7 percent) of elk security habitat in the Wildlife CEAA under Action Alternatives B or C, respectively. Increased sight distances could reduce elk survival in the Wildlife CEAA and proposed road construction could facilitate an increase in public non-motorized use (5.3 miles restricted road under Action Alternatives B and C). DNRC would design seed tree units such that no point is more than 600 feet to cover, which would benefit big game by minimizing distances to escape cover (no point in a unit can be >600 feet to hiding cover; see *HIDING COVER* under *GRIZZLY BEAR*). Both alternatives propose obliteration of 7.2 miles of roads providing non-motorized public use. Changes in elk vulnerability and security habitat would be additive to completed and ongoing activities in the Wildlife CEAA (see *RELEVANT PAST, PRESENT, AND REASONABLY FORESEEABLE ACTIONS* in *CHAPTER I- PURPOSE AND NEED* for a complete list of DNRC projects and *TABLE III-54* for acreage of ongoing timber sales). Estimates of security habitat post-harvest account for habitat that has been removed by other projects. The USFS Mid-Swan Project may occur concurrently and but does not have a final Record of Decision or final treatments that could be included for analysis (*USFS 2020*). Post-harvest 22.4 percent (Action Alternative B) or 22.7 percent (Action Alternative C) of the Wildlife CEAA would provide elk security habitat, which would continue to fall below the 30-percent minimum threshold recommended by Hillis et al. (1991); however, the Bob Marshall Wilderness is a part of the EMU, and would further compensate for reductions of security habitat on DNRC lands. Thus, since: 1) no changes in open roads or motorized access for the general public would be anticipated that would increase hunter access; 2) increases in non-motorized access could increase hunter access on 5.3 miles of new restricted roads under Action Alternatives B and C; 3) small amounts of elk security habitat would be affected (11.1 percent or 10.7 percent of habitat available in the Wildlife CEAA under Action Alternatives B and C, respectively); 4) approximately 9.4 percent or 8.3 percent of available elk security habitat available in the Wildlife CEAA would be removed under Action Alternatives B and C, respectively; 5) low amounts of elk security habitat (24.7 percent of Wildlife CEAA) are currently available, most of which is on inaccessible USFS lands; and 6) reductions in elk security habitat would be temporary and last approximately 20 to 30 years; minor adverse cumulative effects associated with elk vulnerability and security habitat would be anticipated under Action Alternatives B and C.

## **LIST OF MITIGATIONS**

- If a threatened or endangered species is encountered, consult a DNRC biologist immediately. Similarly, if undocumented nesting raptors or wolf dens are encountered within ½ mile of the project area contact a DNRC biologist.

- Prohibit contractors and purchasers conducting contract operations from carrying firearms while on duty as per *ARM 36.11.432(1)(c)* and *GB-PR2 (USFWS and DNRC 2010b)*.
- Contractors will adhere to food storage and sanitation requirements as described in the timber sale contract. Ensure that all attractants such as food, garbage, and petroleum products are stored in a bear-resistant manner.
- Restrict public access on restricted roads that are opened for harvesting activities. Effectively close all restricted roads and skid trails following harvest completion.
- Within Canada lynx winter foraging habitat, retain up to 10 percent of the stand area in patches of advanced regeneration of shade-tolerant trees (grand fir, subalpine fir, and spruce) as per *LY-HB4 (USFWS and DNRC 2010b)*.
- Use a combination of topography, group retention, and roadside vegetation along open roads to reduce sight distances within harvest units where feasible.
- Retain visual screening along open roads to prevent human-wildlife conflict and increase security for bears and big game as per *GB-NR4 (USFWS and DNRC 2010b)*.
- Design seed tree and overstory removal units so that no point within the proposed unit is more than 600 feet to cover.
- Minimize potential disturbance to grizzly bears during the spring period by restricting activities in spring habitat from April 1 through June 15.
- Restrict commercial activities conducted during the grizzly bear non-denning season to 3 consecutive years followed by a 6-year rest window.
- Retain 2 large snags and 2 large snag recruitment trees per acre (>21-inches dbh) particularly favoring western larch, ponderosa pine, western white pine, and Douglas-fir. Clumps of existing snags may be retained to offset areas without sufficient snags.
- Retain coarse woody debris consistent with *Graham et al. (1994)* and emphasize the retention of downed logs  $\geq 15$ -inches dbh where they occur as per *LY-HB2 (USFWS and DNRC 2010b)* aiming for at least one  $\geq 20$ -foot-long piece per acre.
- Maintain connectivity for fisher, Canada lynx, grizzly bears, and other wildlife species by maintaining corridors of unharvested and/or lighter harvested areas along riparian areas, ridgetops, and saddles.

## **ECONOMIC ANALISYS**

### **INTRODUCTION**

This analysis describes current economic conditions surrounding the Swan River State Forest and discloses the potential direct, indirect, and cumulative economic and trust fiduciary effects that may result under each alternative associated with the proposed action of the Squeezer Meadow Multiple Timber Sale Project.

### **ISSUES AND MEASUREMENT CRITERIA**

The following issue statement was crafted to account for concerns of the economic benefits of the Squeezer Meadow Project and guide the analysis of this section:

- The proposed activities may have economic impacts associated with generating revenue for the trust beneficiaries.
- The proposed activities may have economic impacts associated with creating timber-related employment and stimulating the local economy.
- The proposed activities may have economic impacts associated with non-market issues within the area.

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

- For income, the measurement criterion is U.S. dollars distributed to the Common School Trust, FI program, and generated in the regional economy.
- For employment, the measurement criterion is the number of full-time timber-related jobs provided for one year.

### **ANALYSIS AREAS**

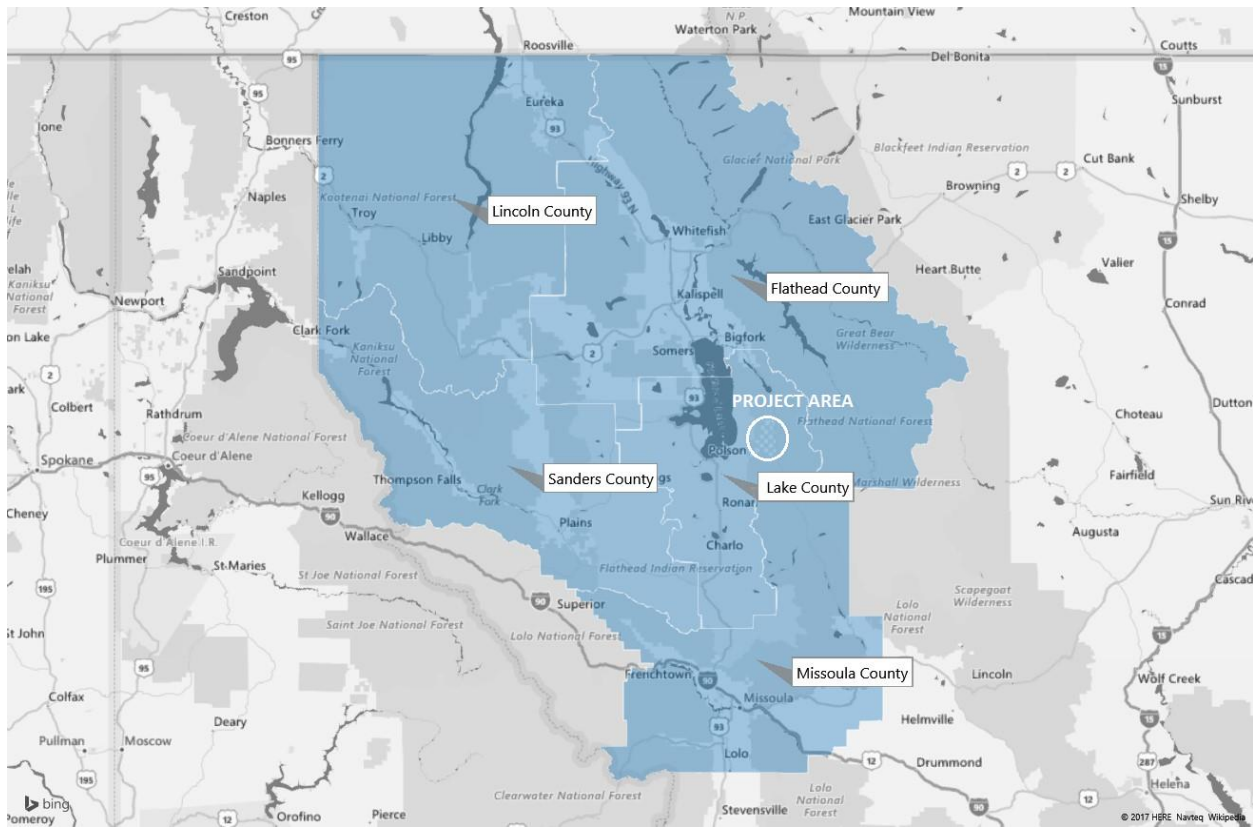
The analysis area for the direct, indirect, and cumulative economic effects includes a multi-county area connected through commuting, business and trade to the Swan River State Forest and the project area (see *FIGURE III-19*).

The counties selected for the analysis area include Missoula, Flathead, Sanders, Lake, and Lincoln Counties. This five-county area represents the project area’s functioning economic region and provides the closest markets for labor, products, and information in forestry, forest products, and a wide array of other industries.

Economic effects are considered geographically at the county-level and temporally over the duration of the proposed action. County-level is the appropriate scale to observe economic

effects because industry job and income data are publicly reported and more accurate at this level.

**FIGURE III - 19 - ECONOMIC ANALYSIS AREA.**



## **ANALYSIS METHODS**

This economic analysis of proposed timber sales is limited to the estimation of direct and indirect income and employment opportunities occurring as a result of the proposed action, including income opportunities for the trust beneficiaries, directly.

Project generated income, from implementation of the proposed action to the point of industrial processing, is estimated by multiplying reported regional gate prices<sup>1</sup> (the delivered log price paid by industrial wood processors) by the total harvest volume expected in the proposed timber sale. Stumpage prices, the contractual price paid for standing timber, are estimated using a transaction evidence appraisal to determine the portion of this total income earned by the trust beneficiaries. Stumpage prices are estimated through transaction evidence from comparable timber sales, highlighting unique characteristics of the proposed sale (i.e. species mix, wood quality, density and diameter, terrain, development requirements, and proximity to

<sup>1</sup> Surveyed gate prices are reported quarterly by the Bureau of Business and Economic Research, an industry research organization at the University of Montana.



markets). State trust management expenses are estimated from annual cash-flow records from DNRC's *TLMD* forest-management program.

Direct and indirect employment opportunities, as well as direct labor income are estimated using employment and income multipliers published by the *University of Montana's Bureau of Business and Economic Research*. Additionally, data sources for the economic analysis include DNRC's *TLMD*, U.S. Department of Commerce, U.S. Department of Labor, the *Department of Labor and Industry, Research and Analysis Bureau*, *Western Wood Products Association* and *Random Lengths*.

## AFFECTED ENVIRONMENT

The proposed action would take place in Swan River State Forest located on the eastern side of Lake County. Timber sales in this area typically supply lumber, pulp and other forest product industrial processors in Lake, Missoula, and Flathead counties, but occasionally timber sales in this area can involve labor, business and commodity trades into Sanders and Lincoln County. Closest to the project area, Flathead, Lake and Missoula County stretch from the Canadian border to the top end of the Bitterroot Valley. The most likely processing locations for Swan Valley timber exist in these three counties. Summary county level economic data, for all five counties, are provided in *TABLE III-71*.

**TABLE III - 71 - ANALYSIS AREA ECONOMY PROFILE<sup>2</sup>**

	Lincoln County, MT	Lake County, MT	Missoula County, MT	Sanders County, MT	Flathead County, MT	Analysis Area
Population, 2021	20,525	32,033	119,533	12,959	108,454	293,504
Population % change, 1970-2021	13.6%	119.5%	104.4%	82.2%	173.1%	112.8%
Employment % change, 1970-2021	32.0%	232.2%	254.1%	115.2%	359.4%	246.5%
Personal Income % change, 1970-2021	107.5%	447.0%	407.5%	280.5%	550.6%	408.5%
Unemployment rate, 2022	4.8%	3.0%	2.6%	4.3%	3.1%	3.0%
Average earnings per job, 2021 (2022 \$s)	\$41,803	\$42,916	\$59,813	\$40,271	\$55,919	\$55,496
Per capita income, 2021 (2022 \$s)	\$47,284	\$50,098	\$66,831	\$45,526	\$63,682	\$61,533
Non-Labor % of personal income, 2021	65.0%	59.7%	47.0%	65.1%	49.1%	50.5%
Services % of employment, 2021	65.1%	57.0%	74.7%	59.2%	74.6%	72.3%
Government % of employment, 2021	13.1%	20.3%	13.2%	11.8%	7.6%	11.6%
Timber % of employment, 2022	2.6%	1.2%	1.4%	5.5%	2.1%	1.8%
Mining % of employment, 2022	0.1%	0.5%	0.1%	2.1%	0.5%	0.3%
Fossil fuels (oil, gas, & coal), 2022	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%
Other mining, 2022	0.1%	0.4%	0.2%	2.1%	0.5%	0.4%
Agriculture % of employment, 2021	3.4%	7.3%	0.7%	8.2%	1.4%	1.9%
Travel & Tourism % of employment, 2022	17.3%	14.1%	17.2%	21.0%	22.2%	18.9%

The total population across the analysis area is estimated around 293 thousand. A majority of this population resides in Flathead and Missoula County. Reflecting a portion of the eligible labor population, unemployment rates are highest in the Lincoln, Sanders, and Flathead County

where a greater percentage of private employment and overall economy is supported by timber related industries. Timber sales are especially important to these three counties due to the greater presence of processing and harvesting industries. Overall, timber industries are most important in this economic region of Montana. Across the State, more than 85 percent of forestry and logging firms and 75 percent of wood-product manufacturing firms are located in these counties.<sup>2</sup>

TABLE III-72 provides a more detailed account of timber industry employment across counties in the analysis area, as of 2022. The majority of industry jobs are located in Flathead and Missoula County, although Lincoln and Sanders County have proportionally higher employment in timber industries. Employment opportunities supported directly, or indirectly to timber sales in the project area may occur in any of these counties.

**TABLE III - 72 - TIMBER INDUSTRY EMPLOYMENT PROFILE<sup>3</sup>**

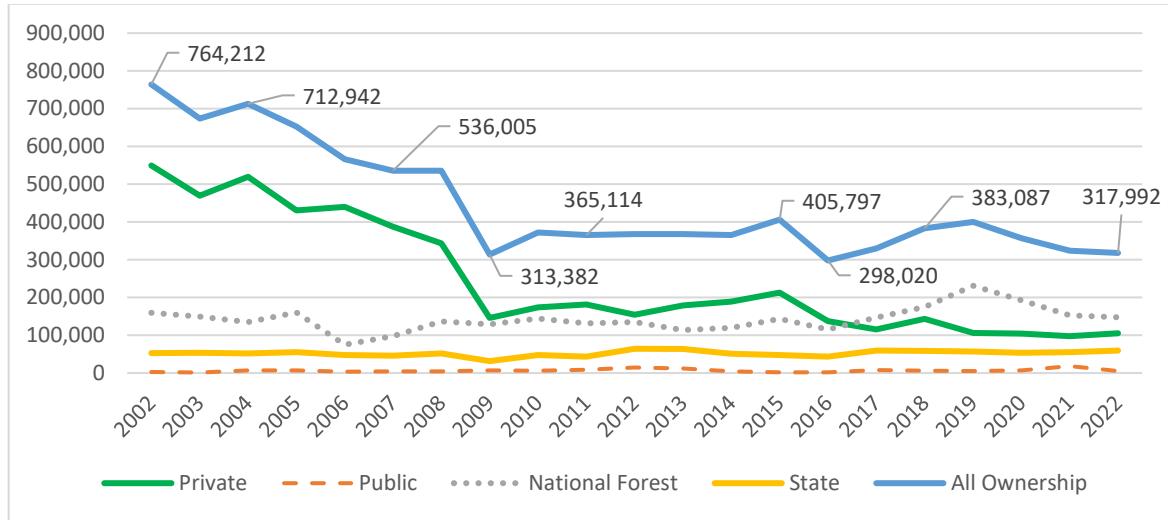
	Lincoln County, MT	Lake County, MT	Missoula County, MT	Sanders County, MT	Flathead County, MT	Analysis Area
Total Employment, 2022	5,985	9,507	62,890	3,241	47,620	129,243
Timber	158	117	896	179	1,002	2,352
Growing & Harvesting	116	27	435	35	97	710
Forestry & Logging	88	25	50	26	74	263
Support Activities for Forestry	28	2	385	9	23	447
Sawmills & Paper Mills	20	32	373	100	837	1,362
Sawmills & Wood Preservation	12	32	83	54	265	446
Pulp, Paper, & Paperboard Mills	0	0	0	0	0	0
Veneer, Plywood, Engineered Wood	8	0	290	46	572	916
Wood Products Manufacturing	22	58	88	44	68	280
Other Wood Product Mfg.	22	58	88	44	66	278
Converted Paper Product Mfg.	0	0	0	0	0	0
Non-Timber	5,827	9,390	61,994	3,062	46,618	126,891

Regional commodity markets are another important perspective to consider for projects such as the proposed action. Overall, Montana timber and lumber markets have declined over recent history. FIGURE III-20 shows this long run decline in Montana’s timber supply since 2002. Aggregate timber supply in Montana has been affected by both changes in Federal policy and supply competition from Canada and the Pacific Northwest. Aggregate timber supply in Montana peaked in 1987 near 1.3 billion board feet and recovered to over 400 million board feet in 2014. During this period in Montana, only state forests have continued to supply similar or increasing volumes year over year. As a result, supply of timber from state forests has increased as a percentage of aggregate supply, from approximately 3 percent to a range of 15 to 18 percent in recent years. Over the past 10 years, state forests have supplied markets with an

<sup>2</sup> Montana Department of Labor and Industry, Bureau of Research and Analysis 2016.

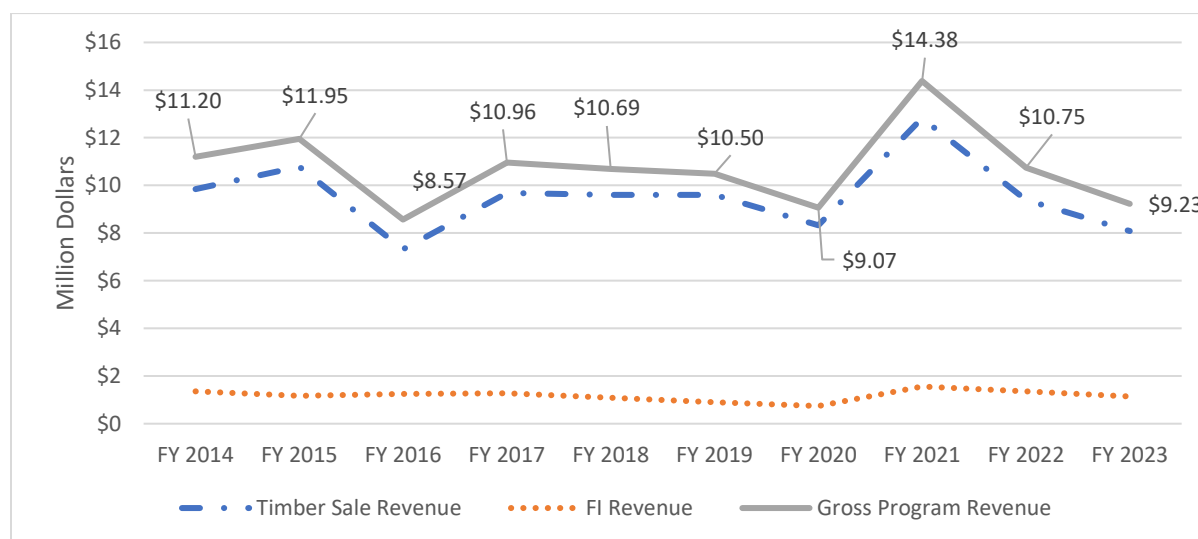
average of over 54 MMBF. In the same timeframe, aggregate timber supply in Montana has averaged just under 355 MMBF.

**FIGURE III - 20 - MONTANA TIMBER HARVEST BY OWNERSHIP, SELECT YEARS<sup>3</sup>**



In addition to supplying timber, state forests generate revenue for state trust beneficiaries. Revenue from state forests fluctuates due in part to fluctuating timber prices and other market conditions. *FIGURE III-21* charts state forest gross revenue, which includes both timber sale and FI revenue. Revenues for trust beneficiaries declined in the most recent fiscal year, though expectations are for revenue growth in future years. The proposed action would contribute a significant portion of revenue to the overall forest management program.

**FIGURE III - 21 - TLMD GROSS FOREST MANAGEMENT REVENUE, 10 YEARS**



Forest improvement (FI) revenues are a component of gross revenues earned from state forest timber sales and are used to finance projects that improve the health, productivity, and value of forested trust lands. FI investments are similar to capital improvements, as they can increase the asset value of forest lands and help yield future returns. FI activities may include the piling and disposal of logging slash, reforestation, thinning, prescribed burning, site preparation, noxious-weed control, seed collection, acquiring access and maintaining roads necessary for timber harvesting, and monitoring.

**ECONOMIC EFFECTS**

Direct economic effects include changes to income and employment in the timber related industries including forestry, logging, transportation, and wood-product manufacturing. Indirect economic effects include changes to other industries and sectors within the analysis area. Cumulative economic effects include any effect of the proposed action that may contribute to long-term changes in any part of the economy.

All economic effects are methodologically related to the scale and type of timber harvested and sold.

- Direct and Indirect Effects of No-Action Alternative A to Economics**  
 Information organized in TABLE III-73 shows that under No-Action Alternative A, income effects from the project area would not be realized at this time. However, if timber from this project is not sold, equivalent volumes would need to come from sales on other trust forestlands in the State, lending to income and employment effects of an unknown scale to occur elsewhere. Local mills may not be able to substitute the potential loss of delivered logs from their regional resource supply chain. Negative economic effects can also occur from a No-Action Alternative concerning salvage

condition trees where a particular forest stand is left unmanaged in a dead or dying state. Unmanaged dead stands can produce negative externalities and extend economic losses by promoting unwanted silvicultural conditions and slowing down the rate at which a replacement stand matures. These effects are not quantified in this analysis, but do represent an increase in the total economic opportunity costs for a Ao-Action Alternative decision concerning salvage or overgrown stands.

- ***Direct and Indirect Effects of Action Alternatives B and C to Economics***

Direct and indirect employment and income are estimated below.

*TABLE III-73* shows an estimated total direct state revenue of \$4,414,536 or \$3,927,720 with a total delivered value of \$15,960,000 or \$14,200,000 would be created in the harvest and delivery of logs from Action Alternative B and C, respectively. A portion of this value represents the margin for operators to harvest, load, and haul the logs to mill locations. The other portion includes revenue for state trust beneficiaries, infrastructure development, and other forest improvements on state forest. The estimated net revenue generated and distributed to trust beneficiaries is \$1,346,433 or \$1,197,955 for Alternative B and C, respectively. Management expenses are estimated using an average program revenue/cost ratio from annual accounting records highlighted and footnoted in *TABLE III-73*.

State income effects reported are based on a preliminary appraised timber sale contract value which references sawlog prices reported from the University of Montana Bureau of Business and Economic 2023 Second Quarter Report. The estimated value in this EIS is preliminary and does not reflect the actual appraised sale values associated with any sale contract package. At the time of an actual sale, appraised values are expected to change with reported sawlog prices and other data refreshed in the timber sale contract package.

Direct labor income from harvesting and processing of timber in the proposed action is estimated at \$11,121,316 or \$9,894,905 for Alternative B and C, respectively.

Estimated direct and indirect employment effects include the contribution to 344 or 306 full-time jobs for one year for alternatives B and C, respectively. The level of employment sustained by these alternatives is estimated using industry research by the *Bureau of Business and Economic Research*.

**TABLE III - 73 - ESTIMATED DIRECT AND INDIRECT ECONOMIC EFFECTS**

Measurable Effect	Formula	Alternative		
		A	B	C
Total harvest volume	[a]	0	39,900	35,500
Delivered log price <sup>3</sup> /MBF	[b]	0	\$400.00	\$400.00
Total delivered log value	[a] x [b]	0	\$15,960,000	\$14,200,000
Timber sale revenue/MBF	[c]	0	\$122.38	\$122.38
FI revenue/MBF	[d]	0	\$3.60	\$3.60
Direct state revenue	[a] x ([c] + [d])	0	\$5,026,602	\$4,472,290
Direct trust revenue <sup>4</sup>	[a] x ([c] + [d]) x (.305)	0	\$1,533,114	\$1,364,048
Estimated direct harvesting and processing employment <sup>5</sup>	[e]	0	223	199
Estimated direct harvesting and processing labor income <sup>6</sup>	[e]*49,809	0	\$11,121,316	\$9,894,905
Estimated indirect employment	[e]*(0.54)		121	107

Indirect and induced income effects are not quantified in this analysis, but they represent additional benefits to the economy as income earned in timber industries from the proposed action is recycled within the analysis area buying other goods and services.

Finally, cumulative effects have been considered and though they cannot be quantified in respect to alternatives B and C, collectively include the minor role the proposed action has in supporting and making whole, long term capital investments made by forest product manufactures and other timber companies in the analysis area. The infrastructure in these industries guarantees not only jobs and income in the analysis area, but also helps guarantee resource and land value for owners, public and private, of forested lands in Western Montana.

Other cumulative effects of the proposed action may include limited effects to regional and national timber and lumber markets, including the potential offsetting, or substitution, of imported timber or wood products.

<sup>3</sup> Estimated using species mix and current Bureau of Business and Economic Research market price for delivered sawlogs in the Western Montana regions.

<sup>4</sup> State management expenses estimated with the revenue and cost summary in the 2019 Return on Asset Report. The 0.41 proportion is the 10-year average operating profit margin of the statewide timber management program.

<sup>5</sup> Sorenson, et al. 2015. Employment and Wage Impacts of Timber Harvesting and Processing in the United States. 2015. BBER University of Montana.

<sup>6</sup> U.S. Department of Labor. 2017. Bureau of Labor Statistics, Quarterly Census of Employment and Wages, Washington, D.C.

## **AIR QUALITY ANALYSIS**

### **INTRODUCTION**

This analysis describes the existing air quality and discloses the potential direct, indirect, and cumulative environmental effects of the proposed action (see *CHAPTER I – PURPOSE AND NEED*) may have on air quality throughout the area.

### **ISSUES AND MEASUREMENT CRITERIA**

The following issues concerning air quality were raised during internal and external scoping and will be analyzed in further detail in this analysis:

- The proposed activities may adversely affect local air quality through smoke produced from burning slash piles and other prescribed burning.
- The proposed activities may adversely affect local air quality through dust produced from harvest, road building, road maintenance, and hauling activities.
- The proposed activities may adversely affect air quality through carbon emissions produced from harvest, road building, road maintenance, and hauling activities.

Quantitative and qualitative changes to the following measurement criteria are intended to measure the extent of the potential direct, indirect, and cumulative environmental effects that the proposed action may have on existing air quality in the area.

- To determine the impacts from smoke, the measurement criteria include: the amount, location, timing (including season), and duration of prescribed burning.
- To determine the impacts from dust, the measurement criteria include: the amount, location, timing (including season), and duration of road construction and maintenance, harvest-related traffic, and gravel pit operation.
- To determine the impacts from carbon emissions, the measurement criteria include: the amount, location, timing (including season), and duration of emissions.

### **ANALYSIS AREAS**

The analysis area used to determine direct, indirect, and cumulative environmental effects of dust and smoke from the proposed action on air quality includes all of the Swan River Subbasin (fourth-level hydrologic unit) and all lands within a 5-mile buffer distance outside the boundary of the subbasin.

Direct and indirect effects of carbon emissions from the proposed action on air quality were analyzed for within the project area. Cumulative environmental effects of carbon emissions from the proposed action on air quality includes all state land within the Swan River State Forest.

## **ANALYSIS METHODS**

The methodologies used to determine the environmental effects of the proposed action on air quality in the project and surrounding areas include considering the amount, location, timing, and duration of smoke, dust, and carbon emissions generated by activities associated with the proposed action. Specific method used to analyze carbon emissions are further described in the carbon emissions analysis section. Cumulative effects include consideration of other actions indicated under *RELEVANT PAST, PRESENT, AND REASONABLY FORESEEABLE ACTIONS* under *SCOPE OF THIS EIS* in *CHAPTER I*.

## **RELEVANT LAWS, PERMITS, AGREEMENTS, PLANS, LICENSES, AND OTHER REQUIREMENTS**

### ***CLEAN AIR ACT OF MONTANA***

*MCA 75-2-101* through *429* is known as the *Clean Air Act of Montana* and requires the State of Montana to provide for a coordinated statewide program to prevent, abate, and control air pollution while balancing the interest of the public.

### ***MONTANA/IDAHO AIRSHED GROUP***

DNRC is a member of the *Montana/Idaho Airshed Group*, which was formed to minimize or prevent smoke impacts while using fire to accomplish land-management objectives and/or fuel hazard reduction (*Montana/Idaho Airshed Group 2010*). The *Montana/Idaho Airshed Group* determines the delineation of airsheds and impact zones throughout Idaho and Montana. As a member, DNRC must submit burn plans to the smoke-monitoring unit that describe the type of burn to be conducted, the size of the burn in total acres, and the location and elevation of each burn site. The smoke-monitoring unit provides timely restriction messages by airshed. DNRC and other cooperators are required to abide by those restrictions and burn only when conditions are conducive to good smoke dispersion.

### ***AIR QUALITY MAJOR OPEN-BURNING PERMIT***

DEQ issues permits to entities that are classified as major open burners (*ARM 17.8.610*). DNRC is permitted to conduct prescribed wildland open-burning activities that are either deliberately or naturally ignited. Planned prescribed burn descriptions must be submitted to *DEQ* and the smoke-monitoring unit of the *Montana/Idaho Airshed Group*. All burns must be conducted in accordance with the major open-burning permit.

### ***CODE OF FEDERAL REGULATIONS: TITLE 40, CHAPTER I, SUBCHAPTER U, PART 1039 – CONTROL OF EMISSIONS FROM NEW AND IN-USE NONROAD COMPRESSION-IGNITION ENGINES***

Vehicle carbon emissions and fuel efficiency standards for medium- and heavy-duty engine vehicles, such as those utilized on forest management projects, are regulated by the Environmental Protection Agency (EPA) and National Highway Traffic Safety Administration (NHTSA). DNRC timber sale purchasers are required to follow all state and federal laws regarding engine emissions standards and practices. For a more comprehensive overview of



federal emission standards for in-use nonroad compression engines, please visit [eCFR :: 40 CFR Part 1039 -- Control of Emissions from New and In-Use Nonroad Compression-Ignition Engines](#)

## **AFFECTED/EXISTING ENVIRONMENT**

The analysis area is located within Montana Airshed 2, which encompasses the entire Flathead and Lake counties, most of Sanders County, and the smaller, northernmost portions of Missoula, Mineral, and Powell counties. The project area (see *CHAPTER I –PURPOSE AND NEED*) is located 9 miles southeast from the town of Swan Lake. The analysis area occurs outside of designated ‘impact zones’ that refer to areas the *Montana/Idaho Airshed Group* or affiliated local program identifies as smoke sensitive and/or having an existing air quality problem. Within the periphery of the analysis area are 3 ‘Class I Areas’; the Mission Mountain Wilderness Area, the Bob Marshall Wilderness Area, and the Flathead Indian Reservation. Both Wilderness Areas are considered Mandatory Federal Class I Areas, which refer to areas specified as Class I by the *1977 Clean Air Act* and include international and national parks greater than 6,000 acres and national wilderness areas greater than 5,000 acres that existed on August 7, 1977. The Flathead Indian Reservation is considered a non-Federal Class I Area, yet still receives recognition and protection under the *1977 Clean Air Act*.

Air quality in the analysis area is generally excellent and has limited local emission sources and consistent wind dispersion throughout most of the year. Existing emission sources include residential wood-burning stoves, private homeowner debris burns, road dust created by recreational or forest-management activities, periodic wildland fires and prescribed burns on federal, private, state, and tribal forested lands and operation of private and commercial fuel-burning vehicles and machinery. Prevailing winds typically blow from west to east; thus, emissions from activities in the western portion of the analysis area tend to drift into the valley bottom, particularly during the late afternoon and evening. Currently, emissions do not affect local population centers, impact zones, or Class I Areas beyond *EPA* and *DEQ* standards. All burning activities by major burners comply with emission levels authorized by the *Montana/Idaho Airshed Group*.

## **ENVIRONMENTAL EFFECTS**

### ***DIRECT AND INDIRECT EFFECTS***

- ***Direct and Indirect Effects of No-Action Alternative A to Air Quality***

No prescribed burning, road construction and maintenance, harvest-related traffic, or gravel pit operation would occur. Therefore, direct and indirect effects to air quality as a result of this alternative would not be expected.

- ***Direct and Indirect Effects of Action Alternatives B and C to Air Quality***

Some differences in direct and indirect effects exist between the two Action Alternatives. Action Alternative B would harvest more timber volume across more acres than Action Alternative C, although road activities would not differ between the two alternatives.

The amount of dust released into the analysis area from road usage is expected to be indistinguishable between alternatives. Particulate matter released from burning slash piles would not differ between the two Action Alternatives. Sources associated with Action Alternative B and C would be equal in spatial distribution over the project area. Action Alternative B would result in greater overall carbon emissions from greater logging and hauling operations than Action Alternative C.

#### **Prescribed Burning**

Under each Action Alternative, DNRC would conduct prescribed burning following harvesting activities in order to remove residual logging waste and fine fuels. These burning activities would subsequently reduce fire risk in the area and prepare site conditions conducive to tree regeneration. Starting in the spring of 2025, 690 to 750 acres of slash (approximately 100-150 piles of slash) and/or variable-sized broadcast units would be burned each fall over a period of approximately 7 years. Burning, which would vary by location under either Action Alternative, depending on weather conditions and which piles and/or units are ready to burn, would likely occur during the months of September through November. Burning would be done only during conditions that are conducive to good smoke dispersion. Actual burning days would be controlled and monitored by *DEQ* and the smoke monitoring unit of the *Montana/Idaho Airshed Group* and would meet *EPA* standards, which would further minimize the direct and indirect effects of burning activities.

#### **Road Operation-Related Dust**

Under each Action Alternative, operators conducting new road construction and road maintenance on existing roads are expected to produce particulate matter (*TABLE III-74*).

Over the 7-year operating period, 12 to 15 timber sales are expected to be implemented. Varying levels of road construction and maintenance would typically occur prior to each sale and during drier conditions to avoid damaging road-drainage features. Depending on the size and location of each sale and on the alternative implemented, 5.3 miles of new road construction, 1.36 miles of temporary road construction, 1.48 miles of road reconstruction, 7.2 miles of road reclamation and 80 miles maintenance would occur over the 4 year project period during the months of June through November, conditions permitting. Depending on the season and conditions of the road, DNRC would require that purchasers apply dust abatement to segments of roads to reduce particulate emissions.

Direct and indirect effects to air quality as a result of dust from road construction and maintenance are expected to be localized to the roadways and areas directly adjacent to the roadways. Vegetative barriers along the roadside and dust-abatement mitigations are expected to greatly limit the dispersion of particulate matter beyond these areas. Thus, direct and indirect effects to air quality throughout the analysis area as a result of dust from road construction and maintenance are expected to be minor.

**TABLE III - 74 - MILES OF ROAD CONSTRUCTION AND MAINTENANCE BY ALTERNATIVE**

ACTION ALTERNATIVE	MAINTENANCE	ROAD CONSTRUCTION & RECONSTRUCTION	ROAD RECLIMATION	TOTAL ROAD MILES
B	80	6.78	7.2	93.98
C	80	6.78	7.2	93.98

**Carbon Emissions**

Under each Action Alternative, harvest and road-use related carbon emissions would be expected. Over the 7-year project implementation period, 35.5 to 39.9 MMBF of timber is expected to be harvested. According to *Johnson et al. (2005)*, harvest operations involving mechanized felling, skidding, processing and loading of timber consume approximately 2.26 gallons of diesel/100 cubic feet of timber harvested or approximately 57.33 metric tons (Mt) of CO<sub>2</sub> eq/MMBF of emissions. The average haul route distance from timber sales in the Squeezer Meadow project area to highway 83 for both Action Alternatives would be 7 miles. On average, one truck load hauls approximately 4.5 MBF of timber. According to *Svenson and Fjeld (2016)*, an empty log truck uses an average of 48.8 L of diesel/100 km (0.0021 Mt of CO<sub>2</sub> eq/mile) and a fully loaded log truck uses an average of 90.8 L of diesel/100 km (0.0039 Mt of CO<sub>2</sub> eq/mile).

Varying levels of road construction and maintenance would occur prior to each timber sale (*TABLE III-74*). According to *Whittaker et al. (2011)*, forest road construction operations result in approximately 12,422.37 kg of CO<sub>2</sub> eq/km (20.02 Mt of CO<sub>2</sub> eq/mile) and forest road maintenance operations result in approximately 2,123 kg of CO<sub>2</sub> eq/km (3.4 Mt of CO<sub>2</sub> eq/mile). For the purpose of this analysis, road reconstruction activities were analyzed consistent with road construction activities and road reclamation activities were analyzed consistent with road maintenance activities.

Direct and indirect effects to air quality as a result carbon emissions are expected to be greater from Action Alternative B than from Action Alternative C, due to the higher amount of harvesting and hauling activities that would occur under Action Alternative B (*TABLE III-75*). Both Alternatives would result in the same amount of carbon emissions from road operations.

**TABLE III - 75 - CARBON EMISSIONS (Mt CO<sub>2</sub> eq) FROM HARVEST AND ROAD-RELATED ACTIVITIES BY ALTERNATIVE**

ACTION ALTERNATIVE	HARVEST EMISSIONS	UNLOADED TRUCK HAULING EMISSIONS	FULLY LOADED TRUCK HAULING EMISSIONS	ROAD CONSTRUCTION + RECONSTRUCTION	ROAD MAINTENANCE + RECLAMATION EMISSIONS	SUM OF C EMISSIONS
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<b>A</b>	0	0	0	0	0	0
<b>B</b>	2290	131	243	136	298	3098
<b>C</b>	2040	116	216	136	298	2806

**Harvest-Related Traffic**

Under each Action Alternative, harvest-related traffic on gravel roads would be expected to produce particulate matter. According to the analysis conducted in the *RECREATION ANALYSIS*, approximately 22,835 to 33,130 harvest-related trips would be expected per year over the 4 to 7 year operating period (see *TABLE III-78*). Traffic on designated restricted roads would be limited to 9 months of the year due to restrictions during the grizzly bear denning period (April 1 through June 15) that are enforced under the *HCP*. Traffic along open roads would likely continue during the denning period, but at rates lower than those expected outside of the denning period.

Dust production on roads during the dry summer and fall months would likely be higher than during the late fall, winter, and early spring months when frozen ground conditions and/or higher levels of moisture are expected to abate particulate production. During the dry months, log, rock, and equipment-hauling traffic would be expected to produce more particulate matter than the other harvest-related traffic due to the size and weight of the vehicles.

One-half to two-thirds of the harvest operations would occur during the late-spring and winter months, while the other remaining proportion would occur during drier months. During the drier months, and depending on the condition of the roads, DNRC would require that harvest operators apply dust abatement to segments of roads used for hauling and other harvest-related traffic in order to reduce particulate emissions.

Direct and indirect effects to air quality as a result of harvest-related traffic are expected to be localized to the roadways and areas directly adjacent to the roadways. Vegetative barriers along the roadside and dust abatement mitigations are expected to greatly limit the dispersion of particulate matter beyond these areas. Thus, direct and indirect effects to air quality throughout the analysis area as a result of harvest-related traffic are expected to be minor.

**Gravel Pit Operations**

Under each Action Alternative, DNRC would utilize resources from 2 different gravel pits. These would be the existing Goat Creek Pit (Section 16, T23N, R17W) and the existing South Woodward Pit (Section 24, T23N, R18W). Contractors are required to hold a *Montana Air Quality Permit* for Portable Sources and abide by air-quality regulations set forth by *DEQ* under this permit. Operators regularly apply water during crushing and loading operations and wet stockpiles in order to reduce particulate emissions. Crushing may occur as needed.

Direct and indirect effects of the gravel pits are expected to be localized to the South Woodward Drainage and Goat Creek Drainage. Woodward gravel pit is more than a mile from the primary travel route through the area, Highway 83, and vegetative

barriers adjacent to the gravel pit and abatement measures are expected to greatly limit the dispersion of particulate matter beyond their immediate surroundings. Thus, direct and indirect effects to air quality throughout the analysis area as a result of gravel pit operations are expected to be minor.

### **CUMULATIVE EFFECTS**

- ***Cumulative Effect of No-Action Alternative A to Air Quality***

Cumulative effects to air quality as a result of this alternative would not be expected.

- ***Cumulative Effects of Action Alternatives B and C to Air Quality***

Actions on adjacent properties and ongoing DNRC timber sales in the analysis area would continue. Burning, road construction, road maintenance, gravel crushing and hauling associated with ongoing and foreseeable actions on DNRC, federal, private, and tribal forested lands would produce particulate matter and carbon emissions. Existing emission sources from residential wood-burning stoves, private homeowner debris burning, road dust created by recreational activities, operation of fuel-burning vehicles and machinery and periodic wildland fires would continue. Nearby residential areas and towns in the analysis area would experience reductions in air quality during peak burning periods. All burning activities by major burners would continue to comply with emission levels authorized by *DEQ, Montana/Idaho Airshed Group, and EPA.*

All above-mentioned emissions in conjunction with expected particulate production from the proposed action would occur at higher levels than currently expected. Providing that dust abatement would be used during dry conditions and gravel operations, half of the harvesting operations would occur during frozen and/or wetter conditions, construction activities would be short in duration, and emissions produced from burning would be appropriately controlled and monitored, the cumulative effects to air quality are not expected to exceed *EPA and DEQ* standards.

Project-related carbon emissions would contribute to the overall carbon emissions produced by forest management activities that contribute to the DNRC Swan Unit's annual cut of 8 MMBF. Annually, the Swan Unit likely contributes approximately 534 Mt of CO<sub>2</sub> from harvest and hauling relating activities, given that the 8 MMBF annual cut requirement is met.

## **RECREATION ANALYSIS**

### **INTRODUCTION**

Many residents and nonresidents of Montana enjoy recreational opportunities in and around Swan River State Forest. Over 56,307 acres of mostly forested, legally accessible land are available for various recreational activities such as berry and mushroom picking, snowmobiling, cross-country skiing, horseback riding, bicycling, fishing, hiking, and hunting. This analysis describes the existing environment of recreational uses in the project area and surrounding areas and discloses the potential environmental effects the proposed action may have on those uses (see *CHAPTER I – PURPOSE AND NEED*).

### **ISSUES AND MEASUREMENT CRITERIA**

#### ***ISSUES***

Two concerns were raised during the scoping period regarding potential impacts the proposed action may have on recreation throughout the area. The following issue statement summarizes those concerns and ultimately guides this analysis:

- The proposed activities may affect public motorized use, non-motorized use, and hunting.
- The proposed activities may affect the revenue generated by recreational uses.

#### ***MEASUREMENT CRITERIA***

The following measurement criteria were used to assess the extent of any potential direct, indirect, and cumulative environmental effects the proposed action may have on existing recreational uses in the project area:

- miles of roads where motorized and nonmotorized recreational access are allowed;
- big game use of the area;
- amount, duration, and location of forest-management activities that would restrict recreation use in the area for a temporary period; and
- recreation revenue generated from 4 categories: General Recreational Use, Special Recreational Use, Conservation, and Land Use licenses.

### **PROJECT AND ANALYSIS AREAS**

Direct and indirect environmental effects of the proposed action on recreational uses will be analyzed within the project area.

Cumulative environmental effects of the proposed action on recreational uses will be analyzed within an area that includes all legally accessible state, federal, and private lands within the perimeter of Swan River State Forest, as well as the roads used to access those lands. This analysis area will herein be referred to as the cumulative effects analysis area.

### **ANALYSIS METHODS**

To assess the environmental effects of the proposed action on recreational uses in the project and cumulative effects analysis areas, the following were determined: 1) the amounts and types

of existing recreational uses, 2) the existing condition regarding each measurement criterion, and 3) any likely changes associated with the measurement criteria that may result under each alternative. When possible, project related and recreation related activities were quantified using metrics such as number of vehicle trips, license sales, and revenues generated. The cumulative effects analysis includes consideration of other actions indicated in *RELEVANT PAST, PRESENT, AND REASONABLY FORESEEABLE ACTIONS* under *SCOPE OF THIS EIS* in *CHAPTER I – PURPOSE AND NEED*.

The DNRC developed the following calculations to determine how many project-related traffic trips would result from each Action Alternative. A trip refers to travel in one direction. That is, a trip *to* the harvest site is counted as one event while the trip *from* the harvest site is counted as a separate event.

- Trips associated with road, harvesting and postharvest operations = 20 days per month multiplied by 9 months of operation per year for 5 to 8 years of operation for 4 to 5 vehicles multiplied by 2 trips  $(20 \times 9 \times [5 \text{ to } 8] \times [4 \text{ to } 5] \times 2 = 7,200 \text{ to } 14,400 \text{ trips})$ .
- Trips associated with gravel hauling = 12,000 to 15,000 cubic yards of gravel hauled divided by 12 cubic yards per load times 2 trips  $([12,000 \text{ to } 15,000] / 12 \times 2 = 2,000 \text{ to } 2,500 \text{ trips})$ .
- Trips associated with timber sale and postharvest contract administration = 10 to 16 days per month multiplied by 9 months of operation per year for 5 to 8 years of operation for 1 vehicle multiplied by 2 trips  $([10 \text{ to } 16] \times 9 \times [5 \text{ to } 8] \times 1 \times 2 = 900 \text{ to } 2,304 \text{ trips})$ .
- Trips associated with log hauling = Volume in MMBF divided by 4.5 Mbf plus 33 percent more trips for cull and pulp material multiplied by 2 trips  $([35.5 \text{ to } 39.9 \text{ MMBF}/4.5 \text{ MBF}] + (.33 [35.5 \text{ to } 39.9 \text{ MMBF}/4.5 \text{ MBF})) \times 2 = 13,096 \text{ to } 14,719 \text{ trips})$ .
- Trips associated with sale preparation = 12 to 16 days per month multiplied by 9 months of marking multiplied by 1 to 2 vehicles times 2 trips for 5 to 8 years of operations  $([12 \text{ to } 16] \times 9 \times [1 \text{ to } 2] \times 2 \times [5 \text{ to } 8] = 1,080 \text{ to } 4,608 \text{ trips})$ .

## **RELEVANT AGREEMENTS, LAWS, PLANS, PERMITS, LICENSES, AND OTHER REQUIREMENTS**

### ***DNRC RECREATION USE RULES***

DNRC *Recreational Use Rules* (ARM 36.25.146 through 162) regulate and provide for the reasonable recreational use of legally accessible school trust lands. Recreational use is divided into 2 categories and, subsequently, requires 2 different types of recreational licenses for those wishing to engage in recreational activities on school trust lands. These include the "general recreational use license," and the "special recreational use license" types.

### ***CONSERVATION LICENSE***

A conservation license is a license issued to individuals for participation in recreational activities on state trust lands that are nonconcentrated and noncommercial in nature. Examples of permitted activities under this license type include snowmobiling, hiking, bicycling, hunting, motorized use, horseback riding, and berry picking. Any person over the age of 12 who wishes to engage in activities that pertain to general recreational uses is required to obtain a 12-month *Conservation License* from a state license provider or DFWP. For recreationists younger than 17

or older than 62, the license is \$4. For recreationists between the ages of 17 and 60, the license is \$8. Licenses for nonresidents is \$10. All license holders are required to abide by current restrictions, closures, and regulations.

#### ***SPECIAL RECREATIONAL USE LICENSE***

A *Special Recreational Use License* is required for trapping, commercial recreational use (such as outfitting), and concentrated (group) use. It is also required for uses outside of the restrictions applicable to general recreational use. For example, overnight horseback uses or overnight use (camping) more than 200 feet from a customary access point or for more than two days on leased/licensed state trust lands. Any person who wishes to engage in activities that pertain to special recreational uses is required to obtain a *Special Recreational Use License* from DNRC. The cost of the license is determined by DNRC and is assessed at what is the full market value of that use.

#### ***MEMORANDUM OF AGREEMENT AFFECTING RECREATIONAL USE OF STATE SCHOOL TRUST LANDS***

A *Conservation License* is not required when using State Trust Lands for hunting and fishing because a \$8.00 fee is included in the Montana Conservation License for use of these lands. This agreement entered by DFWP and DNRC, requires DFWP to reimburse DNRC \$4 for every wildlife conservation license and certain game animal licenses sold in accordance with MCA 87-2-202, 505, 510, and 511.

#### ***LAND USE LICENSE***

DNRC *Surface Management Rules (ARM 36.25.102[14])* define and allow for uses of state lands other than those for which the land was originally classified. Such uses are allowed for a specific fee and a term not to exceed 10 years (*ARM 36.25.106[2]*). An example of a *Land Use* license on the Swan River State Forest is the Sprunger-Whitney Nature Trail by Point Pleasant Campground.

#### ***DNRC FORESTED STATE TRUST LANDS HABITAT CONSERVATION PLAN***

DNRC has agreed to mitigations that restrict motorized use of roads in the project and surrounding areas to adhere to the Swan River State Forest Transportation Plan under the DNRC Forested Trust Lands Final Environmental Impact Statement and Habitat Conservation Plan (*USFWS and DNRC 2010*), *Supplemental Environmental Impact Statement for the Proposed Amendment to the Endangered Species Act 10(a)(1)(B) Permit Associated with the Montana Department of Natural Resources and Conservation Forested State Trust Lands Habitat Conservation Plan (2018)*. Recreational motorized road use is limited to those roads that are open year-round and seasonally to the public (this does not include wintertime snowmobile access on otherwise restricted roads).

#### ***EXISTING ENVIRONMENT***

##### ***MOTORIZED AND NONMOTORIZED RECREATIONAL ACCESS***

The project and cumulative effects analysis areas both receive moderate recreational use throughout the year by anyone holding a *General Recreational Use License*. Current uses include



berry and mushroom picking, snowmobiling, cross-country skiing, horseback riding, bicycling, fishing, hiking, and hunting. These activities primarily occur on or adjacent to roads that are open, seasonally restricted, or closed. Sixty-five road miles are available for recreational opportunities throughout the project area, while 515 miles are available throughout the cumulative effects analysis area (TABLE III-76).

While only a limited amount of the existing roads are available for motorized activities, all roads throughout both analysis areas are open year-round to non-motorized activities, including hiking, horseback riding, bicycling, hunting, and other similar activities that do not require a motorized vehicle.

**TABLE III - 76 - RECREATIONAL ROAD ACCESS.** Existing miles of road by closure status on the project area and Cumulative Effects Analysis Area.

ANALYSIS AREA	OPEN YEAR-ROUND TO PUBLIC MOTORIZED ACCESS	SEASONALLY RESTRICTED TO PUBLIC MOTORIZED ACCESS*	CLOSED YEAR-ROUND TO PUBLIC MOTORIZED ACCESS	TOTALS
	MILES			
Project Area	32.2	3.9	135.9	156.97
Cumulative Effects Analysis Area <sup>1</sup>	66.8	5.02	345	416.8

\*Restricts public motorized use on designated seasonally restricted roads during the grizzly bear spring period (April 1 through June 15).

<sup>1</sup>Total road miles in the cumulative-effects analysis area include road miles in the project area.

**BIG GAME USE**

As indicated in *EXISTING ENVIRONMENT* and *ENVIRONMENTAL EFFECTS* under *WILDLIFE ANALYSIS*, several threatened, sensitive, and other wildlife species persist throughout the area. Of those, big game species are perhaps the most important to many recreationists who use the area. According to the wildlife analyses for this and prior proposed actions, big game species are currently abundant throughout both analysis areas, affording many hunting opportunities. Species commonly hunted in the valley include elk, mule deer and white-tailed deer.

**FOREST MANAGEMENT ACTIVITIES**

A great portion of the land available to recreationists throughout both analysis areas has undergone levels of forest management in the past, is undergoing forest management currently, or is expected to be managed at some point in the future. Many recreationists who frequent the area are, therefore, most likely accustomed to forest-management activities and are adept at shifting their use based on the location and duration of those activities.

Activities that may displace recreationists include harvest-related traffic and temporary area closures during active harvesting. Displacement of recreationists from areas of active harvesting and logging traffic during the summer and fall months generally coincides with the rotational schedule required under the *HCP*. Under the *HCP*, subunits are deemed ‘inactive’ for at least a 6-year period (following a 3-year management period), thereby greatly limiting the amount of forest management activities occurring in the area at those times. By default, these inactive subunits provide recreationists large areas that are relatively free of active harvesting and harvest-related traffic except for occasional administrative uses and small-scale salvage or sanitation sales. Recreationists are free to take part in motorized and non-motorized activities in active and inactive subunits as road restrictions allow under the *HCP*. Public motorized use of closed roads in inactive subunits is not allowed.

***REVENUE FROM GENERAL RECREATION USE, SPECIAL RECREATION USE, CONSERVATION, AND LAND USE LICENSES***

Recreationists wanting to engage in hunting and fishing activities on state trust lands must obtain the appropriate licenses, including a *Conservation License*, which contains the *General Recreational Use License*, which permits these uses on state trust lands. This license covers a purchaser for other general recreational activities as well. However, individuals who do not purchase hunting or fishing license, a *General Recreational Use License* must still be obtained by an authorized license provider. Additional revenue produced from recreation comes from *Special Recreational Use* and *Land Use* licenses. The sales of *Conservation*, and *Special Recreation Use* licenses for FY 2022 generated gross annual revenue of \$1,283,649. This revenue is then divided by the total state trust land acreage. Gross revenue generated from all licenses per acre of state trust lands for FY 2022 was \$0.43 per acre (*DNRC 2022a*). Applying this gross average per acre to both the project area and cumulative effects analysis area, estimated gross annual revenue of \$10,937.48 and \$26,167.22 was generated by each, respectively, in FY 2022. In FY 2022, the estimated revenue that would be produced from recreation in the cumulative-effects analysis area would primarily come from *Special Recreational Use* and *Land Use* licenses and would generate a total of approximately \$6,500 for the trust beneficiaries (*TABLE III-77*).

**TABLE III - 77 - ESTIMATED FY2023 SPECIAL RECREATIONAL AND LAND LICENSES.** Number of recreation licenses issued and estimated revenue for activities conducted in the cumulative effects analysis area.

LICENSE TYPE	NUMBER OF LICENSES ISSUED	REVENUE GENERATED PER LICENSE TYPE	TOTAL REVENUE GENERATED BY LICENSE TYPE
<b>Special Recreational Use License</b>			
Adventure Cycling Tours	1	\$1,700	\$1,700
Guided Hunting	1	\$10,000	\$10,000
Fishing outfitting (average)	4	\$4,220	\$16,880
<b>Land Use License</b>			
Nature trail	1	\$500	\$500
<i>Total</i>			\$29,080

### ENVIRONMENTAL EFFECTS

- ***Direct and Indirect Effects of No-Action Alternative A to Recreation***

No appreciable changes to motorized and nonmotorized access, big game use, forest-management activities, or revenue generated by *General Recreational Use, Special Recreation Use, Conservation, and Land Use* licenses would occur. Therefore, direct and indirect effects to recreational use and revenue as a result of No-Action Alternative A would not be expected.

- ***Direct and Indirect Effects of Action Alternatives B and C to Recreation***

While some differences occur in harvest amounts and road miles between the two Action Alternatives, the effects to recreation are expected to be indistinguishable between these alternatives. For recreational purposes the only distinguishable differences between alternatives occurs in the harvest prescription and location of some harvesting activities. Activities associated with both Action Alternatives would be spread throughout the project area. Action Alternative B would have a slightly higher amount of harvest unit acreage.

#### **MOTORIZED AND NONMOTORIZED RECREATIONAL ACCESS**

Under each Action Alternative, all newly constructed road miles would be closed year-round to public motorized use except for snowmobile use during grizzly bear denning yet remain open to public nonmotorized use. Approximately 5.3 miles of road would be constructed under Action Alternative B and 5.3 miles under Action Alternative C. However, 7.2 miles of existing restricted roads would be permanently reclaimed and closed to all motorized use. Thus, the Action Alternatives would lead to a 1.9 percent long-term decrease in road miles available for public denning period snowmobile recreation in the

project area. Public nonmotorized access would increase by 5.4 percent temporarily until reclaimed roads revegetate sufficiently to discourage use.

**BIG GAME USE**

According to *EXISTING ENVIRONMENT* and *ENVIRONMENTAL EFFECTS* in *WILDLIFE ANALYSIS*, negative impacts to big game use in the project area are expected to be moderate under each Action Alternative. Therefore, adverse direct and indirect effects to hunting and wildlife-viewing opportunities are expected to be moderate as well.

**FOREST MANAGEMENT ACTIVITIES**

Under each Action Alternative, active harvesting and harvest-related traffic would occur up to 9 months per year over the 5-to-8-year operating period. Operators would continue to recognize restrictions in place under the *HCP* and concentrate management activities outside of the grizzly bear spring habitat for the period (April 1 through June 15).

Harvesting operations and associated traffic would mostly occur during the typical business workweek (Monday through Friday) and cease each day by early evening except for the occasional operator. Some limited use of campgrounds by contractors would also likely occur.

Harvest-related traffic under each Action Alternative is expected to be considerable, resulting in approximately 5,760 traffic trips during the shoulder years of the 5-to-8-year operating period. Up to 9,000 traffic trips per year during peak years of the operation period could occur along designated haul routes depending on the total number of trips and total operating trips (*TABLE III-78*). Forty-five to sixty-six percent of those trips would be completed by large trucks.

**TABLE III - 78 - HARVEST-RELATED TRAFFIC.** *Project-related traffic trips by type expected within the project area and cumulative effects analysis area during the 5-to-8-year operating period.*

HARVEST-RELATED TRIPS	ACTION ALTERNATIVE	
	B	C
Road/harvesting operations	5,760 to 9,000	
Gravel hauling	2,000 to 2,500	
Sale administration	900 to 2,304	
Log hauling	13,095 to 14,718	
Sale preparation	1,080 to 4,608	
<i>Totals</i>	<i>22,835 to 33,130</i>	

Direct and indirect effects to recreational use as a result of forest-management activities are expected to be localized to harvest units and harvest-related roads (see *CHAPTER II-ALTERNATIVES*, *FIGURE II-1* and *FIGURE II-2*). Those who choose to recreate in the area during the workweek daytime hours would likely meet harvest-related traffic on designated haul routes and operators in designated harvest units; thus, direct and indirect effects on these recreationists are expected to be moderate to high. Those who choose to recreate in the area on the weekend or during the workweek evenings would likely meet minimal

harvest-related traffic and harvesting operations, except for occasional operators; thus, direct and indirect effects to these recreationists are expected to be minimal. Those who choose to recreate by nonmotorized, or denning period snowmobile use on restricted roads would experience an increase in accessible lands following project completion due to the construction of 5.3 miles of new restricted roads constructed under Action Alternative B, or 5.3 miles of new restricted roads constructed under Action Alternative C. Thus, direct and indirect effects on these recreationists are expected to be moderate to high during the 5-to-8-year operating period.

**REVENUE FROM GENERAL RECREATIONAL USE, SPECIAL RECREATIONAL USE, CONSERVATION, AND LAND USE LICENSES**

No changes in revenue produced from *Special Recreational Use, Conservation, and Land Use* licenses are expected to occur under the Action Alternatives. Forest management activities in the area may temporarily displace some license holders in some local areas during varied pulses of activity for up to 8 years, while the project is active.

- ***Cumulative Effects of No-Action Alternative A to Recreation***

No appreciable changes to motorized and non-motorized access, big game use, forest-management activities, or revenue generated by *Special Recreation Use, Conservation, and Land Use* licenses would occur. Thus, cumulative effects to recreational use and revenue would not be expected.

- ***Cumulative Effects of Action Alternatives B and C to Recreation***

New, permanent road construction under each Action Alternative would lead to increases in public nonmotorized and snowmobile access. As required under the HCP, any new road miles built by cooperators would be closed to motorized public access other than snowmobile use during grizzly bear denning periods. Traffic increases from project-related activities under each Action Alternative would temporarily displace recreationists from areas during the workweek. Those who plan to recreate during the weekend would likely meet minimal harvest-related traffic except for occasional weekend operators and homeowners in the area. Additionally, ongoing projects and proposed future actions would displace recreationists, especially winter recreationists in inactive subunits. Activities related to the Low Lion, Soup or Cilly, Soup Canyon and North Soup Canyon, Lost Ridge, Cilly-to-Lost, Soup Canyon and Lost Again Timber Sale projects are ongoing in the Porcupine, Woodward, South Fork Lost Soup subunits during the denning period, as allowed under the HCP.

Thus, cumulative effects would result in increases in roads available for nonmotorized public access and further displacement of recreationists from active harvest areas during typical business hours. Adverse cumulative effects are expected to be minor within the cumulative effects analysis area since recreationists would continue to have recreational opportunities in the Porcupine and Woodward subunits.

## **AESTHETIC ANALYSIS**

### **INTRODUCTION**

This analysis describes the existing visual quality and noise levels throughout the area and discloses the potential environmental effects the proposed action may have on those attributes.

### **ISSUES AND MEASUREMENT CRITERIA**

#### ***ISSUES***

The following issues concerning visual quality and noise levels were raised during internal and external scoping and will be analyzed in further detail in this analysis:

- The proposed activities may adversely affect local viewsheds and scenic vistas.
- The proposed activities may increase local noise levels.

#### ***MEASUREMENT CRITERIA***

Quantitative and qualitative changes to the measurement criteria are intended to ‘measure’ the extent of the potential direct, indirect, and cumulative environmental effects the proposed action may have on existing visual quality and noise levels in the area. The following are the measurement criteria:

- The number of harvest-unit acres and associated roads visible from specific viewpoints.
- The quality of views from specific observation points in terms of texture, form, line, and color as viewed in the foreground, middleground, and background.
- The magnitude, timing, and type of activities that produce noise in the area.

### **ANALYSIS AREAS**

#### ***DIRECT AND INDIRECT EFFECTS***

The project area will be the analysis area used to determine direct and indirect environmental effects of the proposed action on the visual quality and noise levels.

#### ***CUMULATIVE EFFECTS***

The analysis area used to assess cumulative environmental effects of the proposed action on visual quality and noise levels will include all state, federal, and private lands within the perimeter of Swan River State Forest. This analysis area will herein be referred to as the cumulative effects analysis area.

### **ANALYSIS METHODS**

#### ***VISUAL QUALITY***

The methodologies used to portray the existing environment and determine the environmental effects of the proposed action on the visual quality in the project area and cumulative effects

analysis area include using GIS and methods adapted from the Landscape Visibility section of the *USFS Scenery Management System (USDA 1995)*.

Using a GIS viewshed analysis, historical harvest data, and analysis of digital air photos, DNRC calculated past, present, and future DNRC managed acres of harvest units and associated roads visible from specific viewpoints for both the *EXISTING ENVIRONMENT* and *ENVIRONMENTAL EFFECTS* sections of this analysis. Harvest history on newly-acquired sections of the *SRSF* was not always available. In order to estimate the amount of land that was previously harvested in these sections, SLI analyses were cross referenced with digital air photos.

DNRC selected viewpoints that were determined to be important areas of concentrated public-viewing use. These viewpoints are the Wildlife Viewing area south of Swan Lake, Napa Point Trailhead, Swan Peak Overview, and Highway 83 corridor within the perimeter of the project and cumulative effects area.

Unit acres and associated roads visible from these viewpoints do not account for existing or potential obstructions, such as trees and other vegetation, in the foreground (0 to 0.5 mile), middle ground (0.5 to 4.0 miles), and background (4 miles and beyond). As a result, reported visible unit acres and associated roads are likely to be overestimations of what would currently or potentially be visible from each viewpoint.

Methods adapted from the *USFS Scenery Management System* were used to account for obstructions in the visibility ranges and describe existing form, lines, textures, colors and potential changes to those attributes as proposed under the Action Alternatives. Harvest units associated with the Action Alternatives were displayed by prescription type to more accurately disclose the potential visual quality of harvest units expected under each alternative.

### ***NOISE LEVELS***

The methodologies used to portray the existing environment and determine the environmental effects of the proposed action on the noise levels in the project area and cumulative effects analysis area include estimating the magnitude, timing, and type of activities that produce noise.

Cumulative effects analyses for both visual quality and noise levels include consideration of other actions indicated in *RELEVANT PAST, PRESENT, AND REASONABLY FORESEEABLE ACTIONS* under *SCOPE OF THIS EIS* in *CHAPTER I – PURPOSE AND NEED*.

## **EXISTING ENVIRONMENT**

### ***VISUAL QUALITY***

Most visible harvested acres currently occur in the middle ground and background of the viewpoints. The HCP requires vegetative visual screening along open roads. As a result, many foreground views along such roads are inhibited by a barrier of standing trees. Depending on

visual screening characteristics and topography, harvest stands further away from all viewpoints may be more visible than those nearby.

Due to the evolution of forest management practices and the diversity of previous ownerships in both analysis areas, the existing landscape has various modifications of vegetative textures, forms, lines, and colors affecting the visual quality of the area. Hard, distinctive lines exist where different sections meet, making for a 'checkerboard' appearance when viewed from the viewpoints. The historical development of small harvest units in some areas has created a relatively patchy-looking landscape. The presence of roads creates additional distinctive lines on the landscape. Such characteristics have also led to a multitude of different colors dotting the landscape. Areas that have undergone more intensive treatments (i.e., clearcut, seed tree) often appear lighter in color than those that have undergone less intensive treatments (i.e. commercial thinning).

As stands have regenerated, so has the scenic integrity (degree of intactness) of the forested landscape. Most DNRC managed stands harvested prior to 1986 have regenerated to the point that the units and associated roads have blended in with adjacent unharvested areas, while stands harvested after 1986 are more evident. These newer stands appear lighter in color, are more distinctive in form, and have harder perimeter lines and visible road prisms. For analysis purposes stands harvested prior to 1986 and that appear to have "blended" into landscape and unharvested units will be considered "unharvested". "Harvested" Acres will be considered acres that have been harvested post 1986 or currently have a visual impact at the landscape scale.

#### **HARVEST UNITS AND ASSOCIATED ROADS**

Data describing forest management activities on Swan River State Forest date back beyond 1935; the current SLI denotes harvesting activity dating back to 1970. According to the SLI, approximately 35 percent of the Swan River State Forest has been harvested since 1970. By cross-referencing aerial photos with the SLI analyses it was determined that approximately 42 percent of the Swan River State Forest has been harvested to date; this includes newly acquired lands.

According to the viewshed analysis, not all of the acres within the cumulative effects analysis area are visible from the selected viewpoints. Total visible acres in this area are currently 5% at the wildlife viewing area, 19% at the Swan Peak overview, 58% at the Napa Point Trailhead, and 11% along the highway 83 corridor. Total visible harvested acres are 2% at the wildlife viewing area, 5% at the Swan Peak Overview, 14% at the Napa Point Trailhead, and 2% along the Highway 83 corridor (*TABLE III-79*).

According to the viewshed analysis, not all of the acres within the project area are visible from the selected viewpoints. Total acres visible in this area are currently 0% at the wildlife viewing area, 15% at the Swan Peak overview, 73% at the Napa Point Trailhead, and 16% along the



highway 83 corridor. Total visible harvested acres are 0% at the wildlife viewing area, 1% at the Swan Peak Overview, 16% at the Napa Point Trailhead, and 3% along the Highway 83 corridor. (TABLE III-79).

**TABLE III - 79 - EXISTING VISUAL ENVIRONMENT – ACRES.** Existing harvested and unharvested acres visible in the project area and cumulative effects analysis area.

<b>CUMULATIVE EFFECTS ANALYSIS AREA (60,854 Acres)</b>	<b>Viewpoints</b>			
	<b>Wildlife Viewpoint</b>	<b>Swan Peak Scenic Viewpoint</b>	<b>Napa Point Trailhead</b>	<b>Hwy 83</b>
Harvested Acres Visible from viewpoint	1,620(2%)	2,868(5%)	8,667(14%)	1,125(2%)
Unharvested Acres Visible from viewpoint	1,465(3%)	8,978(14%)	26,445(44%)	5,283(9%)
Total Acres Visible From Viewpoint	3,085(5%)	11,846(19%)	35,112(58%)	6,408(11%)

<b>PROJECT AREA ANALYSIS (25,436 Acres)</b>	<b>Viewpoints</b>			
	<b>Wildlife Area</b>	<b>Swan Peak Overview</b>	<b>Napa Point Trailhead</b>	<b>Hwy 83</b>
Harvested Acres Visible from viewpoint	0(0%)	238(1%)	4,168(16%)	644(3%)
Unharvested Acres Visible from viewpoint	0(0%)	3,487(14%)	14,444(57%)	3,357(13%)
Total Acres Visible From Viewpoint	0(0%)	3,725(15%)	18,612(73%)	4,001(16%)

Approximately 509 miles of highway and open, closed, and seasonally restricted roads occur throughout the cumulative-effects analysis area. Roads introduce hard distinctive lines that are

very light colored in comparison to adjacent forested and harvested areas. According to the viewshed analysis, road miles visible at each viewpoint are approximately 5% at the wildlife area, 24% at the swan peak overview, 60% at the Napa Point Trailhead and 10% percent along the Highway 83 corridor. (TABLE III-80).

There are approximately 221 miles of highway, open, closed, and seasonally restricted roads occur throughout the project area. According to the viewshed analysis, road miles visible at each viewpoint are approximately 0% at the wildlife area, 20% at the swan peak overview, 68% at the Napa Point Trailhead and 15% percent along the Highway 83 corridor. (TABLE III-80).

**TABLE III - 80 - EXISTING VISUAL ENVIRONMENT – ROADS.** Existing road miles visible from the project area and cumulative-effects analysis area by viewpoints and road type.

<b>CUMULATIVE EFFECTS ANALYSIS AREA (509 Miles)</b>	<b>Viewpoints</b>			
	<b>Wildlife Area</b>	<b>Swan Peak Overview</b>	<b>Napa Point Trailhead</b>	<b>Hwy 83</b>
Road Miles Visible from viewpoint	27(5%)	122(24%)	304(60%)	51(10%)

<b>PROJECT AREA ANALYSIS (~221 Miles)</b>	<b>Viewpoints</b>			
	<b>Wildlife Area</b>	<b>Swan Peak Overview</b>	<b>Napa Point Trailhead</b>	<b>Hwy 83</b>
Road Miles Visible from viewpoint	0(0%)	45(20%)	150(68%)	33(15%)

**NOISE LEVELS**

Activities that generate noise within the project and cumulative effects analysis areas include:

- traffic associated with harvesting, road building, motorized recreation, and administrative use;
- harvesting operations; and
- rock blasting and gravel crushing

Noise generation from forest management activities coincides with the rotational schedule required under the HCP. Under this agreement, subzones are deemed ‘inactive’ for at least a 6-year period, thereby, greatly limiting the amount of forest management activities occurring in the area. By default, these inactive subzones are relatively free of forest management activities

except for occasional administrative use and small-scale salvage or sanitation sales. The project area resides in Subzones 2 and 3 that are active from first harvest activity attached to this EIS on a three-year rotation (likely from 2027 to 2029). Noise generated by management activities occurs daily within the active subzone and relatively infrequently within the inactive subzones. Noise created by motorized public use continues to be frequent throughout both areas.

## **ENVIRONMENTAL EFFECTS**

### ***DIRECT AND INDIRECT EFFECTS (PROJECT AREA)***

- ***Direct and Indirect Effects of No-Action Alternative A to Aesthetics***

No harvest-related activities would occur; therefore, no direct and indirect effects to visual quality and noise levels would be expected.

- ***Direct and Indirect Effects of Action Alternatives B and C to Aesthetics***

The anticipated effects to visual quality and noise levels are expected to be somewhat distinguishable between alternatives. The location of visible harvest units, noise levels, and types of harvest being implemented differs slightly between the alternatives. Effects associated with Action Alternative B would be greater than Action Alternative C because there are a greater number of harvest units in the Squeezer and Goat drainages proposed under Action Alternative B that would be more readily visible from viewpoints.

#### **Visual Quality**

##### *Harvest Units and Associated Roads*

Viewers at the viewpoints would tend to see more harvest unit acres under Action Alternative B than Action Alternative C. Action Alternative B would result in an increase in visible harvested acres of 0% at the Wildlife Area, 3% at the Swan Peak Overview, 13% at the Napa Point Trailhead, and 2% along the Highway 83 Corridor. Action Alternative C would result in an increase in visible harvest units of 0% at the Wildlife Area, 3% at the Swan Peak Overview, 12% at the Napa Point Trailhead, and 1% along the Highway 83 Corridor (TABLE III-81). See also FIGURE III-22 and FIGURE III-23 at the end of this analysis.

**TABLE III - 81 - VISUAL ENVIRONMENTAL EFFECTS – ACRES.** Proposed harvested acres visible and not visible within the project area by Action Alternative and viewpoints.

PROJECT AREA ANALYSIS	Viewpoints			
	Wildlife Area	Swan Peak Overview	Napa Point Trailhead	Hwy 83
<b>Existing Environment</b>				
Existing Harvested Unit Acres Visible from Viewpoints	0(0%)	238(1%)	4,168(16%)	644(3%)
Existing Road Miles Visible From Viewpoints	0(0%)	45(20%)	150(68%)	33(15%)
<b>Alternative B</b>				
Post Squeezer Meadow Harvested Unit Acres Visible From Viewpoints	0(0%)	1015(4%)	7,266(29%)	1,167(5%)
Post Squeezer Meadow Road Miles Visible from Viewpoints	0(0%)	50(22%)	150(66%)	34(15%)
<b>Alternative C</b>				
Post Squeezer Meadow Harvested Unit Acres Visible From Viewpoints	0(0%)	1013(4%)	7,079(28%)	1,120(4%)
Post Squeezer Meadow Road Miles Visible from Viewpoints	0(0%)	50(22%)	150(66%)	34(15%)

The vast majority of visible harvest units and associated roads would occur within the middle ground and background of the viewpoints. Due to visual barriers mentioned in *EXISTING ENVIRONMENT*, views of harvest units and roads in the immediate foreground would likely continue to be partially obstructed, while views of harvest units and roads in the distance may be more apparent under each Action Alternative.

Various types of prescriptions associated with each Action Alternative would result in various types of textures, forms, lines, and colors.

- Seed tree prescriptions would result in stands with approximately 10 percent canopy cover. Stands undergoing this type of treatment are expected to appear very light in color, distinctive in form, and have hard perimeter lines where the stand meets adjacent regenerating or unharvested stands. Approximately 6 to 8 of the larger, best available trees per acre would be left along with varying amounts of small submerchantable trees. Seed tree stands would be most apparent compared to the other prescription types.
- Salvage and shelterwood prescriptions would result in stands with approximately 20 percent canopy cover. Stands undergoing this type of treatment are expected to have similar qualities to seed tree stands, only to a lesser degree. Approximately 12 to 16 trees per acre would be left along with varying amounts of small submerchantable trees. These stands would be only slightly less apparent than seed tree stands.
- All other harvest prescriptions would result in stands with a minimum of 40 percent canopy cover. Stands undergoing this type of treatment are expected to be darker in color, less distinctive in form, and have softer perimeter lines than stands undergoing any of the other prescriptions.

All harvesting types would be visible, with seed tree and shelterwood treatments resulting in stand conditions that appear relatively stark in contrast when adjacent to regenerating or unharvested stands. When feasible, these lines would be 'softened' by tapering or feathering stand perimeters and rounding hard stand corners. Associated roads would also appear as distinctive lines. Over time, these stands are expected to become less apparent and darker in color while the road appearances will become less distinctive and buffered by the regeneration, thereby blending with adjacent unharvested and regenerating stands and associated roads in the project area.

Direct and indirect effects to visual quality as a result of seed tree and shelterwood harvest prescriptions are expected to be minor if viewed from the immediate foreground due to visual barriers and moderate if viewed from a distance or where visual barriers don't exist.

#### **Noise Levels**

Under each Action Alternative, noise would be generated by harvesting operations, harvest-related traffic, road construction, and gravel pit activity, including rock blasting and gravel crushing.

Under each Action Alternative, harvesting activities, harvest-related traffic, and road construction would occur up to 9 months per year of the 3 to 7 year operating period. Operators would continue to recognize restrictions in place under the *HCP* and concentrate most management activities outside of the grizzly bear spring period (April 1 through June 15).

Activities would mostly occur during the typical business workweek (Monday through Friday) and cease each day by early evening except for occasional operators and the use of the campgrounds by contractors.

According to *RECREATION ANALYSIS* in *CHAPTER III* 22,476 to 38,531 harvest-related trips would be expected to occur per year over the 3 to 7 year operating period along designated haul routes (see *RECREATION ANALYSIS, TABLE III-78*). Traffic associated with gravel hauling, road and harvesting operations and log hauling is expected to be louder than other harvest-related traffic. This louder traffic would constitute 45 to 66 percent of the traffic trips expected under each Action Alternative.

Rock development would occur in existing pits and coincide with gravel needs for ongoing road construction and maintenance work. Rock blasting and gravel crushing would produce high levels of noise.

Direct and indirect effects to noise levels as a result of harvesting operations, harvest-related traffic, and gravel pit activity associated with the Action Alternatives are expected to be moderate during the workweek and minor during the weekend.

#### **CUMULATIVE EFFECTS**

- ***Cumulative Effects of No-Action Alternative A to Aesthetics***

No harvest-related activities would occur; therefore, no cumulative effects to visual quality and noise levels would be expected.

- ***Cumulative Effects of Action Alternatives B and C to Aesthetics***

Current and foreseeable scheduled activities on DNRC managed and adjacent properties would continue. These activities, in conjunction with those proposed under each Action Alternative, would result in an increase of total harvested acres visible from each observation point and a minor increase in noise levels.

#### **Visual Quality**

The contribution of visible harvested acres under each Action Alternative as seen from each viewpoint would be minor in comparison to what exists currently throughout the landscape (*TABLE III-82*). Visual barriers along open roads would continue to be in place, thereby, obstructing foreground views from the viewpoints. Depending on type and amount of forest management planned on adjacent land ownerships, lands throughout the cumulative-effects analysis area would likely continue to experience similar forms, lines, textures, and colors. Older harvest units would continue to regenerate, blending lines, textures, forms, and colors, while newer harvest units would continue to introduce new attributes in sharper contrast to regenerating stands.

**TABLE III - 82 - VISUAL ENVIRONMENTAL EFFECTS – ACRES.** Proposed harvested acres visible and not visible within the Cumulative Effects analysis area by Action Alternative and viewpoints.

CUMULATIVE EFFECTS ANALYSIS AREA	Viewpoints			
	Wildlife Area	Swan Peak Overview	Napa Point Trailhead	Hwy 83
<b>Existing Environment</b>				
Existing Harvested Unit Acres Visible from Viewpoints	1,620(2%)	2,868(5%)	8,667(14%)	1,125(2%)
Existing Road Miles Visible From Viewpoints	27(5%)	122(24%)	304(60%)	51(10%)
<b>Alternative B</b>				
Post Squeezer Meadow Harvested Unit Acres Visible From Viewpoints	1,620(0%)	3,297(5%)	10,975(18%)	1,502(2%)
Post Squeezer Meadow Road Miles Visible from Viewpoints	27(5%)	126(25%)	304(59%)	52(10%)
<b>Alternative C</b>				
Post Squeezer Meadow Harvested Unit Acres Visible From Viewpoints	1,620(0%)	3,295(5%)	10,788(18%)	1,457(2%)
Post Squeezer Meadow Road Miles Visible from Viewpoints	27(5%)	126(25%)	304(59%)	52(10%)

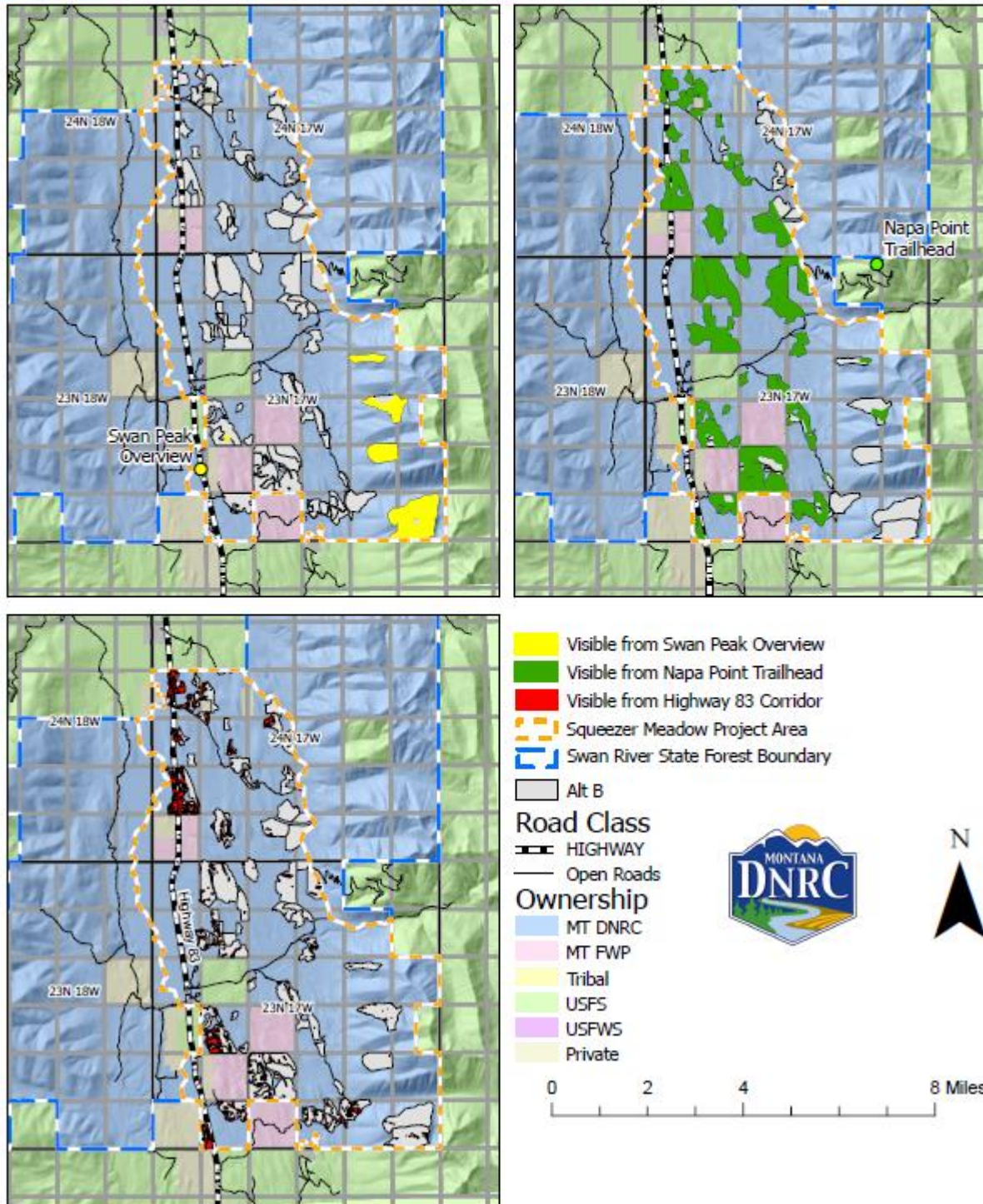
**Noise Levels**

The Cumulative effects to noise would result in a minor increase beyond the current levels found in the cumulative effects analysis area. Rather, noise generated by forest-management activities would be concentrated in the 2<sup>nd</sup> and 3<sup>rd</sup> subzone during the active period until 2028. Noise generated by motorized public use would continue throughout the area on designated roads.

**FIGURE III - 22 - ACTION ALTERNATIVE B - VIEWPOINTS**

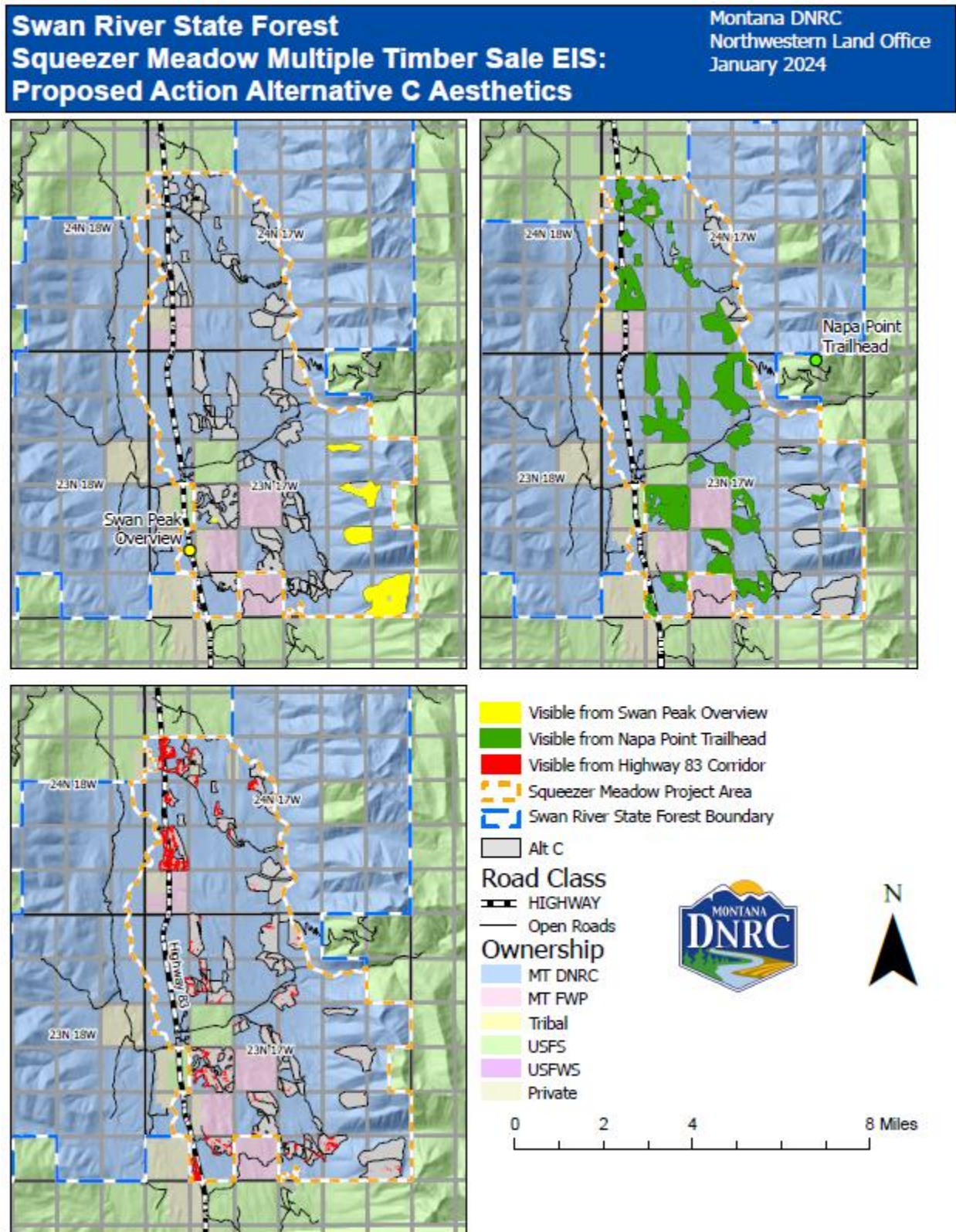
**Swan River State Forest  
Squeezer Meadow Multiple Timber Sale EIS:  
Proposed Action Alternative B Aesthetics**

Montana DNRC  
Northwestern Land Office  
January 2024





**FIGURE III - 23 - ACTION ALTERNATIVE C - VIEWPOINTS**



## **CULTURAL RESOURCE ANALYSIS**

### **INTRODUCTION**

Scoping letters were sent to those Tribes that requested to be notified of DNRC timber sales. No response was returned that identified a specific cultural resource issue. This analysis described the existing environment of cultural resources in the project area and surrounding areas and discloses the potential effects the proposed action may have on those resources (see *CHAPTER I – PURPOSE AND NEED*).

### **ISSUES AND MEASUREMENT CRITERIA**

One concern was raised during the scoping period regarding potential impacts the proposed action may have on cultural resources throughout the area. The following issue statement summarizes the concern and guides this analysis:

- The proposed activities may impact cultural resources in the area.

The following measurement criteria were used to assess the extent of potential direct, indirect, and cumulative environmental effects the proposed action may have on existing cultural resources in the project area:

- The project area acreage where harvest-related activities would occur.

### **ANALYSIS AREAS**

Direct and indirect effects of the proposed action on cultural resources will be analyzed within the project area or area of potential effect (APE).

### **ANALYSIS METHODS**

A Class I (literature review) level review was conducted by the DNRC staff archaeologist for the area of potential effect (APE). This entailed inspection of project maps, DNRC's sites/site leads database, land use records, General Land Office Survey Plats, and control cards. Because of limited resources, the DNRC will only conduct a Class I (records search) review of the area of potential effect, but a formal report will not be prepared.

### **RESULTS OF ANALYSIS**

The Class I search results revealed that no cultural or paleontological resources have been identified in the APE, but it should be noted that Class III level inventory work has not been conducted in much of the sale areas. Thus, there would be no anticipated direct or indirect effects of the proposed action under both Action Alternatives to cultural resources.

### **SUMMARY AND RECOMMENDATIONS**

Because past timber harvesting has occurred extensively throughout the APE, and because the topographic setting and geology suggest a low to moderate likelihood of the presence of cultural or palaeontologic resources, proposed timber harvest activities are expected to have no

effect to antiquities. No additional archaeological investigative work will be conducted in response to this proposed development. However, if previously unknown cultural or paleontological materials are identified during project related activities, all work will cease until a professional assessment of such resources can be made.

**IRRETRIEVABLE**

A resource that has been irretrievably committed is lost for a period of time. Many timber stands in the project area are mature and intermediate. Any of the timber harvesting alternatives would cause live trees to be irretrievably lost; they would no longer contribute to future snag recruitment, stand structure and compositional diversity, aesthetics, wildlife habitat, the nutrient recycling process, or any other important ecosystem functions.

Areas converted from timber production to permanent roads would be lost from timber production and would not function as forested lands for a period of time.

**IRREVERSIBLE**

A resource that has been irreversibly committed cannot be reversed or replaced. The initial loss of trees due to timber harvesting would not be irreversible. Natural regeneration combined with site preparation and artificial regeneration would promote the establishment of new trees. If management decisions allowed for the continued growth of established trees, they would ultimately become equivalent in size to the irretrievably harvested trees.

Areas that are initially lost to timber production through road construction could, over time, be reclaimed and once again produce timber and function as forested land.

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## STIPULATION AND SPECIFICATIONS

The stipulations and specifications for the action alternatives were identified or designed to prevent or reduce the potential effects to the resources considered in this analysis. These measures are derived from issues raised internally and by the public, *Forest Management Rules*, and other requirements with which forest management activities must comply, as listed under *RELEVANT AGREEMENTS, LAWS, PLANS, PERMITS, LICENSES, AND OTHER REQUIREMENTS* in *CHAPTER I – PURPOSE AND NEED*.

Stipulations and specifications that apply to harvesting or roadbuilding operations are incorporated into the *State of Montana Timber Sale Contract*. As such, they are binding and enforceable. Project administrators will enforce stipulations and specifications relating to activities that may occur during or after the contract period, such as site preparation or hazard reduction.

The following stipulations and specifications will be incorporated to mitigate effects on the resources involved with the action alternatives considered in this proposal. Each section is organized by resource.

### **VEGETATION**

#### ***SENSITIVE PLANTS***

Appropriate measures will prevent the disturbance of sensitive plant populations. Riparian areas near harvest units will be marked to protect SMZs and isolated wetlands. No harvesting will take place in wetlands or near springs on localized features. If sensitive plant populations are found, the appropriate habitat area will be excluded from the harvest units.

#### ***NOXIOUS WEED MANAGEMENT***

To further limit the possibility of spreading noxious weeds, the following weed-management mitigation measures will be implemented:

- All tracked and wheeled equipment will be cleaned of noxious weeds prior to beginning project operations. The Forest Officer will inspect equipment periodically during project implementation.
- Surface blading on roads affected by the proposal may result in required weed removal before the seed-set state.
- Disturbed roadside sites will be promptly reseeded with an approved grass mix. Roads used and closed as part of this proposal will be reshaped and seeded.
- Herbicide application, as designated by the Forest Officer, may be used to control weeds along roads that access the timber sale area. To reduce risk to aquatic and terrestrial resources, the following will be required:
  - All herbicides will be applied by licensed applicators in accordance with laws, rules, and regulations of the State of Montana and Lake County Weed District.
  - All applications will adhere to BMPs and the herbicides' specific label guidelines.

- Herbicide applications will not be general, but site-specific to areas along roads where noxious weeds grow. No spray areas will be designated on the ground before applications begin.
- Herbicides will not be applied to areas where relief may contribute runoff directly into surface water.
- Herbicides will be applied on calm days free of rain to limit drift and the possibility of the herbicide moving off the road prisms.

## **WATERSHED AND FISHERIES**

- Planned erosion-control measures and BMPs include:
  - Installing grade breaks on roads;
  - Installing water-diverting mechanisms on roads;
  - Installing slash-filter windrows, and;
  - Grass seeding
- All road stream crossings will be monitored for sedimentation and the deterioration of the road prism.
- Equipment traffic will be allowed at road stream crossings only where road prisms have an adequate load-bearing capacity.
- Culvert sizing for all new road construction projects will be as recommended by the DNRC hydrologist for a 50-year flood period. New road stream crossing structures will ensure fish passage.
- Stream crossings, where culvert or bridge removals and installations are planned, will have the following requirements, as needed, to meet the intent of water-quality permits and BMPs and protect water quality:
  - Diversion channels will be constructed and lined with plastic to divert stream flow prior to any in-channel operations;
  - Slash-filter windrows will be constructed on the base of fill slopes;
  - Silt fences will be installed along the stream banks prior to and following excavation at crossing sites;
  - Filter-fabric fences will be in place downstream prior to and during culvert installation, and;
  - Stream work will be limited to periods approved by permitting agencies to minimize potential impacts to fish species present
- Brush will be removed from existing road prisms to allow effective maintenance. Improved road maintenance will reduce sediment delivery.
- The contractor will be responsible for the immediate cleanup of any spills that may affect water quality (fuel, oil, dirt, etc.).
- Equipment that is leaking fluids will not be permitted to operate in stream crossing construction sites.
- The project proposal will include the following pertinent recommendations of the Flathead Basin Forest Practices, Water Quality and Fisheries Cooperative Program Final Report, June 1991. The following numbers correspond to the numbering of recommendation items contained within the aforementioned document, included in

pages 154 through 162 of the Final Report.

1. BMPs are incorporated into the project design and operations.
  2. Riparian indicators would be considered in the harvest unit layout.
  3. Management standards of the SMZ Law (75-5-301 MCA) are used in conjunction with the recommendations of the study.
  4. The BMP audit process will continue. This sale would likely be reviewed in an internal audit and may be randomly chosen as a statewide audit sale.
  7. SMZs will be evaluated as a part of the audit process.
  12. Watershed-level planning and analysis are completed. Logging plans of other agencies and private companies are used.
  15. DNRC would use the best available methods for logging and road building for this project.
  16. A. Existing roads are fully utilized for this proposal.
  16. B. DNRC utilized BMPs, transportation planning, and logging-system design to minimize new road construction.
  17. DNRC contracts with the DFWP to obtain species composition, spawning inventory, and spawning habitat quality. DNRC's mitigation plan for roads fits all recommendations for 'impaired streams'. Using 'worst-case scenario' criteria provides for conservative operations in this proposal.
  18. Provisions that address BMPs are in the *State of Montana Timber Sale Contract* and would be enforced.
  20. Long-term water quality and fisheries resource monitoring is planned for streams on Swan River State Forest.
  - 29-34. DNRC plans to cooperate with DFWP to continue fisheries work. DNRC would continue to support fisheries-monitoring efforts in the future as funding allows.
- SMZs and RMZs will be defined along those streams that are in or adjacent to harvest units; all applicable BMPs, Rules and HCP conservation strategies for fisheries' Riparian Management Zones adjacent to fish-bearing streams will be followed.
  - A 110 foot no-harvest zone would be implemented immediately adjacent to all fish-bearing streams within the South Fork Lost Creek drainage to provide shade and recruitable woody debris.
  - The SMZ law and Forest Management Rules will be applied to all non-fish bearing streams in the project area.
  - McNeil core and substrate scores are expected to be continued to be monitored in bull trout spawning reaches in Soup and South Fork Lost creeks.

## **WILDLIFE**

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

- Prohibit contractors and purchasers conducting contract operations from carrying firearms while on duty as per ARM 36.11.444(2) and GB-PR2 (USFWS and DNRC 2010).
- Contractors will adhere to food storage and sanitation requirements as per GB-PR3 (USFWS and DNRC 2010).
- Public access would be always restricted on restricted roads that are opened for harvesting activities; signs will be used during active periods and a physical closure (gate, barriers, equipment, etc.) will 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.
- Within Canada lynx winter foraging habitat, retain up to 10 percent of the stand area in patches of advanced regeneration of shade-tolerant trees (grand fir, subalpine fir, and spruce) as per LY-HB4 (USFWS and DNRC 2010).
- Retention of patches of advanced regeneration of shade-tolerant trees in proposed units, where feasible, would provide some break-up site distances, horizontal cover, and forest structural attributes preferred by snowshoe hares and lynx.
- Use a combination of topography, group retention, and roadside vegetation along open roads to reduce sight distances within harvest units where feasible.
- Vegetation screening would be retained within a 100-foot buffer along open roads where regeneration units would be adjacent to the open roads.
- Proposed seed tree units would be laid out so that no point within the proposed unit is more than 600 feet to cover.
- Minimize potential disturbance to grizzly bears during the spring period by restricting activities in spring habitat from April 1 through June 15.
- Prohibit timber harvest activities from November 16 to June 15 in potential grizzly bear denning habitat (slopes greater than 45 percent above 6,300 feet in elevation).
- Retention of visual screening adjacent to RMZs would reduce detection of grizzly bears near these important habitats.
- Minimize mechanized activity within 0.25 miles of burned forested stands in the project area between April 15 through July 1st to minimize disturbance to black-backed woodpeckers.
- Retain 2 large snags and 2 large snag recruitment trees per acre (>21 inches dbh) particularly favoring western larch, ponderosa pine, western white pine, and Douglas-fir. Clumps of existing snags could be maintained where they exist to offset areas without sufficient snags.
- Retain coarse woody debris amounts consistent with Graham et al. (1994) and emphasize the retention of downed logs  $\geq 15$  inches dbh where they occur as per LY-HB2 (USFWS and DNRC 2010).
- Connectivity for fisher, Canada lynx, grizzly bears, and a host of other species would be provided by maintaining corridors of unharvested and/or lighter harvested areas along riparian areas, ridgetops, and saddles.

## **SOILS**

### **COMPACTION**

- Logging equipment will not operate off forest roads unless:
  - soil moisture is less than 20 percent,
  - soil is frozen to a depth of 4 inches or a depth that will support machine operations (whichever is greater), or
  - soil is snow covered to a depth of 18 inches or a depth that will prevent compaction, rutting, or displacement (whichever is greater).
- Existing skid trails and landings will be used when their design is consistent with prescribed treatments and current BMP guidelines are met.
- The harvest project foreman and sale administrator will agree to a skidding plan prior to operating equipment.
- To reduce the number of skid trails and the potential for erosion, designated skid trails will be required where moist soils or short steep pitches (less than 300 feet) will not allow access by other logging systems.
- The density of skid trails in a harvest area will not exceed 20 percent of the total area in the cutting unit.

#### ***DISPLACEMENT***

- Ground-based logging equipment (tractors, skidders, and mechanical harvesters) is limited to slopes less than 45 percent on ridges, convex slopes; and to 40 percent or less on concave slopes without winter conditions.
- Slash piling and scarification will be completed with a dozer where slopes are gentle enough to permit (less than 35 percent). Slash treatment and site preparation will be done with an excavator in areas where soils are wet or slopes are steeper (up to 55 percent). Broadcast burning may also be utilized.

#### ***EROSION***

- Ground skidding machinery will be equipped with a winchline to limit equipment operation on steeper slopes.
- Roads used by the purchaser will be reshaped and the ditches redefined to reduce surface erosion prior to and following use.
- Drain dips, open-topped culverts, and gravel will be installed on roads as needed to improve road drainage and reduce erosion and maintenance needs.
- Some road sections will be repaired to upgrade the roads to design standards that will reduce the potential for erosion and maintenance needs.
- Certified weed-free grass seed and fertilizer will be applied promptly to newly constructed road surfaces, cut slopes, and fill slopes. These applications will also be done on existing disturbed cut slopes, fill slopes, and landings immediately adjacent to open roads. These applications, which will stabilize soils and reduce or prevent the establishment of noxious weeds, would include:
  - Seeding all road cuts and fills concurrently with construction,
  - Applying 'quick cover' seed mix within 1 day of work completion at culvert-installation sites, and
  - Seeding all road surfaces and reseeding culvert installation sites when the final blading is completed for each specified road segment.



- Based on ground and weather conditions and as directed by the Forest Officer, water bars, logging-slash barriers, and, in some cases, temporary culverts will be installed on skid trails where erosion is anticipated. These erosion-control features would be periodically inspected and maintained throughout the Timber Sale Contract period or extensions thereof.

### **AIR QUALITY**

- To prevent individual or cumulative effects and provide for burning during acceptable ventilation and dispersion conditions during burning operations, burning will be done in compliance with the Montana Idaho Airshed Group reporting regulations and any burning restrictions imposed in Airshed 2.
- Excavator, landing, and roadwork debris will be piled clean to allow easy ignition during fall and spring when ventilation is good and surrounding fuels are wet. The Forest Officer may require that piles be covered to reduce dispersed smoke and allow the piles to ignite more easily, burn hotter, and extinguish more quickly.
- The number of piles to burn will be reduced by leaving large wood debris in the harvest units.
- Depending on the season of harvest and level of public traffic, dust abatement may be applied on some segments of the roads that will be used during hauling.

### **AESTHETICS**

- Damaged sub merchantable residual vegetation will be slashed.
- Landings will be limited in size and number and located away from main roads when possible.
- Disturbed sites directly adjacent to roads will be grass seeded.
- When possible, healthy trees not big enough to be harvest will be retained.
- When possible, techniques such as feathering, which involves marking additional timber along the harvest boundary lines, or rounding, which involves eliminating abrupt edges such as those found at property corners, will be implemented to reduce the appearance of straight boundary lines along harvest units.

### **CULTURAL RESOURCES AND ARCHAEOLOGY**

- A review of the project area was conducted by a DNRC archaeologist and local Native American tribal organization.
- A contract clause provides for suspending operations if cultural resources are discovered, and only resuming operations when directed by the Forest Officer.

### **ROADS**

- Information about road reconstruction activities and road use associated with road construction activities will be relayed to the general public.
- Signs will be placed on restricted roads to prohibit public access while harvesting operations are in progress; these roads will be physically restricted during inactive periods (nights, weekends, holidays, shutdowns).
- BMPs will be incorporated into all planned road construction.

## **GLOSSARY**

### **Acre-foot**

A measure of water or sediment volume equal to an amount of material that would cover 1 acre to a depth of 1 foot.

### **Action alternative**

One of several ways of moving toward the project objectives.

### **Adfluvial**

A fish that out migrates to a lake as a juvenile to sexually mature and returns to natal stream to spawn.

### **Administrative road use**

Road use that is restricted to DNRC personnel and contractors for purposes such as monitoring, forest improvement, fire control, hazard reduction, etc.

### **Airshed**

An area defined by a certain set of air conditions; typically a mountain valley where air movement is constrained by natural conditions such as topography.

### **Ameliorate**

To make better; improve.

### **Appropriate conditions**

Describes the set of forest conditions determined by DNRC to best meet the SFLMP objectives. The 4 main components useful for describing an appropriate mix of conditions are cover-type proportions, age class distributions, stand-structure characteristics, and the spatial relationships of stands (size, shape, location, etc.); all are assessed across the landscape.

### **Background view**

Views of distant horizons, mountain ranges, or valleys from roads or trails.

### **Best Management Practices (BMPs)**

Guidelines to direct forest activities, such as logging and road construction, for the protection of soils and water quality.

### **Biodiversity**

The variety of life and its processes, including the variety of living organisms, the genetic differences among them, and the communities and ecosystems where they occur.

### **Board foot**

144 cubic inches of wood that is equivalent to a piece of lumber 1-inch thick by 1 foot wide by 1 foot long.

### **Canopy**

The upper level of a forest consisting of branches and leaves of the taller trees.

### **Canopy closure**

The percentage of a given area covered by the crowns, or canopies, of trees.

**Cavity**

A hollow excavated in trees by birds or other animals. Cavities are used for roosting and reproduction by many birds and mammals.

**Centimeter**

A distance equal to 0.3937 inch.

**Commercial-thin**

A cultural treatment made to reduce stand density of merchantable trees primarily to improve growth, enhance forest health, or to recover potential mortality. For the purposes of this project, commercial thinning will leave approximately 70 to 110 trees per acre and greater than 40 percent canopy coverage will be retained.

**Compaction**

The increase in soil density caused by force exerted at the soil surface, modifying aeration and nutrient availability.

**Connectivity**

The quality, extent, or state of being joined; unity; the opposite of fragmentation.

**Core area**

See Security Habitat (grizzly bears).

**Cover**

See HIDING COVER and/or THERMAL COVER.

**Coarse down woody material**

Dead trees within a forest stand that have fallen and begun decomposing on the forest floor.

**Crown cover or crown closure**

The percentage of a given area covered by the crowns of trees.

**Cull**

A tree of such poor quality that it has no merchantable value in terms of the product being cut and manufactured.

**Cumulative effect**

The impact on the environment that results from the incremental impact of the action when added to other actions. Cumulative impacts can also result from individually minor actions, but collectively they may compound the effect of the actions.

**Direct effect**

Effects on the environment that occur at the same time and place as the initial cause or action.

**Ditch relief**

A method of draining water from roads using ditches and a corrugated metal pipe. The pipe is placed just under the road surface.

**Dominant tree**

Those trees within a forest stand that extend their crowns above surrounding trees and capture sunlight from above and around the crown.

**Drain dip**

A graded depression built into a road to divert water and prevent soil erosion.

**Ecosystem**

An interacting system of living organisms and the land and water that make up their environment; the home place of all living things, including humans.

**Embeddedness**

Embeddedness refers to the degree of armor or the tight consolidation of substrate.

**Environmental effects**

The impacts or effects of a project on the natural and human environment.

**Equivalent clearcut area (ECA)**

The total area within a watershed where timber has been harvested, including clearcuts, partial cuts, roads, and burns.

*Allowable ECA* - The estimated number of acres that can be clearcut before stream-channel stability is affected.

*Existing ECA* - The number of acres that have been previously harvested taking into account the degree of hydrologic recovery that has occurred due to revegetation.

*Remaining ECA* -The calculated amount of harvesting that may occur without substantially increasing the risk of causing detrimental effects to stream-channel stability.

**Excavator piling**

The piling of logging residue (slash) using an excavator.

**Fire regimes**

Describes the frequency, type, and severity of wildfires. Examples include: frequent, nonlethal underburns; mixed-severity fires; and stand-replacement or lethal burns.

**Fluvial**

A fish that out-migrates to a river from its natal stream as a juvenile to sexually mature in the river, and returns to its natal stream to spawn.

**Forage**

All browse and nonwoody plants available to wildlife for grazing.

**Foreground view**

The view immediately adjacent to a road or trail.

**Forest improvement (FI)**

The establishment and growing of trees after a site has been harvested. Associated activities include:

- site preparation, planting, survival checks, regeneration surveys, and stand thinnings;
- road maintenance;
- resource monitoring;
- noxious weed management; and
- right-of-way acquisition on a State forest.

**Fragmentation (forest)**

A reduction of connectivity and an increase in sharp stand edges resulting when large contiguous areas of forest with similar age and structural characteristics are interrupted through disturbances, such as stand-replacement fires and timber stand harvesting.

**Geomorphological processes**

The observed proportions of habitat types for each reach are within the broad ranges of expected conditions.

**Greenhouse Gas**

Any gas that has the property of absorbing infrared radiation (net heat energy) emitted from Earth's surface and reradiation it back to Earth's surface. Carbon dioxide, methane and water vapor are the most important greenhouse gases.

**Habitat**

The place where a plant or animal naturally or normally lives and grows.

**Habitat type**

Land areas that would produce similar plant communities if left undisturbed for a long period of time.

**Harvest units**

Areas of timber proposed for harvesting.

**Hazard reduction**

The abatement of a fire hazard by processing logging residue with methods such as separation, removal, scattering, lopping, crushing, piling and burning, broadcast burning, burying, and chipping.

**Hiding cover**

Vegetation capable of hiding 90 percent of a standing adult mammal from human view at a distance of 200 feet.

**Historical forest condition**

The condition of the forest prior to settlement by Europeans.

**Indirect effects**

Secondary effects that occur in locations other than the initial action or significantly later in time.

**Individual-Tree Selection**

A type of silvicultural harvest where individual trees of all size classes are removed more or less uniformly throughout the stand to promote growth of remaining trees and to provide space for regeneration.

**Intermediate trees**

Characteristics of certain tree species that allow them to survive in relatively low-light conditions, although they may not thrive.

**Interdisciplinary team (ID Team)**

A team of resource specialists brought together to analyze the effects of a project on the environment.

**K factor**

The soil erodibility factor which represents both susceptibility of soil to erosion and the rate of runoff, as measured under the standard unit plot condition.

**Landscape**

An area of land with interacting ecosystems.

**Macroinvertebrate richness**

The relative abundance and diversity of insects and worms found throughout a streambed.

**Macroporosity**

The gaseous portion of a soil profile typically containing pores on the order of 3 to 100mm in diameter and are interconnected to varying degrees; thus, they can allow water to bypass the soil matrix and move rapidly to a basal saturated zone and/or move downslope as pipe flow at speeds greater than predicted by Darcy's Law.

**McNeil Coring**

McNeil coring is a method used to determine the size range of material in streambed spawning sites.

**Meter**

A distance equal to 39.37 inches.

**Middleground view**

The view that is 200 to 1,000 feet from a road or trail, usually consisting of hillsides and drainages.

**Millimeter**

A distance equal to .03937 inch.

**Mitigation measure**

An action or policy designed to reduce or prevent detrimental effects.

**Multistoried stands**

Timber stands with 2 or more distinct stories.

**Nest site area (bald eagle)**

The area in which human activity or development may stimulate the abandonment of the breeding area, affect successful completion of the nesting cycle, or reduce productivity. It is either mapped for a specific nest, based on field data, or, if that is impossible, is defined as the area within a ¼-mile radius of all nest sites in the breeding area that have been active within the past 5 years.

**No-action alternative**

The option of maintaining the status quo and continuing present management activities by not implementing the proposed project.

**Non-forested area**

A naturally occurring area, (such as a bog, natural meadow, avalanche chute, and alpine areas) where trees do not establish over the long term.

**Old-growth**

*Working definition* - Old growth as defined by *Green et al.*

*Conceptual definition* - The term old growth is sometimes used to describe the later, or older, stages of natural development of forest stands. Characteristics associated with old-growth generally include relatively large old trees that contain a wide variation in tree sizes, exhibit some degree of a multi-storied structure, have signs of decadence, such as rot and spike-topped structure, and contain standing large snags and large down logs.

**Old-growth maintenance**

Silvicultural treatments in old-growth stands designed to retain old-growth attributes, including large live trees, snags, and coarse woody debris, but that would remove encroaching shade-tolerant species, create small canopy gaps generally less than one acre in size, and encourage regeneration of shade-intolerant species. This type of treatment is applicable on sites that historically would be characterized by mixed severity fire regimes, either relatively frequent or infrequent.

**Old-growth network**

A collection of timber stands that are selected to meet a management strategy that would retain and recruit 150+-year-old stands over the long term (biodiversity, wildlife, the spatial arrangement of stands and their relationship to landscape patterns and processes) are elements that are considered in the selection of stands.

**Overstory**

The level of the forest canopy that include the crowns of dominant, codominant, and intermediate trees.

**Overstory removal**

The cutting of trees comprising an upper canopy layer in order to release trees or other vegetation in an understory.

**Patch**

A discrete (individually distinct) area of forest connected to other discrete forest areas by relatively narrow corridors; an ecosystem element (such as vegetation) that is relatively homogeneous internally, but differs from what surrounds it.

**Poletimber**

Trees 4.1 inches to 8.9 inches in dbh.

**Potential nesting habitat (bald eagle)**

Sometimes referred to as 'suitable nesting habitat', areas that have no history of occupancy by breeding bald eagles, but contain potential to do so.

**Project file**

A public record of the analysis process, including all documents that form the basis for the project analysis. The project file for the Cilly Cliffs Multiple Timber Sale Project EIS is located at the Swan River State Forest headquarters office at Goat Creek.

**Redds**

The spawning ground or nest of various fish species.

**Regeneration**

The replacement of one forest stand by another as a result of natural seeding, sprouting, planting, or other methods.

**Reinitiation**

The first phase of the process of stand development.

**Resident**

Pertaining to fish, resides and reproduces in natal stream.

**Residual stand**

Trees that remain standing following any cutting operation.

**Road-construction**

Cutting and filling of earthen material that results in a travel-way for wheeled vehicles.

**Road maintenance**

Maintenance and repair of existing roads that are accessible to motorized use, including but not limited to:

- blading;
- reshaping; or
- resurfacing the road to its original condition;
- cleaning culverts;
- restoring and perpetuating road surface drainage features; and
- clearing the roadside of brush.

**Road reconstruction**

Modifying a road to a higher standard to accommodate proposed use.



**Salvage**

The removal of dead trees or trees being damaged or dying due to injurious agents other than competition to recover value that would otherwise be lost.

**Sanitation**

The removal of trees to improve stand health by stopping or reducing actual or anticipated spread of insects and disease.

**Saplings**

Trees 1.0 inches to 4.0 inches in dbh.

**Sawtimber trees**

Trees with a minimum dbh of 9 inches.

**Scarification**

The mechanized gouging and ripping of surface vegetation and litter to expose mineral soil and enhance the establishment of natural regeneration.

**Scoping**

The process of determining the extent of the environmental assessment task. Scoping includes public involvement to learn which issues and concerns should be addressed and the depth of the assessment that will be required. It also includes a review of other factors such as laws, policies, actions by other landowners, and jurisdictions of other agencies that may affect the extent of assessment needed.

**Security**

For wild animals, the freedom from the likelihood of displacement or mortality due to human disturbance or confrontation.

**Security habitat (grizzly bears)**

An area of a minimum of 2,500 acres that is at least 0.3 miles from trails or roads with motorized travel and high-intensity, nonmotorized use during the nondenning period.

**Sediment**

Solid material, mineral or organic, that is suspended and transported or deposited in bodies of water.

**Seedlings**

Live trees less than 1.0 inch dbh.

**Seedtree**

An even-aged regeneration method in which a new age class develops from seeds that germinate in fully exposed microenvironments after removal of all the previous stand except a small number of trees left to provide seed. Seed trees are removed after regeneration is established. For the purposes of this project, 6 to 12 seed-bearing trees per acre will be retained to provide a seed source for stand regeneration.

**Sediment yield**

The amount of sediment that is carried to streams.

**Seral**

Refers to a biotic community that is in a developmental, transitional stage in ecological succession.

**Shade intolerant**

Describes tree species that generally can only reproduce and grow in the open or where the overstory is broken and allows sufficient sunlight to penetrate. Often these are seral species that get replaced by more shade-tolerant species during succession. In Swan River State Forest, shade-intolerant species generally include ponderosa pine, western larch, Douglas-fir, western white pine, and lodgepole pine.

**Shade tolerant**

Describes tree species that can reproduce and grow under the canopy in poor sunlight conditions. These species replace less shade-tolerant species during succession. In Swan River State Forest, shade-tolerant species generally include subalpine fir, grand fir, Douglas-fir, Engelmann spruce, western hemlock, and western red cedar.

**Shelterwood**

A method of regenerating an even-aged stand in which a new age class develops beneath the moderated microenvironment provided by the residual trees. A removal cut to release established regeneration from competition of the overwood would occur after regeneration is established. For the purposes of this project, 12 to 22 trees per acre will be retained to provide a seed source and shelter for stand regeneration.

**Single-tree selection**

A method of creating new age classes in uneven-aged stands in which individual trees of all size classes are removed more-or-less uniformly throughout the stand to achieve desired stand structural characteristics.

**Sight distance**

The distance at which 90 percent of an animal is hidden from view by vegetation.

**Silviculture**

The art and science of managing the establishment, composition, and growth of forests to accomplish specific objectives.

**Site Preparation**

A hand or mechanized manipulation of a harvested site to enhance the success of regeneration. Treatments are intended to modify the soil, litter, and vegetation to create microclimate conditions conducive to the establishment and growth of desired species.

**Slash**

Branches, tops, and cull trees left on the ground following harvesting.

**Snag**

A standing dead tree or the portion of a broken-off tree. Snags may provide feeding and/or nesting sites for wildlife.

**Spur roads**

Low-standard roads that are constructed to meet minimum requirements for harvesting-related traffic.

**Stand**

An aggregation of trees that are sufficiently uniform in composition, age, arrangement, and condition and occupy a specific area that is distinguishable from the adjoining forest.

**Stand density**

Number of trees per acre.

**Stocking**

The area of a piece of land that is now covered by trees is compared to what could ideally grow on that same area. The comparison is usually expressed as a percent.

**Stream gradient**

The slope of a stream along its course, usually expressed in percentage, indicating the amount of drop per 100 feet.

**Stumpage**

The value of standing trees in the forest. Sometimes used to mean the commercial value of standing trees.

**Substrate scoring**

Rating of streambed particle sizes.

**Succession**

The natural series of replacement of one plant (and animal) community by another over time in the absence of disturbance.

**Suppressed**

The condition of a tree characterized by a low-growth rate and low vigor due to overcrowding competition with overtopping trees.

**Texture**

A term used in visual assessments indicating distinctive or identifying features of the landscape depending on distance.

**Thermal cover**

For white-tailed deer, thermal cover has 70 percent or more coniferous canopy closure at least 20 feet above the ground, generally requiring trees to be 40 feet or taller. For elk and mule deer, thermal cover has 50 percent or more coniferous canopy closure at least 20 feet above the ground, generally requiring trees to be 40 feet or taller.

**Timber harvesting activities**

In general, all the activities conducted to facilitate timber removal before, during, and after the timber is removed. These activities may include any or all of the following:

- felling standing trees and bucking them into logs
- skidding logs to a landing

- processing, sorting, and loading logs at the landing
- hauling logs to a mill
- slashing and sanitizing residual vegetation damaged during logging
- machine piling logging slash
- burning logging slash
- scarifying, preparing the site as a seedbed
- planting trees

**Understory**

The trees and other woody species growing under a, more less, continuous cover of branches and foliage formed collectively by the overstory of adjacent trees and other woody growth.

**Uneven-aged stand**

Various ages and sizes of trees growing together on a uniform site.

**Ungulates**

Hoofed mammals, such as mule deer, white-tailed deer, elk, and moose, that are mostly herbivorous and many are horned or antlered.

**Vigor**

The degree of health and growth of a tree or stand.

**Visual screening**

The vegetation that obscures or reduces the length of view of an animal.

**Watershed**

The region or area drained by a river or other body of water.

**Water yield**

The average annual runoff for a particular watershed expressed in acre-feet.

**Water yield increase**

An increase in average annual runoff over natural conditions due to forest canopy removal

## ACRONYMS AND ABBREVIATIONS

ARM	Administrative Rules of Montana	MBF	Thousand Board Feet
BMP	Best Management Practices	MMBF	Million Board Feet
dbh	diameter at breast height	MNHP	Montana Natural Heritage Program
DEIS	Draft Environmental Impact Statement	NAIP	National Aerial Imagery Program
DEQ	Department of Environmental Quality	NWLO	Northwestern Land Office
DFWP	Montana Department of Fish, Wildlife, and Parks	RMZ	Riparian Management Zone
DNRC	Department of Natural Resources and Conservation	ROD	Record of Decision
ECA	Equivalent Clearcut Acres	SFLMP	State Forest Land Management Plan
EIS	Environmental Impact Statement	SLI	Stand-level Inventory
EPA	Environmental Protection Agency	SMZ	Streamside Management Zone
FEIS	Final Environmental Impact Statement	SVGBCA	Swan Valley Grizzly Bear Conservation Agreement
FI	Forest Improvement	TMDL	Total Maximum Daily Load
FNF	Flathead National Forest	USFS	United States Forest Service
FY	Fiscal Year (July 1 – June 30)	USFWS	United States Fish and Wildlife Service
FOGI	Full Old-Growth Index	124	Permit Stream Preservation Act Permit
GIS	Geographic Information System		
HCP	Habitat Conservation Plan	318	Permit A short-term Exemption from Montana’s Surface Water Quality and Fisheries Cooperative Program
ID	Team Interdisciplinary Team		
LWD	large woody debris		
MCA	Montana Codes Annotated	Land Board	Board of Land Commissioners
MEPA	Montana Environmental Protection Act	Plum Creek	Plum Creek Timber Company

## ATTACHMENT A

### VEGETATION ANALYSIS – OLD GROWTH ATTRIBUTE ASSIGNMENTS

#### LARGE LIVE TREES

Listing the number of trees in the 21 inches or greater dbh category (TPA\_21), first, and the 17 inches or greater dbh category (TPA\_17) second: all possible combinations are shown for each class in the table below.

#### LARGE COARSE WOODY DEBRIS

Values for large coarse woody debris are calculated using the following formula:

$$(CWD\_SML + CWD\_LRG*3)/.667$$

where CWD\_SML = number of small pieces (between 3 and 15 inches dbh) of coarse woody debris within a 300-foot transect and CWD\_LRG = number of large pieces (>15 inches dbh) of coarse woody debris within a 300-foot transect. Formula results corresponding to the “none”, “few”, “some”, and “lots” categories are shown in the table below.

#### SNAGS

Listing the number of snags in the 21 inches or greater dbh category (SNAGS\_21), first, and the 15 inches or greater dbh category (SNAGS\_15) second: all possible combinations are shown for each class in the table below.

#### DECADENCE

Decadence is based on stand vigor, with classification as follows:

- (1) Full vigor (open grown trees; crown closure has not occurred).
- (2) Good to average vigor (crowns closed, at least in clumps, but growth has not yet slowed greatly; crown lengths > 50% in young stands, crown lengths > 33% in older stands).
- (3) Just below average to poor vigor (poor crown ratios and growth).
- (4) Very poor vigor (stand is generally in a decadent condition due to insect and disease problems, stagnation, suppression, or old age).

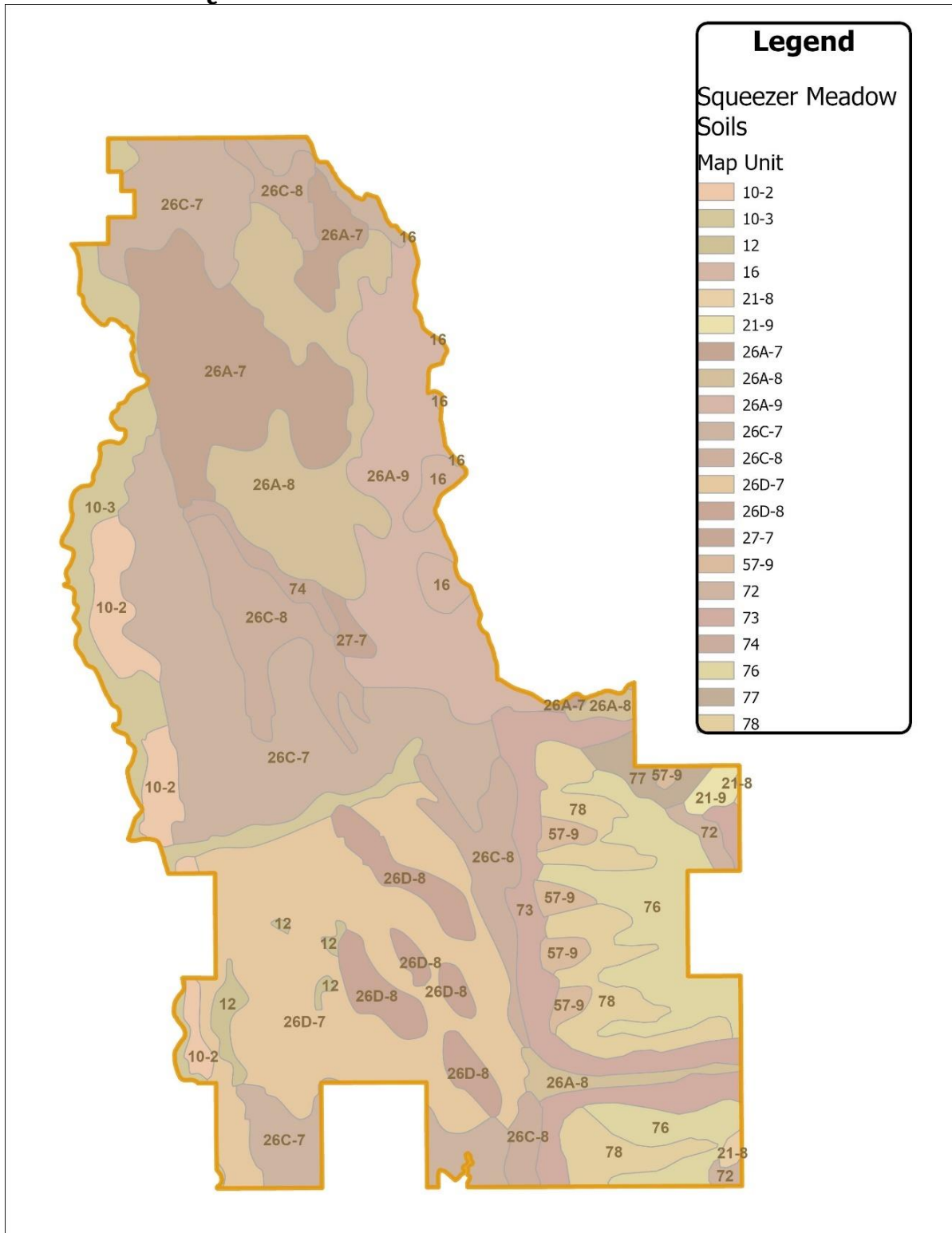
Attribute	None	Few	Some	Lots
Large Live Trees (TPA_21/TPA_17)	0/0, 0/1	0/4, 0/8, 0/10, 1/1, 1/4, 1/8, 4/4	1/10, 4/8, 4/10, 8/8, 8/10	10/10
Coarse Woody Debris*	<1	1-9	10-20	>=21

Snags (SNAGS_21/SNAGS_15)	0/0	0/1, 0/3	0/6, 1/0, 1/1, 1/3, 1/6, 3/0, 3/1, 3/3, 3/6	0/11, 1/11, 3/11, 6/0, 6/1, 6/3, 6/6, 6/11, 11/0, 11/1, 11/3, 11/6, 11/11
Decadence (VIGOR)	1	2	3	4

\* (CWD\_SML + CWD\_LRG\*3)/.667

**ATTACHMENT B**

**FIGURE B - 1 - SQUEEZER MEADOW PROJECT AREA AND SOIL MAP UNITS.**





**TABLE B - 1 - SOIL MAP UNITS AND ATTRIBUTES**

Map Unit	Description	Acres	Acres of Proposed Management/New Road		Landtype Description	Compaction hazard	Erosion Hazard	Displacement Hazard
			Alt B	Alt C				
10-2	Fluents, stream bottoms	686	0 / 0	0 / 0	Flood plains from alluvium	L	L	H
10-3	Aquepts, stream bottoms	1,299	9 / 0	14 / 0	Flood plains from alluvium	M	L	L
12	Borosaprists, depressions	173	10 / 0	1 / 0	Moraines, flood plains, terraces	L	L	L
16	Fluents, alluvial fans	270	196 / 0	196 / 0	Alluvial fans from alluvium	L	L	M
21-8	Andic Cryochrepts-Entic Cryandepts-Rock outcrop complex, cirque basins	39	0 / 0	0 / 0	Cirques, Glacial till and material derived from metasedimentary rocks	L	M	H
21-9	Andic Cryochrepts-Entic Cryandepts-Rock outcrop complex, cirque basins, steep	102	0 / 0	0 / 0	Cirques, Glacial till and material derived from metasedimentary rocks	L	M	H
26A-7	Andeptic Cryoboralfs, silty till substratum, calcareous, rolling	2,183	354 / 0	349 / 0	Moraines, Calcareous silty till	M	M/H	M
26A-8	Andeptic Cryoboralfs, silty till substratum, calcareous, hilly	2,130	400 / 0.1	215 / 0.1	Mountain slopes, Calcareous silty till	M	M/H	H
26A-9	Andeptic Cryoboralfs, silty till substratum, calcareous, steep	2,063	732 / 0	681 / 0	Mountain slopes, Calcareous silty till	M	M/H	H
26C-7	Andeptic Cryoboralfs, silty till substratum, rolling	4,684	796 / 0	815 / 0	Moraines, silty till	M	M/H	M
26C-8	Andeptic Cryoboralfs, silty till substratum, hilly	1,808	488 / 0	316 / 0	Moraines, silty till	M	M/H	M
26D-7	Dystric Cryochrepts, rolling	3,808	1,065 / 0	1,082 / 0	Moraines, till	L	L	L
26D-8	Dystric Cryochrepts, hilly	848	302 / 0	340 / 0	Moraines, till	M	L	L
27-7	Dystric Eutrochrepts, till substratum	97	8 / 0	0 / 0	Terraces, kettles, kames; till	M	L	L
57-9	Andic Cryochrepts, glaciated mountain slopes	332	24 / 0	24 / 0	Mountain slopes, Till and metasedimentary rocks	L	M	H

Map Unit	Description	Acres	Acres of Proposed Management/New Road		Landtype Description	Compaction hazard	Erosion Hazard	Displacement Hazard
			Alt B	Alt C				
72	Cirqueland-Entic Cryandeps complex, very steep	138	4 / 0.1	4 / 0.1	Cirque headwalls	N/A	M	N/A
73	Andic Cryochrepts-Andeptic Cryoboralfs association, glacial trough walls	1,419	112 / 0.4	112 / 0.4	Troughs, Till and metasedimentary rocks	L	M	H
74	Ochrepts, very steep	188	25 / 0	0 / 0	Glacial drift from metasedimentary rocks	M	L	M
76	Rock outcrop-Ochrepts complex, structural breaklands	1,593	492 / 3.2	492 / 3.2	Material derived from metasedimentary rocks	N/A	L	N/A
77	Ochrepts-Rock outcrop complex, structural breaklands	210	0 / 0	0 / 0	Material derived from metasedimentary rocks	L	L	M
78	Ochrepts-Rock outcrop complex, southerly aspects	1,366	219 / 1.5	219 / 1.5	Troughs, Material derived from metasedimentary rocks	L	L	M

## ATTACHMENT C

### INTRODUCTION

This section contains public comment letters received from parties interested in the Squeezer Meadow Multiple Project Timber Sale DEIS during the 30-day DEIS comment period and DNRC’s responses to those comments. Four parties provided comments on the DEIS in the form of emails. The contents of each comment are displayed in the left column of the following table, with DNRC responses in the right column. Portions of the comment letter that are either an opinion or recommendation do not require a response from DNRC.

All comments were carefully reviewed. The DNRC appreciates both the time and thought that was involved in producing these comments. The decisionmaker will carefully consider each received comment to aid them in deciding on a course of action for this project.

**TABLE C - 1 - SQUEEZER MEADOW DRAFT EIS PUBLIC COMMENTS AND DNRC RESPONSES**

C o m m e n t  #  1	<i>Rodney Marriott</i> 2/19/2024 Via: Email	<i>DNRC Response:</i>
1	I support the logging industry. We need lumber and we need forest fire management. I support your project but hope there is some plan to avoid clear cutting technique. I would hope stands of trees are left for animal habitat and allow a level of aesthetic, if that is practical and still allows for the economic harvest of logs.	<i>As described in Chapter 2 – Alternatives, there are no proposed harvest units in Action Alternatives B or C with clearcutting prescriptions. In addition to prescribed leave tree amounts associated with each silvicultural prescription, retention of at least two snags and two snag recruits per acre is required as described in ARM 36.11.411 for wildlife habitat and other forest ecology considerations.</i>
2	<i>Kari Gunderson</i> 3/18/2024 Via: Email  To: Chad Blanchard, Project Leader for Squeezer Meadow EIS.	<i>DNRC Response:</i>  <i>Chapter 2 – Alternatives, shows the proposed location, size, shape, and prescription of proposed harvest units under both Action Alternatives B and C. There are no proposed harvest units with clearcutting prescriptions under this project.</i>

Thank you for the opportunity to comment on the Squeezer Meadow Multiple Timber Sale Project Draft Environmental Impact Statement (DEIS).

I have lived in the Swan Valley for 46 years and have witnessed the unsustainable and ecologically damaging timber harvest activities on state-managed timberlands. Recent state-managed timber harvests seen from my house and Hwy 83 have been large in size, volume, and are a visual eyesore. An example of that are the clearcuts in the Woodward area.

We need smaller cutting units using select cutting treatments, not clear cuts, and NO new roads. Stay out of watersheds including the Swan River corridor, lakes, ponds creeks and other wetlands. Decreasing ground fuels negatively affects ground cover and winter cover for many wildlife species. Proposed Forest health treatments in this EIS negatively affect riparian areas and bull trout; and negatively affect grizzly bear, wolverine, and lynx habitat.

We don't need improved access to state-managed lands. Refrain from cutting right up to the Mission Mountains Wilderness boundary. Trailheads, campgrounds and huckleberry patches are already overflowing with visitors, resulting in more garbage and bear attractants, and crowded recreation areas that are putting more pressure on fish and wildlife in their critical habitat. Some of the funds generated from this timber sale should be used to address recreation areas including Cedar Creek Campground, the dispersed camping spot on Fatty Creek Rd next to the Swan River where there is excessive human waste improperly disposed of and Point Pleasant Campground where homeless people are living and leaving garbage and human waste, abandoned camps, and food attractants for wildlife. It is not a safe

*DNRC does monitor harvest units and roads for noxious weeds and conducts management activities to reduce noxious weed populations through its Forest Improvement Program. Potential effects of each alternative on noxious weeds and mitigation measures to prevent noxious weed spread are described in Chapter 3 – Vegetation Analysis.*

*Application of relevant law (MCA 77.5.301-305) and administrative rules (ARM 36.11.301-313, ARM 36.11.425-426) focused on protection of riparian areas and water quality would occur on classified waterbodies within the proposed project area. Based on forest management activities proposed under both Action Alternative B and Action Alternative C, no timber harvest is proposed in riparian buffers on classified waterbodies in the project area.*

	<p>place for my family to camp. There needs to be invasive weed monitoring and treatment after timber harvest on these state-managed lands in the Swan Valley.</p> <p>Timber sales on state-managed lands generate funding for local schools, under the Common School Trust. These state-managed lands should not be unsustainably overharvested and left as weed-infested clearcuts. Lake County property taxes have skyrocketed in 2024. In the past few years there have been only 1-3 students enrolled at Salmon Prairie School. 21.45% of my current property tax bill is for a district school levy. This is not cost effective and students would be better served by Swan Valley Elementary School, 10 miles south, where students have peers in each grade level and more teachers to better serve students' educational needs.</p> <p>I recommend the No-Action Alternative A until the issues my public comments are addressed more effectively.</p> <p>An executive summary of the proposed actions would have been helpful. Not all of us are able to spend the time to read a 406-page document.</p> <p>Thank you for your consideration.</p> <p>Kari Gunderson, PhD.</p> <p>Wildland Recreation Management</p> <p>Swan Valley, MT</p>	
3a	<p><i>Friends of the Wild Swan</i>  <i>P.O Box 5103</i>  <i>Swan Lake, MT 59901</i>  <i>3/18/2024</i>  <i>Via: Email</i></p> <p>Swan River State Forest</p>	<p><i>DNRC Response:</i></p> <p><i>DNRC concurs that it does not have an Incidental Take Permit (ITP) for wolverine and wolverine is not included in</i></p>

<p>34925 MT Hwy. 83 Swan Lake, MT 59911 Attn: Chad Blanchard, Project Leader Via email to: <a href="mailto:chad.blanchard@mt.gov">chad.blanchard@mt.gov</a></p> <p>Mr. Blanchard,</p> <p>Please accept the following comments on the Draft Environmental Impact Statement for the Squeezer Meadow Multiple Timber Sale projects on behalf of Friends of the Wild Swan.</p> <ul style="list-style-type: none"> <li>• Wolverine now has Endangered Species Act protection. DNRC does not have an Incidental Take Permit (ITP) and wolverine is not included in your Habitat Conservation Plan (HCP). The DEIS admits on page 24 that "The proposed activities could result in disturbance that could alter wolverine use of habitat."</li> </ul> <p>Wolverines have been found in the project area and logging may take place on 451 acres that retain persistent spring snowpack and harm could occur from disturbance and displacement, yet the DEIS failed to analyze any impacts to wolverine in violation of the Endangered Species Act.</p> <p>DNRC must obtain an ITP and add wolverine to the HCP in coordination with the US Fish and Wildlife Service before this project can proceed.</p>	<p><i>your Habitat Conservation Plan (HCP). The statement on DEIS page 24 pertaining to wolverines is outlining a potential issue statement for analysis; it does not provide an analysis nor any conclusions for impacts on wolverines. Anticipated effects to wolverines are disclosed in Table III-58 on pages 268 to 269. As stated in the analysis, occasional use of the project area by wolverines is possible during their extensive home range movements and no high-quality denning habitat (as measured by multiple years of persistent spring snowpack, avalanche chutes, rock slopes, etc.) would be impacted by the proposed harvesting. Combined with timing and elevation/slope restrictions, any potential disturbance of a wolverine moving through the project area in the vicinity of a harvest unit would be temporary. Negligible adverse direct, indirect, or cumulative effects to wolverines would be expected to occur as a result of either Action Alternative. Thus, DNRC does not believe an ITP is necessary or warranted.</i></p>
<p><b>3b</b> The two action alternatives are strikingly similar. They both log a similar volume using the same silvicultural prescriptions, both log old growth forest habitat, both reduce thermal cover for big game, and build a similar amount of roads. Why wasn't an alternative developed that did not build roads or log in old growth forest habitat?</p>	<p><i>DNRC believes that we have presented an adequate range of alternatives by analyzing two action alternatives and a no-action alternative. Each alternative is unique in terms of stand treatments, volume harvested, and the amount and type of harvesting in old growth. Silvicultural prescriptions for each proposed harvest unit were designed to achieve stand-level management objectives and to comply with ARM 36.11.408 and 36.11.418 with regards to selection of silvicultural systems and old growth management. Over 85% of the proposed harvest acres in each Action Alternative occur</i></p>

		<p><i>in non-old growth or second-growth stands. While the amount of old growth acres treated under each Action Alternative is similar (760 acres in Action Alternative B vs. 717 acres in Action Alternative C), Alternative B results in a higher amount of old growth removal than Alternative C due to increased use of regeneration harvest prescriptions, such as seed tree and shelterwood, while Alternative C results in a higher amount of old growth retention due to increased use of old growth maintenance prescriptions that will meet the criteria of DNRC’s old growth definitions according to Green et al. (1992) following harvest. Action Alternative B covers a larger area, treats more acres in the project area compared to Action Alternative C (DEIS, page 46, TABLE II-1). ARM 36.2.529 (5) requires “an analysis of reasonable alternatives to the proposed action, including the alternative of no action and other reasonable alternatives...”. Accordingly, ARM 36.2.522 (2)(b) requires the Agency “to consider only alternatives that are realistic, technologically available, and that represent a course of action that bears a logical relationship to the proposal being evaluated.” We feel that through the alternative development process, we have addressed the concerns of the public and have developed alternatives that meet the tenets of the SFLMP, Administrative Rules for Forest Management (ARM 36.11.401 through 36.11.457), and the HCP. Each action alternative was designed to meet the overall project objectives (DEIS, page 15).</i></p>
<p><b>3c</b></p>	<p>This project will manipulate old-growth forest habitat under the assumption that 325 acres of the 760 acres will still be old-growth after it is logged (in Alternative B). The Technical Review Report (Contract Review of Old-Growth Management on School Trust Lands: Supplemental Biodiversity Guidance 8/02/00 - attached) commissioned by DNRC in 2000 was very clear:</p> <p>“In addition, there is the question of the appropriateness of management manipulation of old-growth stands – both those extant and those in process of development toward old-growth condition. Opinions of well-qualified experts vary in this regard. As long term results from</p>	<p><i>DNRC recognizes, as stated on pages 121-122 of the DEIS, that harvesting would reduce old growth attribute levels in harvested stands, even though the stands would still meet the minimum criteria of Green et al. (1992). To be clear, DNRC does not believe that the old growth stands harvested as proposed would maintain the same habitat characteristics for old growth-associated wildlife species as they would in their pre-harvest condition (DEIS pages 253-255). DNRC also recognizes that recent seed tree logging units that may have &gt;10 large, old trees per acre typically do not have other attributes present in old-growth forests, such as abundant large snags, coarse woody debris, multi-canopy structure, and decadence. While old growth attributes would be reduced in these stands, they would continue to provide mature forest habitat suitable for use by some wildlife species, and structural forest attributes will re-grow over time. TABLE</i></p>

	<p>active management lie in the future – likely quite far in the future – considering such manipulation as appropriate and relatively certain to yield anticipated results is an informed guess at best and, therefore, encompasses some unknown level of risk. In other words, producing “old-growth” habitats through active management is an untested hypothesis.” (Page 11 – emphasis added)</p> <p>The whole old-growth analysis is based on an untested hypothesis. DNRC may be wishfully thinking that these stands will still be old-growth after logging has occurred in them but you don’t know that and it will take over one hundred years to see if your hypothesis is correct. What other subtle changes will occur in these stands after they are logged? Will soils be drier? Will mychorrizal fungi be destroyed? How will these changes affect tree and plant growth?</p> <p>That is why the technical review scientists recommended “adherence to the precautionary principle” and “the more common approach of ‘reserve strategies’ considering the...variables of numbers of old-growth patches, stand size, juxtaposition with other stands, and connectivity.” (Page 11)</p>	<p><i>III-10 in the DEIS explicitly details treatment types and stands that would or would not meet the Green et al. (1992) minimum criteria following harvesting (DEIS, Pages 118-120).</i></p> <p><i>Only stands treated with old growth maintenance, commercial thinning, or individual tree selection prescriptions would be classified as old growth postharvest. These stands would meet Green et al. (1992) minimum old growth criteria, but DNRC recognizes that old growth attribute levels in these stands would be reduced (TABLE III-12). DNRC commissioned the old growth technical review to help guide policy development in the year 2000. The review was instructional for better understanding management risks and policy implications at that time. Since the year 2000, a growing body of scientific literature has evolved that addresses the use of silvicultural treatments to retain and promote the development of old growth attributes (Bauhus et al. 2009, Raymond et al. 2009, Twedt and Somershoe 2009, Brewer et al. 2008, Fiedler et al. 2007, Keeton 2006, Beese et al. 2003, Latham and Tappeiner 2002, Fiedler 2000). DNRC also notes, that counter to the opinions of the 2000 technical review team, Green et al. (1992) stated that “old growth is not necessarily ‘virgin’ or ‘primeval’. Old growth could develop following human disturbances.”</i></p>
<p><b>3d</b></p>	<p>The Full Old Growth Index (FOGI) weaknesses were also identified by the technical review scientists:</p> <p>“The particular OG Index used is not supported by science, especially with the weighting of factors. (A high index with no large trees is possible, but totally unacceptable based on OG literature to date.) Since a large proportion of the acreage would still be open for harvesting, the possibility of removing too many large trees does not provide credibility</p>	<p><i>As previously mentioned, DNRC adopted the Green et al. (1992) minimum criteria to identify stands as old growth (ARM 36.11.403[54]). DNRC does not use the FOGI to identify old growth stands on state lands but instead uses it to consistently describe the attributes of old growth stands relative to other old growth stands on state lands. As such, the FOGI is useful as a tool to communicate various attribute levels of old growth stands both within DNRC and to the public. Since the DNRC technical review in 2000, many very similar index scores have been developed to characterize old growth and degree of “old growthness” by other agencies and they are in common use today (Gray et al. 2009, Steen et al. 2008, Franklin et al. 2005, Mosseler et al. 2003, and Holt</i></p>



<p>for the DNRC. Allows “harvesting” in large amounts of OG acreage, when the emphasis should be on the need for “ecological restoration treatments” rather than harvesting. (This is not a play on words! Ecological restoration treatments should be prescriptions with emphasis to enhance old growth development, rather than allowing harvesting down to minimum OG standards.)” (Page 4)</p> <p>“The main Option 2 weaknesses are lack of scientific support for the proposed index (not available at this time), and public trusts concern about use of the index to allow harvesting of too many large trees.” (Page 10)</p> <p>What science and/or monitoring has DNRC done in the past 20 years that addresses the concerns about old-growth manipulation and FOGI that were expressed by these scientists? What peer review has been conducted on the FOGI?</p>	<p>2000). While the FOGI could be applied to any forest stand with adequate inventory data, DNRC does not use the FOGI in stands that are not defined as old growth according to the Green et al. (1992) minimum criteria. The stand attributes used in developing the FOGI were selected from peer-reviewed scientific literature by an interdisciplinary team of specialists that identified those attributes as important components of old growth stands.</p> <p>Recognizing the importance of the presence of large, older trees as a component of old growth stands, DNRC placed a high emphasis on that attribute when developing the FOGI, and for that reason it is not possible for a stand to achieve a high index score without an abundance of large, old trees, particularly when considered in combination with the minimum large tree requirements of Green et al. (1992). TABLE III-6 of the DEIS (page 113) shows the attributes considered in the FOGI as well as the class assignments for attributes described as ‘NONE’, ‘FEW’, ‘SOME’, and ‘LOTS,’ which are simple, descriptive terms assigned to actual numerical data classes.</p> <p>The DNRC FOGI has been academically peer reviewed by third-parties once as mentioned in this comment above. It was peer reviewed as a part of the “Contract Review of Old-Growth Management on School Trust Lands: Supplementary Biodiversity Guidance [Version] August 2, 2000.” Reviewers were R.D Pfister, W.L. Baker, C.E. Fiedler, and J.W. Thomas -- November 27, 2000. DNRC’s continued use of FOGI for the purpose of describing old growth attributes is not in conflict with the conclusions of that review as it is not being used to define stands as “old growth” or “not old growth”. The FOGI has undergone internal review and field verification by a DNRC interdisciplinary review team. Results from that review indicated that stand FOGI scores consistently and accurately reflected the relative old growth attribute levels in observed stands. DNRC conducts regular SLI inventory updates and postharvest stand updates for all stands in western Montana; old growth classifications are noted using these procedures. Additional analysis and disclosure is provided every 5 years in the departments’ State Forest Land Management Plan Monitoring Report (see DNRC 2000, 2005, 2010, 2016 and 2021 reports).</p>
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<p><b>3e</b></p>	<p>There is no provision for putting mature stands on longer rotations to provide for future (i.e., recruitment old growth habitat). Instead logging will contribute to continued fragmentation of old growth habitat. This violates the SFLMP rule at §36.11.407(1): Within areas of large, blocked ownership, the department shall manage for a desired future condition that can be characterized by the proportion and distribution of forest types and structures historically present on the landscape.</p> <p>And (2)(a): Among the forest conditions the department shall typically consider are:</p> <p>(vii) old-growth distribution and attribute levels; and (viii) habitat type.</p>	<p><i>The old growth constraint applied in DNRC’s most recent sustainable yield calculation was designed to require administrative units in the NWLO and SWLO to maintain at least 8% of forested acres as old growth (MB&amp;G 2020). Requiring management of forested stands to maintain at least 8% old growth over time implicitly requires some stands (both mature stands and old growth stands) to be managed on longer rotations. DNRC’s SLI indicates that the Swan River State Forest currently has approximately 6,632 acres (approximately 12% of forested acres) of moderately and well-stocked non-old growth sawtimber stands in age classes older than 100 years that could potentially meet the old growth minimum criteria when they reach sufficient age. Some of those stands would be considered for management on longer rotations in accordance with biodiversity and fiduciary objectives described in ARM 36.11.404-407, but those decisions are made at the project-level as stands are evaluated for potential management.</i></p> <p><i>The effects of harvesting activities on forest fragmentation are described on pages 131-132 and 255-264 of the DEIS. Harvesting activities are likely to increase the amount of younger stands with corresponding reductions in mature forest stands, including old growth stands receiving seed tree or shelterwood treatments, and certain harvest units containing old growth treated with commercial thinning or individual tree selection treatments. This would result in increased fragmentation of mature forests and wildlife habitat, as stated in the analyses presented in the DEIS. Habitat connectivity and fragmentation are important landscape attributes that DNRC considers as stated in ARM 36.11.407(2)(a)(v). However, changes to existing levels are not prohibited under the rule. In some circumstances in some forest types, increasing fragmentation can be a desirable management objective to emulate natural conditions (e.g. along forest/grassland ecotones), and changes to habitat connectivity and fragmentation often also occur as a result of natural disturbance events.</i></p> <p><i>In managing for desired future conditions, DNRC implements a coarse filter approach to promote biodiversity on its managed lands (ARM 36.11.404), which is characterized</i></p>

		<p>by a desired future condition informed by the pre-settlement forest types that existed in Montana as described by Losensky (1997). A site-specific model that relies on evidence of historic species presence is used to determine the desired future condition and management direction for individual forest stands (ARM 36.11.405). The aggregation of stand-level desired future conditions to the administrative unit level defines the desired future condition for the unit in terms of both the proportion and distribution of cover types required by ARM 36.11.407(1). The term "habitat type" referenced in ARM 36.11.407(2)(viii) may refer to the types described by Pfister et al. (1977) or other more generic forest types relevant for describing forest stand conditions. Habitat types as described by Pfister et al (1977) are used as a fundamental underlying descriptor for all DNRC forest stands in DNRC's SLI (DEIS p. 98-99), and they are used to classify old growth groups under definitions of Green et al. (1992) (DEIS p. 112) and fire group classifications of Fischer and Bradley (1987) (DEIS p. 149-150). Habitat type and other factors, such as those listed in ARM 36.11.407(2), are considered to help guide the development of treatments to effectively implement the coarse filter approach and promote long-term, landscape-level diversity [ARM 36.11.407(3)]. Fiduciary obligations are also one of the important considerations required by these rules. The historical distribution of old growth is considered at a regional landscape scale by assessing the proportions of old forest stands present in differing climatic sections across the state that were compiled by Losensky (1997) (DEIS p. 106-109).</p>
3f	<p>Historic old growth estimates on the SRSF are estimated to have been between 15% to 60%. Current estimate is 12.23% on the SRSF- below historic. Project implementation will reduce the old growth and patch sizes, decrease patch sizes and connectivity. Alternative B will reduce old growth habitat on the SRSF to 11.43% and Alternative C to 11.69% -- well below historic old growth conditions. This violates the SFLMP rules. Cumulatively DNRC is incrementally liquidating old growth forest habitat on the Swan River State Forest [See DEIS pg. 52:</p>	<p>Estimates of historic amounts of old growth are dependent on the criteria used to qualify or define stands as old growth. Each of the historic estimates presented on pages 110-111 of the DEIS are based on different defining criteria than DNRC currently uses, which confounds comparisons between current and historic amounts. As described in ARM 36.11.403(48), DNRC defines old growth using the criteria specified by Green et al. (1992). The Green et al. (1992) criteria require detailed forest inventory data to determine whether the minimum criteria for potential old growth stands are met. Historical forest data was typically not collected at the resolution necessary to provide an estimate of the amount of old growth that historically existed using the Green et al.</p>

<p>"Cumulative effects would result in a trend of reducing acres in the older age classes while increasing acres in the younger age classes."]</p> <p>The Sustained Yield Calculation old growth threshold of 8% is also in violation of the SFLMP rules.</p>	<p><i>(1992) definitions. As described on pages 110-111 of the DEIS, because of the exclusive nature of the Green et al. (1992) definitions, there are areas of mature forest (150+ years old) that do not qualify as old growth but would likely have been included as such if a more inclusive definition were used. As shown on page 107 of the DEIS, the Swan Unit currently has 4,994 acres of mature forest &gt;150 years old that are not classified as old growth. Those acres, combined with the 6,639 acres of old growth, amount to 21.4 percent of the Swan Unit being occupied by old forests, which is well within the historical range of variability described in the DEIS. Each of two alternatives presented in the DEIS would reduce the total amount of mature forest in the Swan Unit to 20.5 percent.</i></p> <p><i>Both the SFLMP and ARM 36.11.418 require DNRC to manage old growth for biodiversity and fiduciary objectives. Age class representation and historical natural disturbance patterns are considered as specified in ARM 36.11.407 and 36.11.418 in DNRC's management of old growth, as well as MCA 77-5-116, which states that old growth may not be set aside for the purposes of preservation unless the trust is compensated for that disposition. The balance between biodiversity and fiduciary objectives for old growth management is reflected by the inclusion of a constraint requiring the model used to determine the annual sustainable yield to maintain or achieve a target number of old growth acres on each administrative unit using management regimes consistent with those described in ARM 36.11.418. The relationship between the SYC and old growth is described on pages 111-112 of the DEIS. In the most recent Sustainable Yield Calculation (MB&amp;G 2020), the model constraint was designed to ensure that each administrative unit within the Northwestern and Southwestern Land Offices would maintain 8 percent old growth. During initial implementation of the SFLMP, DNRC estimated that 19.8 percent of its western Montana lands were historically old growth; an 8 percent target represents just under half of that percentage. The stands included in the 8 percent amount are typically those that occur on sites that are either operationally deferred from management (such as wetlands, steep/rocky terrain not suitable for timber management, parcels to which we have no legal access, etc.), managed under longer rotations, and/or are</i></p>
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		<i>treated using old growth restoration or old growth maintenance treatments described in ARM 36.11.418.</i>
<b>3g</b>	Both action alternatives reduce old forest patch sizes and multi-story stands to below historical conditions to the detriment of wildlife. What are the anticipated adverse impacts? How does it impact wildlife? Will they be displaced? Will their reproduction be affected? Will their young survive? Will it affect breeding, feeding and shelter? The DEIS doesn't tell us.	<i>The anticipated effects of the proposed alternatives on old growth habitat are summarized in Table III-55 on DEIS page 252. Moderate adverse direct and indirect impacts are anticipated under Action Alternatives B and C, respectively, due to the amount of old growth habitat that would be removed, reductions in old growth stand density, reductions in average patch size, and considering that the availability of patches greater than 80 acres in size would be reduced by two. The analysis discussion is a part of the coarse filter analysis where habitat conditions are broadly addressed in the context of spatial distribution and availability. Specific effects on individual species, some of which utilize old or multi-story stands, are addressed in the fine filter portion of the analysis. Attempting to analyze impacts to all old growth-associated wildlife species occurring in the SRSF would be encyclopedic and beyond the scope of this analysis. We believe the analysis accurately describes impacts to old growth habitat and thus, old growth associated species.</i>
<b>3h</b>	Forested linkages will be severed under both action alternatives. Connectivity will be severed as patch size decreases, canopy cover decreases and miles of edge increases that will inhibit movement of interior forest species, some of which are rare, sensitive and threatened. The SRSF already has huge areas without connectivity, the action alternatives make this situation worse.	<i>We agree that connectivity is an important consideration in timber sale design. Some adverse impacts to linkage/connectivity are anticipated under both Action Alternatives and disclosed within the DEIS beginning on page 255. However, we disagree with the comment that "connectivity will be severed" and the description of the SRSF as having large areas without connectivity. Effects to connective forest stands are summarized in Table III-56 on DEIS page 257 and depicted in Figures III-17 to III-18. As described in the DEIS, existing connective forest habitat availability is currently 55.9 percent in the Project Area and 54.5 percent in the Coarse Filter CEAA, providing habitat to facilitate movement of wildlife across the SRSF. Post-harvest, connective forest habitat would be reduced to 45.6 percent or 48.4 percent in the Project Area and to 50.3 percent or 51.4 percent in the Coarse Filter CEAA under Action Alternatives B and C, respectively. Additionally, DNRC maintains forest connectivity by retaining 300-foot wide corridors along some major streams and ridgelines where feasible. Detailed analyses of effects to threatened and sensitive wildlife species are described beginning on DEIS page 272.</i>

<p>3i</p>	<p>Research indicates that some old growth associated species such as the pine marten need old growth in stand sizes of 250 to 500 acres to be effective. Pileated woodpeckers, another old growth associated species, require 100-250 acre stands. Goshawks, another old growth associated species, require an average nesting stand size of 40 acres in west-central Montana, plus additional acres for postfledgling habitat.</p>	<p><i>We agree that old growth associated species have differing habitat requirements and patch size requirements. In the Coarse Filter analysis, the effects of the alternatives on old growth habitat are analyzed at a broad level to assess impacts to all old growth-associated species (DEIS pages 250 to 255). A patch size of 80 acres was chosen to assess the availability of large old growth stands. This metric was chosen because it is likely to support the needs of many old growth associated species (Harger 1978). Another important consideration is that many of the old growth stands in the SRSF share their boundaries with mature dense forests, and that the wildlife species impacted can use connected mature stands (non-old growth) to varying degrees. Thus, the close juxtaposition of many mature stands to old growth stands can serve to increase the effective habitat patch size for many species. For example, while research demonstrates that pine marten prefer old growth stands, research also indicates that they prefer mature stands that are not considered old growth as well, and are tolerant of clearcuts and regenerating forests within their home ranges (Thompson et al. 2012). Research also indicates that thoughtful timber harvest can retain important habitat attributes such as snags, coarse woody debris, and escape cover; increasing suitability of managed stands for marten and other wildlife species (Thompson et al. 2012).</i></p> <p><i>We also consider the needs of sensitive species, including potential affects to pileated woodpeckers, which can be found in DEIS pages 290 to 303. Therefore, we believe that our assessment of the availability of large old growth patches is appropriate and accurately depicts potential impacts to old growth habitat, as well as sensitive wildlife species.</i></p>
<p>3j</p>	<p>The current old growth patch size in the project area is 46 acres, it will be reduced to 40 or 41 acres with Alternatives B and C. The old growth stand sizes are insufficient to provide the habitat needs of these old growth associated species.</p>	<p><i>The statistics reported in the comment are from the DEIS Vegetation Analysis and Table III-55 on FEIS page 252. These values represent an average patch size of all old growth forest stands 5 acres or larger, rather than a specific patch. For instance, the largest old growth patch (of 60) within the project area, totaling 358 acres, would remain 358 acres under Action Alternative C and drop by 22 acres under Action Alternative B. Habitat requirements of old growth-associated species varies by species and habitat quality. DNRC agrees that some species may be displaced due to old-growth habitat removal; however, as the number of large patches of old-</i></p>

		<i>growth greater than 80 acres would be reduced by two within the project area and one within the coarse filter cumulative effects analysis area.</i>
<b>3k</b>	<p>This project will negatively impact old-growth associated species due to high contrast edge effects, potential blowdown, displacement, logging recruitment old growth, fragmentation and roads yet no alternative was developed that actually favored wildlife.</p>	<p><i>DNRC developed alternatives to meet the project objectives (DEIS page 15). Old growth status and impacts to old growth associated species are disclosed in (DEIS pages 250 to 255). As described in the DEIS, the proposed action alternatives are anticipated to adversely affect some wildlife species including old growth associates. However, other species such as those that prefer more open stands or would benefit from greater availability forage plants including grasses, forbs, and shrubs such as huckleberries would be positively affected. Thus, every alternative, including the No Action Alternative, has the potential to benefit or adversely affect wildlife. Additionally, the amount of new road construction proposed under both Action Alternatives is quite low compared to past EIS documents in the SRSF. Furthermore, total road densities would decrease under both Action Alternatives in the Squeezer Meadows project area. DNRC values biodiversity and manages landscapes such that ecological characteristics such as cover type, age class, and stand structure are balanced and appropriate for the local area as per ARM 36.11.404. If these attributes are considered and properly managed as per historic conditions, habitat for native wildlife species will be maintained. The alternatives for this project were developed in a manner that addressed a variety of resource issues and project objectives, including biodiversity and revenue generation for school trust beneficiaries. MEPA does not require the development of alternatives that necessarily favor wildlife, and both the SFLMP and DNRC Forest Management HCP acknowledge that some adverse effects to wildlife associated with implementing the Forest Management Program are possible. We believe the range of alternatives is reasonable given the project's Purpose and Need, as well as issues that were raised during the planning process, and we believe that the analysis accurately reflects the anticipated effects that would be likely to occur.</i></p>
<b>3l</b>	<p>The project relies heavily on BMPs to protect water quality and fish habitat. First, there is no evidence that application of BMPs actually protects fish habitat and water quality. Second,</p>	<p><i>BMPs have been shown to protect fish habitat and water quality across a wide range of forest management activities. Sugden (2018) evaluated the effectiveness of sediment delivery reduction BMPs across commercial timber lands in western</i></p>

<p>BMPs are only maintained on a small percentage of roads or when there is a logging project.</p>	<p><i>Montana with a specific focus on road surface delivery. Of the ten watersheds monitored prior to and following implementation of BMPs, the author noted a 46 percent reduction in sediment delivery from road surfaces, in which 90 percent of the sites noted reduced delivery. The study also emphasized the importance of physical inspection of road systems to identify individual sites that contribute large proportions of the sediment delivery from road sources, which is supported by other similar studies (Al-Chokhachy et al. 2016, Sugden 2018). Rashin et al. (2006) conducted a review of 21 forest management projects in which riparian management zones were implemented to minimize or prevent water quality degradation by sediment. Of the projects examined, 17 were effective and 4 were partially effective at preventing chronic sedimentation to waterbodies. Wear et al. (2013) evaluated sediment reduction BMPs at stream crossing sites and noted reductions in sediment delivery through the application of slash and mulch treatments at crossing sites. Morris et al. (2016) evaluated implementation of three BMP levels on road crossings including fords, culverts, and bridges. BMP levels ranged from minimal practices with bare road surfaces and fill to extensive BMP application which included rocked road and fill surface, seeding, mulching, and geotextile application. Results indicated reduction in sediment delivery at crossing sites under all three scenarios, suggesting that any application of BMPs will reduce sediment delivery to streams. Similarly, Brown et al. (2014) found reduction in sediment delivery through application of BMPs to road crossing approach gravel by 40 percent and 80 percent across low- and high-gravel applications. In a review, Edwards and Williard (2010) found that across three paired watershed studies, BMPs were effective at reducing sediment loads by up to 96 percent (Range; 76–96 percent reduction).</i></p> <p><i>DNRC has adopted rules directing BMP implementation and requires all timber sales on state land to adhere to these rules. Statewide BMP audits are completed biannually by a collective group of natural resource professionals from state, federal, industrial, and conservation agencies and groups. During the most recent BMP audit in 2022, BMP application and effectiveness were evaluated at 38 sites across Montana including 7 timber sales on DNRC lands. Audits indicated</i></p>
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		<p><i>that DNRC timber sales met or exceeded application of appropriate BMP practices in 97.1 percent of rated practices, with only 2.9 percent of the rated practices resulting in a minor BMP departure. Additionally, high risk BMPs defined as practices that have a potential to directly impact water quality, were analyzed separately to evaluate protections afforded to watershed protection. Overall application of the high-risk BMP practices was 90 percent (91 percent on DNRC audits) while effectiveness was rated at 98.1 percent (96 percent on DNRC audits) (Vessar 2022). Currently, DNRC addresses road management and application of BMPs under ARM 36.11.421. DNRC is also required to ensure that all BMPs are in place during and after timber sales ensuring that all roads meet BMPs, including roads without active logging operations. Implementation of BMPs specific to the proposed actions under analysis focused on sediment delivery from roads in the project area and are anticipated to decrease sediment delivery by an estimated 2.4 percent in Soup Creek and 31 percent in Goat Creek, and maintain sediment delivery at existing levels in Cilly and Squeezer creeks at existing levels (see Tables III-37-40 in the Hydrology Analysis).</i></p>
<p><b>3m</b></p>	<p>BMPs fail to protect and improve water quality because of the allowance for “naturally occurring degradation.” In Montana, “naturally-occurring degradation” is defined in ARM 16.20.603(11) as that which occurs after application of “all reasonable land, soil and water conservation practices have been applied.” In other words, damage caused directly by sediment (and other pollution) is acceptable as long as BMPs are applied. The result is a never-ending, downward spiral for water quality and native fish.</p> <p>Here’s how it works:</p> <ul style="list-style-type: none"> <li>• Timber sale #1 generates sediment damage to a bull trout stream, which is “acceptable” as long as BMPs are applied to project activities.</li> <li>• “Natural” is then redefined as the stream condition after sediment damage caused by Timber Sale #1.</li> </ul>	<p><i>Analysis methods for sediment delivery analysis were reported on page 188 of the DEIS, and include procedures adapted from the Washington Forest Practices Board (Callahan, 2000). Using these methods, all roads proposed for use within all project area watersheds were evaluated for potential sediment delivery. The results of these assessments, along with the estimated sediment delivery values expected following improvements to BMPs on project area roads were disclosed in the DEIS on pages 198-205.</i></p> <p><i>According to ARM 17.30.602 (17), “Naturally occurring” means conditions or material present from runoff or percolation over which man has no control or from developed land where all reasonable land, soil and water conservation practices have been applied.</i></p> <p><i>According to ARM 17.30.602 (23), “Reasonable land, soil, and water conservation practices” means methods, measures, or practices that protect present and reasonably anticipated beneficial uses. These practices include, but are not limited to, structural and nonstructural controls and operation and</i></p>

	<ul style="list-style-type: none"> <li>• Timber sale #2 – in the same watershed – sediment damage would be acceptable if BMPs are applied again – same as was done before.</li> <li>• “Natural” is again redefined as the stream condition after sediment damage caused by Timber Sale#2.</li> </ul> <p>The downward spiral continues with disastrous cumulative effects on bull trout and most aquatic life. BMPs are not “reasonable.” Clearly, beneficial uses are not being protected. In Montana, state water quality policy is not being followed. § 75-5-101 et seq. and ARM 16.20.701 et seq.</p>	<p><i>maintenance procedures. Appropriate practices may be applied before, during, or after pollution-producing activities.</i></p> <p><i>For a discussion of BMP effectiveness, see comment and response 3l.</i></p> <p><i>Assessment of existing water quality conditions in Cilly, Soup, Goat and Squeezer Creeks were presented in the watershed and fisheries analyses. Existing thermal conditions are below optimal for bull trout and westslope cutthroat trout in Goat and Squeezer Creek (Figures III-12-13). Thermal conditions in Soup Creek are above optimal for bull trout and westslope cutthroat trout (Figure III-14). The potential effects mechanisms impacting water temperature are outlined in Table III-45, and include altered flow regime, altered channel form, and altered riparian condition. Based on the analysis of these effects mechanisms in the Hydrology and Fisheries analyses, alterations to flow regime and channel form were determined to be a low risk of negligible to very low impacts.</i></p> <p><i>Assessment of spawning and rearing conditions in Soup, Goat and Squeezer Creeks has been completed annually since 1996 (Figures III-10 and III-11, Table III-48).</i></p> <p><i>Long-term water quality monitoring on the Stillwater State Forest has been ongoing since the late-1970’s with minimal observed relationship between forest management activities and total suspended solids, nitrate, and phosphorus. Water quality monitoring is summarized in the DNRC State Forest Land Management Plan Monitoring report which is available upon request.</i></p>
<p><b>3n</b></p>	<p>Goat, Squeezer and Soup creeks are bull trout critical habitat. In the Flathead basin when the percentage of fine materials in spawning gravels in any given year is greater than 35% the stream is considered threatened as a bull trout spawning and/or rearing stream. When the percentage of fine materials in spawning gravels in any given year is greater than 40% the stream is considered impaired. 2021 McNeil coring in Goat Creek was 35.1%, Squeezer Creek was 38.6% (Old Squeezer) and 32.1% (New Squeezer), and 37.1% in Soup</p>	<p><i>The project area does include approximately 22 miles of bull trout spawning and rearing critical habitat in Goat, Squeezer, and Soup creeks. DNRC has an incidental take permit and Habitat Conservation Plan covering forested state lands for potential take for bull trout (USFWS 2011). DNRC continues to cooperate with MFWP to collect and monitor bull trout spawning and rearing conditions on Trust Lands. Bull trout spawning habitat data are presented in Figure III-10 and rearing data are presented in Figure III-11 in the Fisheries Analysis. McNeil core sampling in Goat, Squeezer, and Soup creeks indicates that while annual values may</i></p>

	<p>Creek -- this threatens embryo survival. In addition, water temperature in Soup Creek is high. These high sediment levels have a cumulative impact on spawning when added to the proliferation of lake trout in Swan Lake -- this was not analyzed in the DEIS. Furthermore, rather than take actions that would reduce sediment this project builds more roads, increases water yield, constructs new stream crossings, and weakens slope stability.</p> <p>Goat Creek is a WQLS that is impaired by Total Suspended Solids and not fully supporting aquatic life. The source of the impairment is highways, roads, bridges, infrastructure and silviculture harvesting. A TMDL has been prepared for the Swan Lake Watershed requiring a 33% reduction in fine suspended sediment loads during peak flow conditions in Goat Creek. The EIS failed to analyze how sediment will be reduced to meet these parameters especially given the high road densities in this watershed.</p>	<p><i>exceed the threatened threshold (Weaver and Fraley 1991), long-term trends indicate relatively stable spawning habitat conditions in these watersheds over the last 15 years. Based on the proposed actions under both Action Alternatives, sediment delivery would be reduced, or maintained at existing levels as presented in Tables III-38, III-39, and III-40. Reduction in sediment would primarily occur through removal of relict stream crossings and application of Forestry BMPs which have been shown to be effective at minimizing potential sediment delivery during timber management activities when applied appropriately (Cristan et al. 2016, Sugden 2018, Hawks et al. 2022). Under both proposed Action Alternatives, more stream crossings would be removed in project area watersheds than are proposed to be constructed (Table III-47). While water yield may increase in all project area watersheds (Tables III-42, III-43, III-44) anticipated increases are below established thresholds, and are expected to result in a low-risk of creating unstable stream channels in Goat, Squeezer, or Soup Creeks. Potential impacts to slope stability were summarized in the DEIS on pages 73-74 and analyzed in the DEIS on pages 164-179</i></p> <p><i>Sediment delivery to project area streams, including Goat Creek, were summarized in the DEIS on pages 65-67 and analyzed in the DEIS on pages 190-205. These values include existing and potential sediment sources that were removed and rehabilitated in 2018 and 2019 through a 319 grant administered by the Swan Lake TMDL Technical Advisory Group; and existing and potential sources of sediment delivery proposed for removal under the projects analyzed in the DEIS. More crossings would be permanently removed and rehabilitated than constructed, and a net decrease in road miles would occur under this analysis through decommissioning and removing more miles of road than miles proposed for construction.</i></p>
3o	<p>Current total road densities in the project area are high at 5.6 mi/mi<sup>2</sup> and secure habitat is low at 4.6% (which will be reduced to 3.6% with implementation of Alternatives B and C). Why isn't DNRC striving to reduce rather than increase road densities? The new roads that are constructed and the old roads that are re-opened</p>	<p><i>Total road density would decrease under both Action Alternatives with the permanent reclamation of 7.2 miles of existing road. DNRC manages road densities in a manner that is in full compliance with DNRC's Forest Management HCP. Additionally, no Alternative in the DEIS includes an increase in permanent open roads or roads open to public motorized use. While there would be an increase in traffic on</i></p>

	<p>will essentially be open roads when it comes to wildlife impacts. There will be a lot of traffic on them even if they are closed with gates.</p>	<p><i>restricted roads during timber sale operations, we disagree that these roads would function as open roads post-harvest. DNRC disagrees that these roads would function as open roads once timber sale and reforestation related activities have concluded. Many restricted roads within the SRSF become blocked off with brush and regenerating trees over time, rendering them impassible to all motorized use until there is a needed for forest or fire management.</i></p>
<p><b>3p</b></p>	<p>Mace and Waller's South Fork Study found grizzly bears were displaced significantly from restricted roads, not just open roads. To justify lack of displacement from total road densities the DEIS states: "radio-instrumented grizzly bears in the Swan Valley showed little evidence of displacement from restricted roads or differential use of active or inactive management units associated with logging (<i>Ruby 2014</i>)." (This is not a peer reviewed paper but Mark Ruby's Master's Thesis.) Ruby largely documents the high-risk behavior of bears in the Swan Valley that in turn have suffered unsustainably high levels of mortality when they fail to avoid roads and other human developments, in spite of their tendency to visit these areas during the cover of nighttime. Indeed, Ruby at p. 48 acknowledges "Our research did not examine mortality risk for grizzly bears within the study area, yet mitigating grizzly bear mortality risk in the presence of humans is a management concern."</p>	<p><i>Road density considerations and habitat security concerns were addressed in the grizzly bear analysis in detail on DEIS pages 281 to 290. We agree that new and existing restricted roads, as well as temporary roads, utilized for harvest activities during the active period would function as open roads in terms of impacts to grizzly bears. We also agree that restricted roads can increase displacement of grizzly bears and reduce secure habitat. These considerations are discussed in detail in the grizzly bear analysis. DNRC manages road densities in a manner that is in full compliance with DNRC's Forest Management HCP. No Alternative in the DEIS includes an increase in permanent open roads or roads open to public motorized use. Mace and Waller's South Fork Study, which occurred some 25 years ago, was important research that added greatly to our understanding of grizzly bears in Montana. Since then, the number of researchers studying grizzly bears has increased and the tools/technologies used to study bears has evolved considerably. Mark Ruby's study of grizzly bears within the Swan Valley represents one of these more recent studies and is of particular relevance given its location relative to the Swan River State Forest. Although it is not a peer-reviewed journal article, Mr. Ruby's thesis committee (which reviewed and approved the Master's thesis document) was comprised of professional scientists and statisticians, including Richard Mace himself. Numerous modern studies have found that the relationship between grizzly bears and roads is complex and dependent upon a wide variety of factors, including gender and reproductive status of the bear, surrounding habitat quality, road access class, and time of day. To our knowledge, a higher rate of bear mortality in the NCDE has not been attributed to greater amounts of restricted roads, rather the largest sources of bear mortality in the NCDE continue to be associated with bear-human conflicts at human developments and collisions along high-</i></p>

		<p>speed highways such as Montana Highway 83 (Roberts and Costello 2016, Costello and Roberts 2020, Costello et al. 2023).</p>
<p><b>3q</b></p>	<p>The DEIS fails to analyze the high total road densities on the SRSF nor does it adequately describe these risks and subsequent bear mortality in the Swan Valley from roads.</p> <p>The DEIS doesn't analyze effects from ALL roads in terms of wildlife displacement. Instead it focuses on open roads.</p>	<p><i>Road density considerations and habitat security concerns were addressed in the grizzly bear analysis in detail on DEIS pages 281 to 290. We agree that new and existing restricted roads, as well as temporary roads, utilized for harvest activities during the active period would function as open roads in terms of impacts to grizzly bears and increased risks to wildlife. We also agree that restricted roads can increase displacement of grizzly bears and reduce secure habitat. These considerations are discussed in detail in the grizzly bear and big game analyses. DNRC manages road densities in a manner that is in full compliance with DNRC's Forest Management HCP. No Alternative in the DEIS includes an increase in permanent open roads or roads open to public motorized use. Additionally, total road density would decrease under both Action Alternatives. Numerous studies have found that the relationship between grizzly bears and roads is complex and dependent upon a wide variety of factors, including gender and reproductive status of the bear, surrounding habitat quality, road access class, and time of day. We are unaware of any studies specifically documenting mortality of grizzly bears in the Swan Valley associated with total road densities. The most significant sources of bear mortality in the NCDE continue to be associated with bear-human conflicts at human developments and collisions along high-speed highways such as Montana Highway 83 (Roberts and Costello 2016, Costello and Roberts 2020, Costello et al. 2023). Despite some mortalities due to these factors, the grizzly bear population of the NCDE, which includes the Swan Valley, continues to remain healthy and increase annually (Costello et al. 2016, NCDE Subcommittee 2020, Costello and Roberts 2020, Costello et al. 2023). Additionally, any forest management operations prohibit contractors from carrying firearms and require proper bear-safe storage or disposal of attractants, which further decreases the likelihood of bear-human conflicts (and associated mortality) under either Action Alternative.</i></p> <p><i>DNRC focused on open roads in this analysis since they typically receive greater traffic compared to roads that are</i></p>

		<p><i>only open to non-motorized public use, agency administrative uses or commercial uses. Therefore, open roads are more likely to disturb and displace many species of wildlife. For species that are sensitive to motorized disturbance, additional analysis on the impact of all roads including roads that are closed to the public, but open to administrative and commercial uses was considered. Additionally, it is worth noting that, many restricted roads within the SRSF become blocked off with brush and regenerating trees over time, rendering them impassible to all motorized use until there is a need for forest or fire management. The impact of all roads on grizzly bear secure habitat can be found on DEIS pages 281 to 290. The impacts of active roads on big game winter range can be found on Table III-69 on DEIS page 307. Accessibility for trapping risk to fishers is discussed on DEIS pages 290 to 295.</i></p>
<p><b>3r</b></p>	<p>This project will reduce habitat and negatively impact wildlife:  Grizzly bear hiding cover and security will be reduced,  Suitable lynx habitat will be rendered unsuitable,  Fisher habitat will not be suitable,  Pileated woodpecker habitat will be reduced,  Big game thermal cover will be logged,  Elk security will be reduced,  Wildlife will be displaced.</p>	<p><i>We acknowledge that some adverse effects to wildlife would occur as a result of the proposed Action Alternatives. These impacts are discussed and analyzed in Table III-58 on DEIS pages 268 to 272 and detailed in the Fine Filter Section of the DEIS beginning on page 273. Impacts to vegetation would be temporary until stands regenerate and DNRC will continue to favor an appropriate mix of age classes, cover types, and stand structure.</i></p>
<p><b>3s</b></p>	<p>The DEIS discloses that there will be high adverse effects to big game. Thermal cover will be reduced but the DEIS doesn't analyze how that will affect elk, mule or whitetail deer's ability to move through deep snow in the winter. Or how it effects regulating summer and winter temperatures.</p>	<p><i>The DEIS does not anticipate or disclose high adverse effects to big game. Moderate to minor adverse impacts to big game are disclosed within the DEIS on pages 304 to 313. Acreages of thermal cover on elk, mule deer, and white -tailed deer winter range that would remain post-harvest are summarized in Table III-67 on DEIS page 306. To be conservative, we assumed that none of the harvest units proposed under Action Alternatives B or C would retain the 60-percent cover of mature conifers required to meet thermal cover definitions. During years with high snow depth, the ability of animals to move through harvest units in deep snow would be impacted potentially causing deer and elk to shift their habitat use to portions of their winter range with more thermal cover located in the valley bottom throughout their winter range. By providing connected mature stands in proportions similar to</i></p>

		<p><i>what was observed in the area historically, DNRC anticipates that wildlife populations will also be maintained. Impacts to big game thermoregulation in the summer was not an issue raised during scoping and was not evaluated in the DEIS. We are unaware of any information available that suggests summer thermal protection is limited and/or limiting for any of these big game populations in this area.</i></p>
<b>3t</b>	<p>Lynx suitable habitat will be reduced by between 2,741 and 3,052 acres resulting in adverse effects impacting lynx ability to move across the landscape unimpeded by clearcuts (that they avoid) and displacing them from key habitat.</p>	<p><i>The acreages listed in the comment are of acres that would be impacted by logging, but would likely retain sufficient conifer cover to continue providing suitable habitat for lynx as described on DEIS Table III-60 page 275. Action Alternative B would convert 311 more acres (3,052 acres) of suitable lynx habitat to temporary non-suitable habitat than Action Alternative C (2,741 acres). We agree that lynx would likely be displaced from these stands proposed for regeneration treatments, such as seed tree harvest units. We anticipate that displacement would occur for approximately 10-20 years until conifer saplings are large enough to provide snowshoe hare habitat. Other areas within the project area harvested within the last 20 years will continue to regenerate and grow into suitable lynx habitat. To ensure that lynx and other wildlife that prefer dense cover are able to move across the landscape while these stands are young, 300-foot wide connectivity corridors would be retained as per DNRC's HCP along some streams and ridgelines in the Project Area. Corridors planned for retention include Squeezer, Soup and Goat Creeks in the Project Area.</i></p>
<b>3u</b>	<p>The DEIS does not disclose what past monitoring has been done to determine whether the proposed treatments actually achieve the desired results.</p>	<p><i>DNRC engages in a number of efforts both during and after a timber sale to monitor the effectiveness of treatments implemented during a timber sale:</i></p> <ul style="list-style-type: none"> <li><i>• Timber sale inspections conducted during sale administration ensure that sale operations are in compliance with certain standard operating procedures, Administrative Rules for Forest Management, Montana Best Management Practices for Forestry (BMPs), and any other mitigation measures that might be stipulated in the sale contract.</i></li> <li><i>• Regeneration surveys are used following harvesting to monitor regeneration success.</i></li> <li><i>• Internal DNRC and statewide BMP audits are conducted on completed DNRC timber sales either annually or</i></li> </ul>

		<p><i>biannually to determine whether BMPs were properly applied and whether the BMPs were effective in preventing erosion and sediment delivery.</i></p> <ul style="list-style-type: none"> <li><i>• DNRC participates in fisheries monitoring with the Department of Fish, Wildlife, and Parks to measure the potential impact of forest management on fisheries habitats within the Swan River Basin. DNRC also conducts stream temperature monitoring, woody debris and shade surveys, fish habitat inventories, macroinvertebrate analyses, westslope cutthroat trout genetics assessments, water quality monitoring, population trend surveys, and fish passage assessments throughout Swan River State Forest.</i></li> <li><i>• Soil disturbance and coarse and fine woody material retention monitoring is regularly conducted on the Swan River State Forest.</i></li> <li><i>• Road closure devices are monitored annually to determine whether each is effective at keeping users from entering restricted areas.</i></li> <li><i>• Annual monitoring of access and road closures to ensure compliance with the Habitat Conservation Plan.</i></li> <li><i>• Biodiversity field reviews are conducted on selected timber sales, typically three to five years following harvesting, to monitor the implementation at the timber sale level of the biodiversity resource management standards described in the State Forest Land Management Plan and Administrative Rules for Forest Management. These reviews are conducted in a field setting and examine biodiversity issues associated with the timber sale, the silvicultural treatments used, and biodiversity-related mitigations (such as protection of snags, coarse woody debris, nutrients, and wildlife) implemented during the sale.</i></li> </ul> <p><i>The intent of the reviews is to monitor the effectiveness of the treatments and mitigations implemented at achieving desired results and for refining options to more effectively accomplish the agency's mission of managing for healthy and diverse forests and to comply with the Administrative Rules for Forest Management, BMPs, the newly approved HCP, and other applicable laws and agreements. More information on the intent, procedures, and results of these monitoring activities are published in DNRC's five-year SFLMP Monitoring Report, which is available upon request.</i></p>
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<p><b>3v</b></p>	<p>The DEIS did not take a hard look at how climate change affects and is affected by this project. Published scientific reports indicate that climate change will be exacerbated by logging. Hotter, drier conditions will affect tree regeneration. These stands that are regeneration logged may not regrow due to increased temperatures drying out the understory.</p> <p>Challenges in predicting responses of individual tree species to climate are a result of “species competing under a never-before-seen climate regime – one forests may not have experienced before either.” Achievable future conditions as a framework for guiding forest conservation and management, <i>Forest Ecology and Management</i> 360 (2016) 80–96, S.W. Golladay et al.</p> <p>At dry sites across our study region, seasonal to annual climate conditions over the past 20 years have crossed these thresholds, such that conditions have become increasingly unsuitable for regeneration. High fire severity and low seed availability further reduced the probability of postfire regeneration. Together, our results demonstrate that climate change combined with high severity fire is leading to increasingly fewer opportunities for seedlings to establish after wildfires and may lead to ecosystem transitions in low-elevation ponderosa pine and Douglas-fir forests across the western United States. Wildfires and climate change push low-elevation forests across a critical climate threshold for tree regeneration, <i>PNAS</i> (2018), Kimberley T. Davis, et al.</p>	<p><i>As stated on pages 26-27 of the DEIS, issues related to the impacts of climate change on forest growth were eliminated from further analysis. As stated on page 26 of the DEIS, impacts of climate change will be complex and variable and dependent on multiple factors including species, site, and stand conditions. We agree that there are challenges in predicting the response of individual tree species to changing climate and that changing climate may impact tree regeneration; however, the publications attached by the commenter refer to forest types commonly found on warm/dry sites. The Davis et al. study also refers to post-fire regeneration, not post-logging regeneration. In the comparatively more moist sites in the Swan Valley, at this point in time we have observed no impacts on the ability of trees to successfully regenerate following harvesting.</i></p>
<p><b>3w</b></p>	<p>The State Forest Land Management Plan has no strategy for carbon reduction and this project will increase carbon emissions from log trucks driving to access the project area and from removing stored carbon from the forest.</p>	<p><i>As stated on page 31, Table I-2 of the DEIS, the lack of a strategy for carbon reduction in the SFLMP is outside of the scope of the project and is removed from analysis. Carbon emissions associated with short-term use of mechanized logging equipment are disclosed on pages 323-329 of the</i></p>

		<p><i>DEIS. Additionally, effects to forest carbon are disclosed on pages 160-163 of the DEIS.</i></p>
<p><b>3x</b></p>	<p>Also, the DEIS did not analyze the impacts to fish from rising stream temperatures, less water and increased peak flows due to climate change.</p>	<p><i>Watershed level thermal regimes are generally driven by basin geology, stream morphology, seasonal discharge patterns, riparian condition, and precipitation patterns (Poole and Berman 2001, Caissie 2006, Webb et al. 2008). While the primary factors listed above determine the overall thermal regime of project area streams, climate change has been shown to have a potential long-term effect on stream temperature, and subsequently fisheries populations, based on climatic factors including seasonal air temperature and seasonal shifts in the timing and intensity of precipitation patterns (Williams et al. 2009, Isaak et al. 2017). While climate change is likely to affect lotic thermal conditions regionally (Isaak et al. 2017), the effects analysis is focused on specific management actions which may affect thermal conditions in the analysis area.</i></p> <p><i>Current stream temperature data are presented in Figures III-12, III-13, and III-14 for Squeezer, Goat and Soup creeks respectively. Based on monitoring data, stream temperatures in Squeezer and Goat creeks normally are within the preferred range for bull trout (Rieman and Chandler 1999, Sauter et al. 2001, Selong et al. 2001, Rich et al. 2003, Bear et al. 2007), with peak summer temperatures in the optimal growth range for bull trout (Selong et al. 2001). Stream temperatures in Soup Creek are slightly warmer, however peak summer temperatures are regularly in the optimal growth range for bull trout and lower than the predicted upper incipient lethal temperature for bull trout (Selong et al. 2001). The primary effects mechanism which may affect stream temperature would be riparian timber harvest. Under both proposed Action Alternatives, no proposed RMZ harvest would occur. Existing levels of stream shade would be retained in the SMZ and RMZ, meaning that any observed changes in the thermal regime would likely be due to broader watershed level changes in hydrological patterns.</i></p> <p><i>DNRC acknowledges that the anticipated effects of climate change may result in alterations to the natural flow regime during both high and low discharge periods due to changes in the frequency and intensity of precipitation and runoff events (Poff 2002, Williams et al. 2009, Leppi et al. 2012). These</i></p>

		<p><i>alterations to the historical flow regime may directly impact fisheries populations, however the scale and magnitude of those effects are largely outside of the scope of analysis for this project (Holsinger et al. 2014).</i></p>
<p><b>3y</b></p>	<p>How will the costs for this timber sale be tracked? How will the revenue be tracked?</p> <p>The economic prediction for direct state revenue is \$5,026,602 or 4,472,290. Direct trust revenue is estimated at \$1,533,114 (Alt B) or \$1,364,048 (Alt C). Please disclose how DNRC will deal with bids that come in appreciably lower than the EIS predicts and how that is reconciled with school trust revenue.</p> <p>The DEIS raised many questions and lacked analysis; this needs to be addressed in the DEIS. Please keep us informed.</p> <p>/s/Arlene Montgomery Program Director</p>	<p><i>Revenue received from each timber sale is tracked and recorded using an accounting database. Total project revenue is computed by summing all project payments received and recorded. Operational expenses are tracked and recorded at the land office level in a separate accounting database. Costs are primarily DNRC wages and are not project specific but are averaged across all timber sales managed in a given accounting period across each land office. Costs relating to contracted development work are estimated by comparing the development work to previous contracts executed on timber sales in the same region. Detailed revenue information is published yearly by DNRC in the Fiscal Year Annual Report. Detailed expense information is published yearly by DNRC in the Return on Assets Report. Both reports are available on DNRC Trust Land Management Division’s website <a href="http://dnrc.mt.gov/divisions/trust">http://dnrc.mt.gov/divisions/trust</a></i></p> <p><i>DNRC guarantees excessive losses from low bidding by placing a minimum, or a reserve bid, on each timber sale contract. These minimum bids are set to protect a significant proportion of the appraised value in any contract, set at over 60 percent of the final appraised value. Currently DNRC does not anticipate a downward market trend in the regional forest products industry. As stated in the Direct and Indirect Economic Effects Analysis of the action alternatives, we recognize the range of variability between the revenue generation anticipated during the analysis phase of the EIS compared to what may be realized at the time of the sale:</i></p> <p><i>“State income effects reported are based on a preliminary appraised timber sale contract value which references sawlog prices reported from the University of Montana Bureau of Business and Economic Research 2020 Second Quarter Report. The estimated value in this EIS is preliminary and does not reflect the actual appraised sale values associated with any sale contract package. At the time of an actual sale, appraised values are expected to change with reported sawlog</i></p>

		<p><i>prices and other data refreshed in the timber sale contract package.</i></p> <p><i>Direct labor income from harvesting and processing of timber in the proposed action is estimated at \$11,121,316 or \$9,894,905, for Alternative B and C, respectively.</i></p> <p><i>Estimated direct and indirect employment effects include the contribution to 223 or 199 full-time jobs for one year for alternatives B and C, respectively. The level of employment sustained by these alternatives is estimated using industry research by the Bureau of Business and Economic Research.”</i></p>
4	<p style="text-align: center;"><i>Swan View Coalition 3165 Foothill Road, Kalispell, MT 59901 3/18/2024 Via: Email</i></p> <p>Swan River State Forest 34925 MT Hwy. 83 Swan Lake, MT 59911 Attn: Chad Blanchard, Project Leader Via email to: <a href="mailto:chad.blanchard@mt.gov">chad.blanchard@mt.gov</a></p> <p>Mr. Blanchard,</p> <p>Please accept the following comments on the Draft Environmental Impact Statement for the Squeezer Meadow Multiple Timber Sale projects on behalf of Swan View Coalition. We have read the comments submitted today by Friends of the Wild Swan. We concur with them and, rather than repeat them, we hereby incorporate them by reference as our comments also in this matter.</p> <p>Thank you for keeping us informed about this project and please continue to do so.</p> <p>Sincerely,</p> <p>Keith J. Hammer Chair</p>	<p style="text-align: center;"><b>DNRC Response:</b></p> <p><i>Please refer to the above responses to comments 3a – 3y submitted by Friends of the Wild Swan.</i></p>

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