MCNAMARA LANDING TIMBER SALE Environmental Assessment

March 9, 2012
Montana Department of Naural Resources and Conservation
Southwestern Land Office
Missoula Unit

FINDING
MCNAMARA LANDING TIMBER SALE

An interdisciplinary team (ID Team) has completed the Environmental Assessment (EA) for the McNamara Landing Timber Sale prepared by the Montana Department of Natural Resources and Conservation (DNRC). After review of the EA, project file, public correspondence, Department Administrative Rules, policies, and the State Forest Land Management Plan (SFLMP), I have made the following decisions:

1. ALTERNATIVE SELECTED

Two alternatives were presented and the effects of each alternative were fully analyzed in the EA:

1. The No Action Alternative
2. The Action Alternative

The Action Alternative proposes to harvest approximately 1.5-2 million board feet (MMBF) of timber on 330 acres. The No Action Alternative does not include the harvest of any timber. Subsequent review determined that the alternatives, as presented, constituted a reasonable range of potential activities.

For the following reasons, I have selected the Action Alternative without additional modifications:

a) The Action Alternative meets the Project Need and the specific Objectives of the Proposed Action (Desired Outcomes and Conditions) as described on pages 1 and 2 of the EA. The Action Alternative would produce an estimated $195,000-$260,000 ($130/MBF) return to the Common School (CS) Trust, while providing a mechanism whereby the existing timber stands would be moved towards conditions more like those which existed historically.

b) The analysis of identified issues did not disclose any reason compelling the DNRC to not implement the timber sale.

c) The Action Alternative includes mitigation activities to address environmental concerns identified during both the Public Scoping phase and the project analysis.

2. SIGNIFICANCE OF IMPACTS

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

a) **Water Quality –** There would be a low risk of direct or indirect impacts to water quality or downslope beneficial uses within the watershed. There is very low risk of cumulative impacts to water quality or beneficial uses from increases in water yield or sediment delivery. Water Quality Best Management Practices for Montana Forests (BMPs) and the Streamside Management Zone (SMZ) law will be strictly adhered to during all operations involved with the implementation of the Action Alternative.

b) **Cumulative Watershed Effects –** Estimated increases in annual water yield for the proposed action has been determined to be negligible by the DNRC Hydrologist. Increases in sediment yield are expected to be negligible due to the amount of area treated, location along the landscape, replacement and/or improvement of existing culverts and mitigations designed to minimize erosion.

c) **Geology/Soil Resources –** With the implementation of BMPs and the recommended mitigation measures, the proposed harvest operations present a low risk of detrimental impacts to soils. Existing roads would be improved to meet BMPs. Leaving 5 – 15 tons of large, woody debris on site will provide for long-term soil productivity. Harvest mitigation measures such as skid trail planning and season of use limitations will limit the potential for severe soil impacts

d) **Cold Water Fisheries –** Implementation of the SMZ Law and Rules, Best Management Practices and site-specific recommendations of the DNRC Soil Scientist and Hydrologists would minimize impacts to downstream perennial stream channels. Replacement of the road-stream crossing on Warm Springs Creek will improve fish passage, connectivity and water quality.

e) **Noxious Weeds –** Equipment will be cleaned prior to entering the project area, which will reduce the likelihood of weed seeds being introduced onto treated areas. The DNRC will monitor the project area for two years after harvest and will use an Integrated Weed Management strategy to control wee infestations should they occur.

f) **Forest Conditions and Forest Health –** Implementation of the Action Alternative would alter stand conditions towards those which were more common historically. The remaining stands would likely emulate those conditions which existed prior to European settlement, with seral species dominant. Many of the large ponderosa pine and western larch would

likely have survived the mixed severity fires which were common in these forest types, and be represented in the forest much as they will be following treatment. Many of the smaller encroaching Douglas fir will be removed and the forest will approach the seral species mix of a more natural condition. Stand productivity would also be expected to increase.

g) **Air Quality –** Full compliance with applicable air quality laws would be achieved by securing approval from the Montana-Idaho state airshed group prior to any burning operations. Burning associated with slash disposal would only be done on days with good to excellent smoke dispersion.

h) **Visual Quality –** Reduced stocking levels, fresh slash and skid trails could affect the appearance of the project area. Following treatment, all stands would have a more open appearance.

i) **Wildlife –** The proposed harvest operations present a minimal likelihood of negative impacts to Threatened and Endangered Species. Those potential impacts that do exist have been mitigated to levels within acceptable thresholds. The same is true for those species that have been identified as "sensitive" by the DNRC. The effects of the proposed action on Big Game species would be low due to habitat not being a limiting factor in the project area.

3. PRECEDENT SETTING AND CUMULATIVE IMPACTS

The project area is located on State- owned lands, which are "principally valuable for the timber that is on them or for growing timber or for watershed" (**MCA 77-1-402**). The proposed action is similar to past projects that have occurred in the area. Since the EA does not identify future actions that are new or unusual, the proposed timber harvest is not setting precedence for a future action with significant impacts.

Taken individually and cumulatively, the identified impacts of the proposed timber sale are within established threshold limits. Proposed timber sale activities are common practices and none of the project activities are being conducted on fragile or unique sites.

The proposed timber sale conforms to the management philosophy adopted by DNRC and is in compliance with existing laws, policies, guidelines, and standards applicable to this type of action.

4. SHOULD DNRC PREPARE AN ENVIRONMENTAL IMPACT STATEMENT (EIS)?

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

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

b) Evaluation of the potential impacts of the proposed timber sale indicates that significant impacts to the human environment will not occur as a result of the implementation of The Action Alternative.

c) The ID Team provided opportunities for public review and comment during project development and analysis.

// Jonathan Hansen
Jonathan Hansen
Missoula Unit Manager-Decision Maker
DATE 3-14-2012

McNamara Landing Timber Sale
Environmental Assessment

Cover Sheet

Proposed Action: The Montana Department of Natural Resources and Conservation (DNRC) proposes to conduct forest management activities in section 36, T14N – R17W. This work would involve: harvesting approximately 12,000 tons (1.8 MMBF) of sawtimber from 330 acres by commercial thinning and salvage treatment. Prescribed burning of slash piles would be performed on approximately 50 acres.

Revenue generated for this project would be for the Common Schools (CS) grant. Approximately $195,000 – $260,000 ($130/MBF) would be generated from the proposed action. The proposed action would be implemented as early as August 2012 and could be completed by February 2015. Slash work and burning associated with the sale may not be completed until the fall of 2015. These dates are approximate.

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Special Note: Comments received in response to this Environmental Assessment will be available for public inspection and will be released in their entirety if requested pursuant to the Montana Constitution.

How to Read this EA

(Environmental Assessment)

To read this EA more effectively, carefully study this page. Following State regulations, we have designed and written this EA (1) **to provide** the Project Decision Maker with sufficient information to make an informed, reasoned decision concerning the proposed McNamara Landing Timber Sale and (2) **to inform** members of the affected and interested public of this project so that they may express their opinions to the Project Decision Maker.

This EA follows the organization and content established by the Administrative Rules of Montana (ARM 36.2.521-36.2.543). The EA consists of the following chapters.

1.0 Purpose and Need for Action
2.0 Alternatives, Including the Proposed Action
3.0 Affected Environment
4.0 Environmental Consequences
5.0 List of Agencies and Persons Consulted
6.0 References
7.0 Appendix

Chapters 1 and 2 together serve as an Executive Summary. We have written these two chapters so that non-technical readers can understand the potential environmental, technical, economic, and social consequences of **taking** and of **not taking** action.

- **Chapter 1** introduces the McNamara Landing Project. It provides a very brief description of the proposed McNamara Landing Project and then explains three key things about the project:

(1) the relevant environmental issues,

(2) the decisions that the Project Decision Maker must make concerning this project, and

(3) the relevant laws, regulations, and consultations with which the DNRC must comply.

- **Chapter 2** serves as the ***heart*** of this EA. It provides detailed descriptions of Alternative A: No Action and Alternative B: Action. Most important, it includes a **summary comparison** of the predicted effects of these two alternatives on the human environment, providing a clear basis for choice between the two alternatives for the Project Decision Maker and the Public.

- **Chapter 3** briefly describes the past and current conditions of the relevant resources (*issues*) 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 4** presents the detailed, analytic predictions of the consequences of implementing Alternative A: No Action and Alternative B: Action. These predictions include the direct, indirect and cumulative effects of implementing the alternatives.

1.0 Purpose and Need

1.1 Introduction

The Montana Department of Natural Resources and Conservation (DNRC) is proposing to harvest timber in the Potomac Gold Creek vicinity. The proposed project area is composed of 580 acres of Common Schools Trust land in Section 36, T14N R17W approximately 10 miles northeast of Bonner, Montana (see figure 1.1). Under the proposed action, the DNRC would harvest approximately 1.8 million board feet (1,800 mbf) from approximately 330 acres while constructing approximately 0.5 miles of new roads. The proposed action would be implemented as early as May, 2012 and could continue until December, 2014.

The school trust lands involved in the proposed project are within the administrative boundaries of the DNRC Missoula Unit, located in Missoula, MT.

1.2 Project Need

The lands involved in the proposed project are held in trust by the State of Montana for the support of specific beneficiary institutions. These include public schools, state colleges and universities, and other specific state institutions such as the School for the Deaf and Blind (Enabling Act, February 22, 1889; 1972 Montana Constitution, Article X, Section 11). The Board of Land Commissioners(Land Board) and the DNRC are required by law to administer these Trust Lands to produce the largest measure of reasonable and legitimate long term advantage for the beneficiary institutions (Section 77-1-202, MCA). All forested lands involved in the proposed project would be managed in accordance with DNRC's State Forest Management Plan (SFLMP), Administrative Rules for Forest Management (ARMs: ARM 36.11.401 – 456), the Montana DNRC Forested State Trust Lands Habitat Conservation Plan (HCP) and other applicable state and federal law.

Many of the stands in the project area have high tree densities and increasing amounts of shade tolerant species that, due to the lack of natural or human-caused disturbance, may soon dominate these stands. Continued increases of the shade tolerant component in the project area would move these stands away from desired future conditions (DFC) as described in Chapter 3 of this section. These stands lack the seral species regeneration that is necessary to maintain and promote DFC in these stands. Active management in these stands would produce revenue for the Common Schools Trust while encouraging future stand conditions and development that reflect the programmatic DNRC's goals of managing for healthy and biologically diverse forests.

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1.3 Objectives of the Proposed Action (Desired Outcomes and Conditions)

In order to fulfill the management philosophy adopted through the SFLMP and the ARM's for Forest Management, the DNRC has set the following specific project objectives:

- Harvest sufficient timber volume to generate revenue for the Common Schools (CS) Trust grant.

- Reduce the occurrence of Mountain Pine beetles in Ponderosa and Lodgepole Pine to improve forest health and maintain stand productivity while capturing value of the affected trees.

- Maintain and enhance timber stand vigor and growth by utilizing methods which promote tree resilience to insects and diseases.

- Move existing stands toward desired future conditions for healthy and biologically diverse forests.

1.4 Decisions to be made

The following analysis will be performed by the Decision Maker and incorporated into the Finding at the beginning of this document:

- Determine if alternatives meet the project objectives.
- Determine which alternative should be selected.
- Determine if the selected alternative would cause significant effects to the human environment, requiring the preparation of an Environmental Impact Statement (EIS).
- Determine the economic and logistical feasibility of the project.

1.5 Relationship to the State Forest Land Management Plan, Administrative Rules for Forest Management, and HCP

In 1996, the Land Board approved the Record of Decision (ROD) for the State Forest Land Management Plan (SFLMP). The SFLMP provides philosophical basis, consistent policy, technical rationale, and guidance for the management of forested state trust lands. In 2003, DNRC adopted the Administrative Rules for Forest Management (Forest Management Rules; ARM 36.11.401 through 456). The Forest Management Rules are the specific legal resource management standards and measures under which DNRC implements the SFLMP and subsequently its forest management program.

In December 2011, the Land Board approved the Record of Decision (ROD) for the Montana Forested State Trust Lands Habitat Conservation Plan (HCP). Approval of the ROD was followed by the issuance of an Incidental Take Permit (Permit) by the U.S. Fish and Wildlife Service (USFWS). The HCP is a required component of an application for a Permit which may

be issued by the U.S. Fish and Wildlife Service or National Marine Fisheries Service to state agencies or private citizens in situations where otherwise lawful activities might result in the incidental take of federally-listed species. The HCP is the plan under which DNRC intends to conduct forest management activities on select forested state trust lands while implementing specific mitigation requirements for managing the habitats of grizzly bear, Canada lynx, and three fish species: bull trout, westslope cutthroat trout, and Columbia redband trout.

This project was developed in compliance with the State Forest Land Management Plan (SFLMP), the Administrative Rules for Forest Management (Forest Management Rules; ARM 36.11.401 through 471), and conservation commitments contained in the Selected Alternative in the Final EIS of the Montana Forested State Trust Lands Habitat Conservation Plan (HCP) and associated Record of Decision (ROD), as well as other applicable state and federal laws. The proposed action is limited to specific management activities that are needed to implement the project and provide resource protection. This Environmental Assessment (EA) documents site-specific analysis and is not a general management plan or programmatic analysis of the area. The scope of this EA was determined through DNRC interdisciplinary analysis and public involvement.

1.6 History of the Planning and Scoping Process

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

The Burnt Bridge Timber Sale project was proposed in this section in the Fall of 1991. Champion Timberlands owned much of the Gold Creek drainage at the time and were very aggressively logging the area. The land surrounding the Burnt Bridge project was heavily logged and the proposal generated a great deal of public interest and scrutiny. The Department of State Lands (DSL), which later merged with the Montana Department of Natural Resources and Conservation (DNRC), was in the initial stages of developing strategies to effectively implement the Montana Environmental Policy Act (MEPA). As a result, the agency decided that a great deal of time on the part of many individuals would be required to adequately address the issues in a document which would be defensible in court. At that time, December of 1994, the agency decided to postpone further work on this proposed timber sale in order to complete other harvest volume objectives.

Public scoping for the McNamara Landing Timber Sale was initiated in June of 2006. Scoping notices were sent to 24 various entities including the Confederated Salish & Kootenai Tribes F.H. Stoltze Land and Lumber, Plum Creek Timber Company, Montana Fish Wildlife and Parks, Alliance for the Wild Rockies, Friends of the Wild Swan, Wild West Institute and the Montana Wood Products Association. Private individuals who had commented on the previous proposed project for this section were also scoped. Written and/or verbal comments were received in the form of letters, emails and personal communication. Issues identified in the scoping process are included in section *1.9 Issues and Concerns* of this EA.

The following resource specialists were involved in the project design, assessment of potential impacts and development of mitigation measures:

Jeff Rupkalvis – Project Leader/Forest Management Supervisor, DNRC Missoula Unit
Jonathan Hansen – Unit Manager, DNRC Missoula Unit
Jeff Collins – Hydrologist/Soil Scientist, DNRC Southwest Land Office
Mike McGrath – Wildlife Biologist, DNRC Southwest Land Office
Dana Boruch – Right Of Way Specialist, DNRC Southwest Land Office
Patrick Rennie – DNRC Archeologist, Agriculture and Grazing Management Bureau

1.7 Other Environmental Assessments (EA's) Related to this Project

Several other projects are either recently completed, in progress or are in development within the general area of the proposed McNamara Landing Timber Sale. Table 1.1 displays the name of the proposed activity, the year when the activity would be initiated or active and the type of activity proposed. Of the projects listed, all are outside of any analysis area used in this assessment and would have no measurable cumulative effects on wildlife considered in this assessment.

Table 1.1: OTHER DNRC ACTIVITIES

Project Name	Approximate Air Miles from McNamara Landing	Year of Proposed Activity	Status	Description of Proposed Activity
Roman – Sixmile Timber Sale	30	2007	In Progress	Precommercial Thinning
Evaro Thinning	20	2009	Completed	Precommercial Thinning
Deer Creek Timber Sale	10	2010	In Progress	Shelterwood
Tarkio Timber Sale	30	2011	In Progress	Commercial Thinning, Individual Tree Selection
Mill Creek Timber Sale	30	2010	In Progress	Commercial Thinning, Individual Tree Selection
Lubrecht Thinning	10	2011	Completed	Precommercial Thinning

1.8 Other Agencies with Jurisdiction/Permit Requirements

The Project Area is within Airshed 3A and the Missoula Impact Zone for prescribed burning. DNRC is a member of the Montana/Idaho Airshed Group, which regulates prescribed burning, including both slash and broadcast burning, related to forest management activities done by DNRC. As a member of the Airshed Group, DNRC agrees to burn only on days approved for good smoke dispersion as determined by the Smoke Management Unit in Missoula, MT.

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

The Missoula County Health Department regulates prescribed wildland outdoor burning in Missoula County. DNRC is considered a major outdoor burner in Missoula County, and is permitted to conduct prescribed wildland outdoor burning in Missoula County by virtue of its major open burning permit issued by the Montana DEQ. When burning in Missoula County, DNRC agrees to conduct burning activities in accordance with County Outdoor Burning Regulations.

A 124 permit would need to be obtained from the Montana Department of Fish, Wildlife and Parks for a proposed culvert replacement on Warm Springs Creek.

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

1.9 Issues and Concerns

Through careful consideration of each public comment submitted and through extensive field reconnaissance, the ID Team several issues related to the proposed project. Issues pertain to statements that raise concern about the potential impacts the project may have on various resources. Of these issues, the ID Team determined which would be analyzed in detail and which would be eliminated from further analysis. Issues to be analyzed in detail were determined to be relevant and within the scope of the project and were thus included in the impacts analyses and used to assist the ID Team in alternative development (*Section 1.9.1*). Issues that were eliminated from further analysis were those that were determined to be either not pertinent to alternative development or beyond the scope of the project and were thus not carried through in any of the impacts analyses (*Section 1.9.2*).

1.9.1 Issues Studied in Detail

Wildlife-Related Issues

- There is a concern that the proposed action may negatively affect habitat connectivity for resident bird and mammal populations.
- There is a concern that the proposed action's resulting road densities and vegetation management may negatively affect grizzly bears.
- There is a concern that the proposed action may negatively affect bald eagles.
- There is a concern that the proposed action may negatively affect flammulated owls.
- There is a concern that the proposed action may negatively affect peregrine falcons.
- There is a concern that the proposed action may negatively affect pileated woodpeckers.
- There is a concern that the proposed action may negatively affect fishers.
- There is a concern thtat the proposed action may negatively affect interior forest songbird habitat.
- There is a concern that the proposed action may negatively affect pine marten habitat.
- There is a concern that the proposed action may negatively affect northern goshawk habitat.
- There is a concern that the proposed action may negatively affect great gray owl habitat.
- There is a concern that the proposed action may negatively affect barred owl habitat.
- The primary concerns relating to water resources within the analysis area are potential impacts to water quality from sediment sources outside the stream channels as well as inside the channel. Comments were received recommending a minimum 100 ft Streamside Management Zone. In order to address these issues the following parameters were analyzed for each alternative:

  ~Miles of new road construction and road improvements
  ~Potential for sediment delivery to streams
  ~Potential for water yield increase impacts to stream channel stability

- There is a concern that the proposed timber harvest may cause or contribute to cumulative watershed impacts as a result of increased water yields.

<u>Fisheries Issues Raised During Scoping</u>

Issues related to fisheries resources that were raised from DNRC internally and from public scoping include: The proposed actions may adversely affect fisheries habitat features, including channel forms, stream temperature, and connectivity; habitat fragmentation may have direct, indirect and cumulative effects to fisheries resources;

- fisheries resources in Warm Springs Creek may potentially be impacted;
- existing levels of fine sediment in the analysis areas should be disclosed;
- fisheries populations and trends in the analysis areas should be disclosed;
- short-duration peak flows from water yield alteration may impact fisheries resources;

- rain-on-snow event frequency and duration may be affected by the proposed actions, which may affect fisheries resources;
- peak flow increases may occur due to increased road densities, which may affect fisheries resources;
- poorly maintained roads may cause increased levels of sedimentation, which may affect fisheries resources;
- BMPs may not reduce cumulative effects of roads to fisheries resources;
- road sedimentation to degrade fisheries resources is not a wise choice for our
- future;
- road densities may have direct, indirect and cumulative effects to fisheries resources, especially bull trout;
- statistical uncertainty in the effects assessment of fisheries resources should be disclosed.

Issue statements 1- 5 (public) will be carried through the analysis of fisheries resources in this environmental assessment. Although limitations in the degree to which issue statement #4 is assessed are described in "Proposed McNamara Landing Timber Sale: Fisheries-related public comments to scoping and detailed responses", which can be found in the project file. Issue statements 6-10 will be further discussed in the Hydrology Analysis; and, the Fisheries Analysis will reference that document as needed to describe foreseeable effects to fisheries resources. Issue statements 11-13 will not be carried through the analysis of fisheries resources in this environmental assessment, and the rationale for these issue dismissals are described in "Proposed McNamara Landing Timber Sale: Fisheries-related public comments to scoping and detailed responses", which can be found in the project file.

1.9.16 Identify All Areas Harboring Rare, Threatened or Endangered Plants, Old Growth and Wetlands including Specific Plans for their Protection and Management.

There is a concern that the proposed management activities may disturb areas containing endangered plants, old growth timber and wetlands.

1.9.17 Management Plans to Minimize Exotic Plant Invasions

There is a concern that the proposed forest management activities may introduce or spread noxious weeds and that disturbed areas should be reseeded.

1.9.18 Potential Impacts to Recreational and Educational Opportunities

The proposed management activities may have an impact on recreational and educational opportunities.

1.9.19 Soils – Alluvial Deposits Pose Erosion Risks

There is a concern that forest management activities may result in increased erosion and reduced soil productivity due to excessive disturbance, compaction and displacement, or loss of nutrients depending on area and degree of harvest effects.

1.9.2 Issues Eliminated from Further Study

Old Growth

The DNRC uses the minimum criteria described by *Green et. al. (Old Growth Forest Types of the Northern Region, 1992)* to identify old growth stands on school trust lands. *Green et. al.* describes characteristics of old growth forests in Montana and defines the minimum number of trees per acre of a specified diameter at breast height (dbh) and age for each old growth type. DNRC's Stand Level Inventory (SLI) provides an initial classification of old growth stands on State lands. These stands are verified through field reconnaissance and/or the collection of field data during project preparation. The field verification process may, in some cases, identify old growth stands that were not classified as old growth in the SLI and in other cases may change stands that were identified as old growth in the SLI to a non old growth classification.

Given the history of logging in this section, (1892 – Big Blackfoot Milling Company and 1940 – 1955 – the Anaconda Company) where clearcutting was the common practice, there are no stands which meet the minimum criteria for old growth. This was confirmed by field surveys, therefore, this issue was not considered for further analysis.

Canada Lynx

There is a concern that the proposed action may negatively affect Canada lynx. Based on stand level inventory data (SLI database 20110112 update) and lynx habitat definitions (ARM 36.11.403 (39), (40), (41), (42), (56), (86), and (96)), lynx habitat does not occur on the project area. As a result, there would likely be minimal risk of direct, indirect, or cumulative effects to lynx from the proposed action.

Gray Wolf

There is a concern that the timber harvest activities would alter gray wolf habitat or provide unnecessary disturbance for a federally endangered species. The project area is approximately 6 miles southwest of the nearest known wolf territory. Thus, due to the distance between the territory and project area there would be low risk of direct, indirect, or cumulative effects to gray wolves as a result of the proposed action.

Black-backed Woodpecker

There is a concern that the timber harvest activities would alter black-backed woodpecker habitat or provide unnecessary disturbance. The project area is located approximately 1.5 miles and 10 miles south of large fires from 2003 and 2007, respectively. Due to the distance between suitable black-backed woodpecker habitat and project area, there would be low risk of direct, indirect, or cumulative effects to black-backed woodpeckers as a result of the proposed action.

Big game (elk, deer, bighorn sheep) security

Big game generally avoid open roads, however, they become more tolerant of closed roads in the area over time (Lyon 1998). Extensive (e.g., ≥250 acres) areas of forest cover ≥0.5 miles from open roads serve as security for elk (Hillis et al. 1991). Thus, increasing the abundance of open roads or reducing cover that will hold big game could reduce big game security. Due to the proximity of existing open roads that surround the project area, there is no security habitat within the project area. Additionally, the proposed action would not create open roads. As a result, there would likely be minimal risk to big game security from the proposed action, and this issue will not be analyzed further.

The following species were considered but eliminated from detailed study due to lack of habitat present: Harlequin Duck, Townsend's Big-eared Bat, Coeur d'Alene Salamander, Northern Bog Lemming, Common Loon, Mountain Plover, and Columbian Sharp-tailed Grouse.

Rare, Threatened and Endangered Plants

Public scoping identified a concern for the potential impacts of timber harvesting and associated activities on any threatened, endangered or rare plants that may exist within the proposed sale area. A query of The Montana Heritage Program listed only Howell's Gumweed (Grindelia howellii) as a species of concern in the area. The sighting locations were several miles from the timber sale area.

A field reconnaissance survey for sensitive plant species was conducted on this section on June 3, 1992 by Montana Natural Heritage Program Botanist J. Stephen Shelly. This survey identified the plant Madia minima (Small Headed Tarweed) as existing on an open slope in the SW ¼ of the SW ¼ of the section. The total area occupied by the plant was approximately 1,500 square feet. The area occupied by this plant species is excluded from the harvest unit and is surrounded by a suitable protection zone which will prevent any damage from harvest and equipment operations.

The same June 3, 1992 survey found no occurrences of Cypripedium fasciculatum (Clustered Orchid) in this section. The Pseudotsuga menziesii\Physocarpus malvaceus (Douglas fir\ninebark) habitat type has been closely associated with this plant species and is present in this section. Another survey conducted June 9, 1993 by Robert Ethridge, Department of State Lands (now DNRC), Southwestern Land Office Silviculturist, and Peter Stickney, U.S. Forest Service Ecologist, found no occurrences of Cypripedium fasciculatum in the section either. As a result of the findings of these surveys, there is little risk of disturbance to any known rare, threatened or endangered plants.

Fisheries Analysis Areas Dismissed From Further Analysis

After considering comments received during scoping, project-specific issue statements (Section 1.9) and the extent of the proposed actions, the following three areas were dismissed from further analysis: Burnt Bridge Creek, Small Face Drainage to East Twin Creek, and Small Face Drainage to Gold Creek. [While these three analysis areas will not be further considered for

fisheries resources, one or more analysis area may be utilized in the assessment of other potentially affected resources in the project area.] The Burnt Bridge Creek area is dismissed from the further analysis of fisheries resources due to:

(1) The proposed actions would only occur on 0.9% of the total analysis area.

(2) The proposed actions in the affected 0.9% of the analysis area include relatively low impact selective thinning of merchantable timber.

(3) No upland harvest would occur within 260' of Burnt Bridge Creek.

(4) No roads or road-stream crossings in the analysis area would be utilized as part of the proposed actions.

The Small Face Drainages to East Twin and Gold creeks are dismissed from the further analysis of fisheries resources due to:

(1) The lack of any perennial or intermittent stream channels within the project area.

(2) The lack of any fisheries habitat within the analysis areas downslope of the project area.

(3) No upland harvest would occur within 910' of either East Fork Twin or Gold creeks

(4) Minor amounts of potentially affected area within downslope, contributing watersheds (0.3% of East Twin Creek and 0.3% of Gold Creek, respectively).

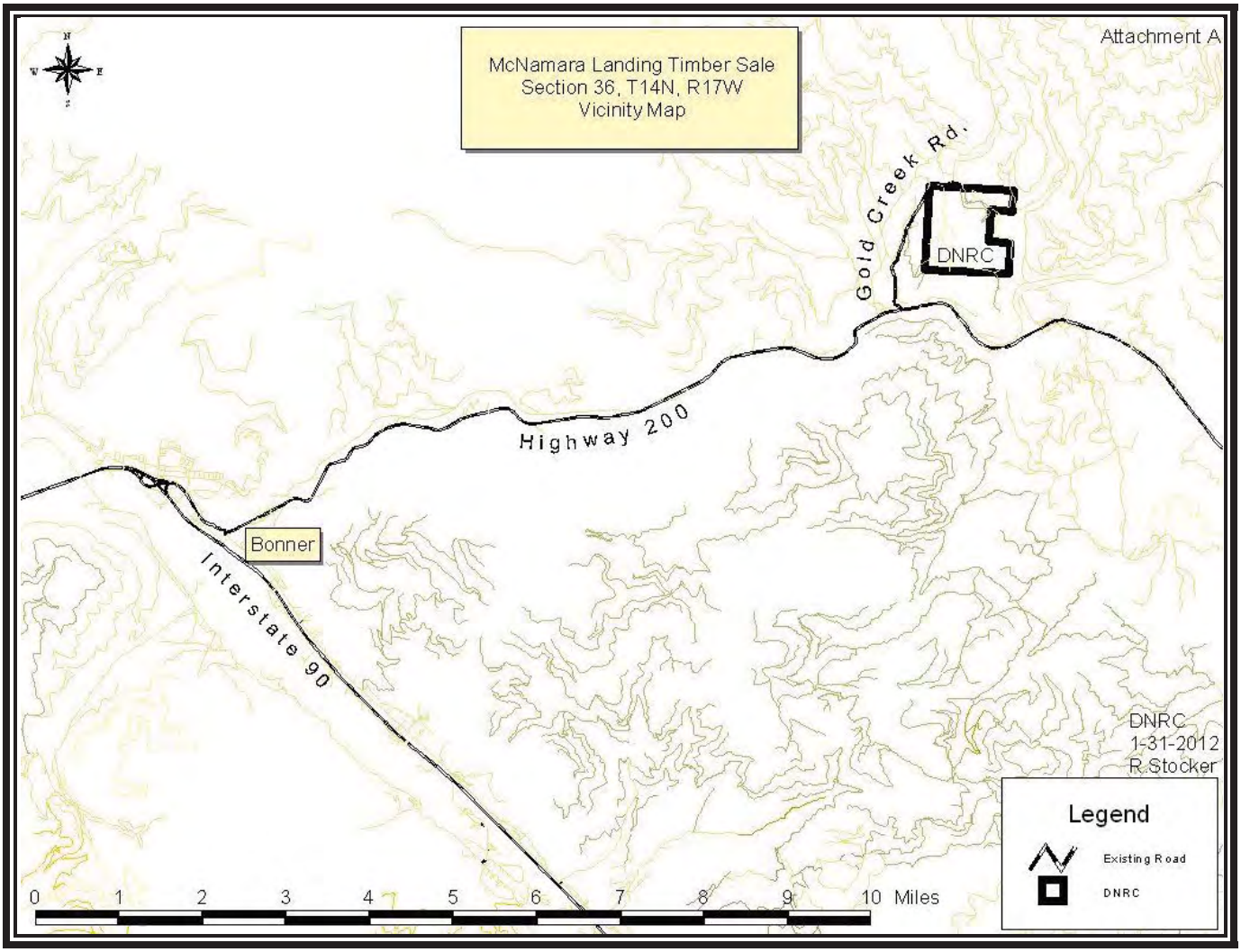
As no foreseeable direct or indirect impacts to fisheries resources would be expected to occur in the three dismissed analysis areas, no additional cumulative effects to fisheries resources would be expected in the these analysis areas as a result of implementing the Action alternative.

Impacts to Recreational and Educational Opportunities

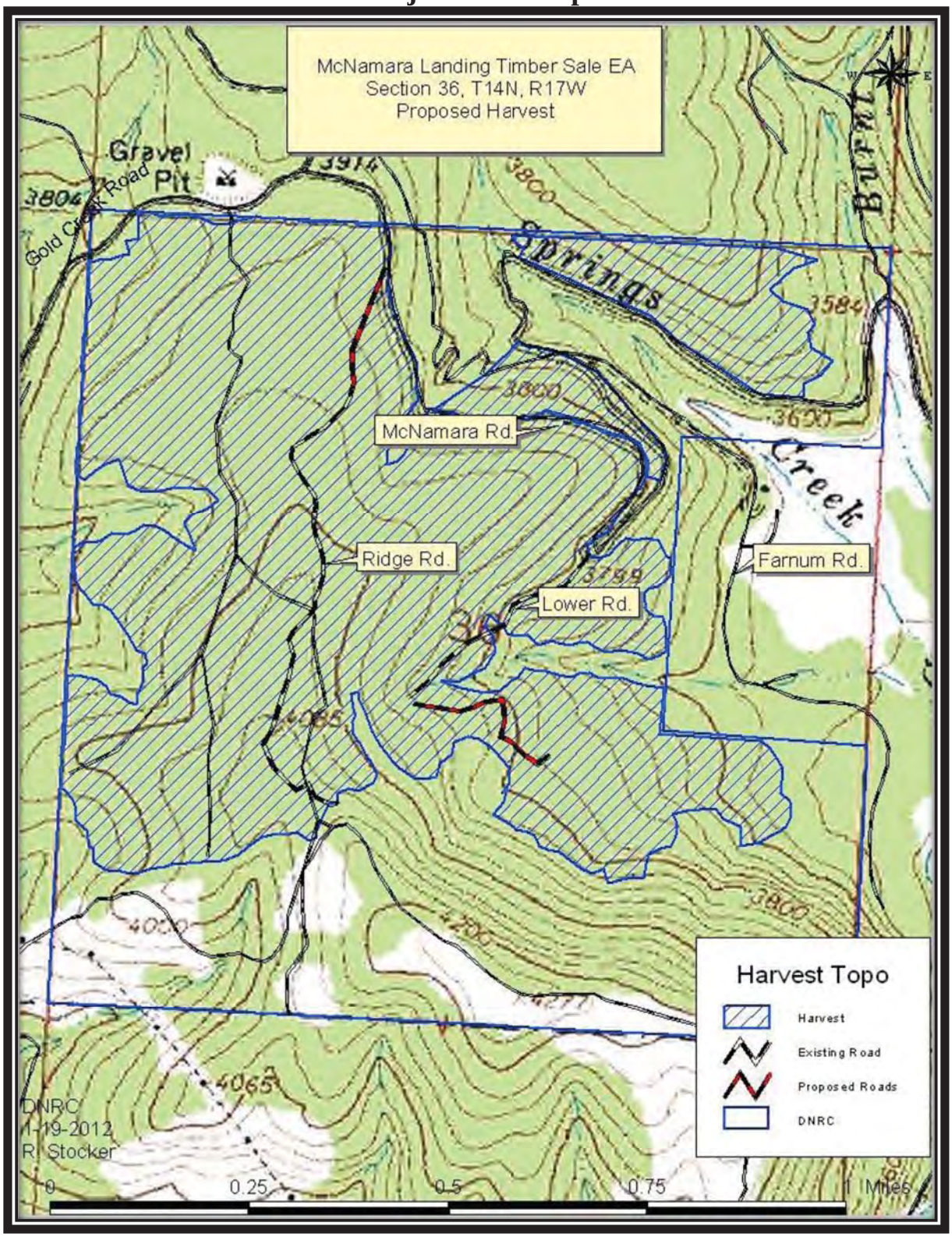
The comments received for the 1993 Burnt Bridge project were concerned mainly with the vernal pond located on Champion Timberlands, now owned by a private party. We received no comments regarding educational opportunities during the last scoping period. There are no Land Use Licenses on this State parcel for educational purposes.
There is a variety of recreational activities pursued within the State section. The major uses include: big game hunting, cross-country skiing, hiking, dog walking, horse riding, camping and paint ball shooting. The proposed activity would not adversely impact these activities. All the proposed roads are located behind a locked gate located on the McNamara Road, 1.8 miles from highway 200 up the Gold Creek Road, before entering the section. The majority of the roads which would be used if timber harvesting were to take place already exist. Any proposed road construction would be limited to short sections of new road to link the existing roads into a single usable road system. The reconstructed roads would be blocked to restrict public motorized access at the end of the timber sale.

The logging activities would create easier non-motorized access to parts of the section for increased hunting, hiking, horse riding and cross-country skiing opportunities. The commercial thinning would remove the smaller and unhealthy trees and retain the majority of the larger healthier trees creating a more open stand with greater opportunities for snow accumulation.

Figure 1.1


Attachment A
McNamara Landing Timber Sale
Section 36, T14N, R17W
Vicinity Map
Gold Creek Rd.
DNRC
Highway 200
Bonner
Interstate 90
DNRC
1-31-2012
R.Stocker
Legend
Existing Road
DNRC
0 1 2 3 4 5 6 7 8 9 10 Miles

Project Area Map



2.0 Alternatives Including the Proposed Action

2.1 Introduction

Chapter 2 describes the alternatives developed and considered in this EA. Summaries and comparisons are included for the activities associated with each alternative. The potential environmental consequences of these activities are included for comparison. Information regarding alternatives is presented in greater detail in chapters 3 and 4.

2.2 Development of Alternatives

Public Scoping was initiated in June of 2006.Written responses were received from Cathy and Tarn Ream, F.H. Stoltze Land and Lumber Company and the Wild West Institute. Additional comments were received through personal communication with Gary Farnum, an adjacent land owner and grazing lessee for this section. In August of 2010, a DNRC Interdisciplinary Team (IDT) began project area analysis and internal review to develop a management plan. Public comment and IDT input identified issues and shaped alternatives. Issues identified during the scoping process are summarized in Chapter 1: Purpose and Need.

2.3 Description of Alternatives

2.3.1 Alternative A: Deferred Harvest (No Action)

Activities associated with Alternative A: No Action:

Timber harvest would not occur in the project area at this time.

2.3.2 Alternative B: Harvest (Action)

Alternative B: Action was developed to address relevant issues, comply with applicable regulations and laws, provide effective mitigation for potential impacts and achieve project objectives. The proposed harvest would include removal of approximately 1.8 MMBF (million board feet) of Douglas-fir, Western Larch Ponderosa Pine and Lodgepole Pine from approximately 330 acres through a combination of sanitation harvest and commercial thinning. The healthy mature ponderosa pine, western larch and Douglas-fir would be retained where available. The large relic western larch would be retained for snags and snag recruitment. A minimum of two snags and two snag recruits per acre or one snag and one snag recruit per acre would be retained onsite, depending on the habitat type group as required by the Montana Administrative Rules for Forest Management (ARM 36.11.411).

Approximately 250 acres of the 580 acres (45%) of sate ownership would be deferred from harvest at this time.
Approximately 70% - 80% of the slash produced by the project would be piled and burned or removed from the site to avoid large accumulations of downed woody fuel. 5 – 15 tons of slash

would be retained to facilitate nutrient cycling and provide coarse woody debris (ARM 36.11.409 and 36.11.414).

2.3.2.1 Harvest Unit Designation

Stands were identified for treatment based on field reconnaissance by project IDT. Harvest prescriptions developed to meet project objectives based on current stand conditions are identified in Table 2.1.

Table 2.1 Description of Proposed Silvicultural Treatments

Prescription	Description	Proposed Harvest Units	Acres
Sanitation/Commercial Thin (SAN/CT)	In multi-aged stands that are dominated by healthy western larch, ponderosa pine and Douglas-fir, a SAN/CT prescription would restore and maintain existing stands and retain healthy stand characteristics. Stands designated for SAN/CT typically contain healthy vigorous dominant, codominant and intermediate western larch, ponderosa pine and Douglas fir which would be retained on a 20-30 foot spacing. Nearly all large trees (>20" DBH) would be retained in these stands.	All	330

Approximately ½ mile of new road construction would occur to access harvest units. The new construction would link exiting roads into a more efficient and usable road system. The Lower and Ridge Road systems would be blocked after the sale at their junctions with the McNamara Road by rebuilding the ditch and creating an earth barrier to discourage further use. The existing gate on the McNamara Road accessing the section would also be retained to further restrict motorized vehicle use. All roads would be upgraded to comply with the Forestry Best Management Practices (BMPs). These upgrades may include grading, surfacing, ditching and installation of drainage features such as culverts and drain dips.

2.4 Mitigation Measures of Alternative B: Harvest (Action)

Mitigations would be incorporated into project design, as a contract stipulation or may be implemented programmatically. The following discussion will address mitigation actions associated with the project

2.4.1 Mitigations for Protection of Water quality, Soils & Noxious Weed Management

2.4.1.1 Harvest Unit Design

- The DNRC would locate, mark and maintain suitable water resource protection boundaries including Streamside Management Zones (SMZ'S), Riparian Management Zones (RMZ's) and Wetland Management Zones (WMZ's) adjacent to streams and wetlands consistent with the State Forest Land Management Plan rules.

- Equipment restriction zones would be established to protect sensitive and moist soils.

- The contractor and sale administrator would agree to a general skidding plan prior to equipment operations.

- Ground based skidding would be limited to slopes of 45% or less.

- Operating season limitations for ground based skidding would protect vegetation and prevent rutting and soil compaction by requiring dry (< 20% moisture content), frozen or snow covered soil conditions for equipment operation.

- Soil moisture conditions would be monitored prior to equipment operation and throughout the project.

- Contract stipulations would require grass seeding and installation of drainage features and vehicle barriers. Slash would be placed on skid trails to protect soils and reduce erosion potential.

- Within moderate to densely stocked stands, whole tree skidding can reduce slash hazard, but also remove a portion of nutrients from growing sites. Target woody debris levels are to retain 5-15 tons/acre (old and new) well distributed on site while meeting the requirements of the slash law. On sites with lower timber harvest, retain large woody debris as feasible since it may not be possible to retain 5 tons/acre, with the emphasis on providing additional CWD (coarse woody debris) in the future. For fire safety, the amount of CWD will be treated to lower levels along a strip of land near main open roads.

2.4.1.2 Road Design and Location

- Forestry BMP's would be the minimum standard for all road construction and maintenance associated with the project.

- Existing roads on adjacent ownerships would be improved and maintained in association with the proposed project.

- Adequate road drainage such as drain-dips would be restored or installed on existing and new roads as needed to control erosion concurrent with harvest activities. All temporary spur roads would have adequate drainage installed and maintained during use prior to closure. For ground based operations, slash distributed on trails or temporary roads should be adequate to control erosion.

- Grass seed would be applied to newly constructed road cuts, fills and disturbed soils immediately after excavation.

- Road ditches with direct delivery to streams or ephemeral draws would be filtered at the ditch outlet by using slash or filter fabric and straw bales.

- Road use would be limited to relatively dry or frozen ground conditions to reduce rutting and erosion. New road construction, including drainage features would be required to be completed in the fall prior to freeze-up.

- Replace the Warm Springs Culvert, implement 124 permit requirements and BMP's to control sediment. Require rock armor over the inlet and outlet of culvert and construct slash filter windrows to filter road sediment.

2.4.2 Noxious Weed Mitigations

To reduce current noxious weed infestations and limit the spread of weeds, the following integrated weed management mitigation measures of prevention and control would be implemented:

- All road construction and harvest equipment would be cleaned of plant parts, mud and weed seed to prevent the introduction of noxious weeds. Equipment would be subject to inspection by the Forest Officer prior to moving on-site.

- All newly disturbed soils on temporary road cuts and fills would be promptly reseeded to protect the site from erosion.

- DNRC would monitor the project area for noxious weeds as part of on-going timber sale administration. If new noxious weeds occur following the harvest, a control plan would be developed and implemented that may include herbicide treatments. If herbicides are used, application would be done using a licensed applicator in accordance with label directions, State laws, and rules of the Missoula County Weed District.

2.4.3 Threatened and Endangered Species Mitigation Measures

- If any threatened or endangered species were encountered during the project planning or implementation periods, all project-related activities that would potentially affect that species would cease and a DNRC wildlife biologist would be informed immediately. Additional habitat protection measures would be designed and implemented where appropriate.

- If active den sites or nest sites of threatened, endangered, sensitive species, or raptors were located within the Project Area, activities would cease until a qualified biologist can review the site and develop species appropriate protective measures.

- Should an active wolf den be located within a one-mile radius, or a suspected rendezvous site be located within 0.5 miles of the proposed action, all mechanized activities would be suspended until such time as wolves are known to have vacated the site or it has been determined that resumption of activities would not present conflicts with wolf use.

- An eagle nest is located within 0.5 miles of the haul route down Gold Creek. Log hauling activities are limited to August 15 to January 31 to accommodate nesting activities. This time frame also accommodates nesting activities of goshawks, Great Gray and barred owls.

2.4.4 Sensitive Species Mitigation Measures

- Should nesting raptors be encountered, all operations would cease, and a DNRC Biologist would be consulted to develop additional mitigation measures to ensure the security of the nest site and specific animals, consistent with the Migratory Bird Treaty Act.

2.4.5 Fisheries Mitigation Measures

- One permanent road-stream crossing would be reconstructed on Warm Springs Creek to improve fish passage and water quality.

- Fisheries-related resource mitigations that would be implemented with the proposed Action Alternative include:

    (1) Applying all applicable Forestry BMPs and Forest Management Administrative Rules for fisheries, soils, and wetland riparian management zones (RMZ) (ARMs 36.11.425 and 36.11.426).

    (2) Monitoring all road-stream crossings for sedimentation.

2.5 Summary Comparison of Activities, Predicted Achievement of the Project Objectives, and Predicted Environmental Effects of All Alternatives

The following tables show the activities, objectives, and effects that would occur if Alternative A or Alternative B were implemented.

Table 2-2: SUMMARY OF PROJECT ACTIVITIES, ALTERNATIVES A AND B

Activity	Alt. A: No Action	Alt. B: Action
Area Harvested (acres)	0	330
Tractor yarding (acres)	0	330
Road construction (miles)	0	0.5
Prescribed Burning – Landing Piles (acres)	0	7

2.5.1 Predicted Achievement of Project Objectives

Alternative B: Harvest was designed to meet project objectives while providing for resource protection. Approximately $150,000 to $300,000 in net revenue would be generated to benefit the Common Schools Trust. Treatment would remove beetle infected and salvageable dead trees while thinning remaining stands to promote forest health and vigor. A summary is provided in table 2.3.

Table 2.3 Predicted Achievement of Project Objectives

Project Objective	Indicator of Attainment	Alternative A: No Action	Alternative B: Action
Harvest sufficient timber volume to generate revenue for the Common Schools (CS) Trust.	Timber volume to be harvested.	No Timber would be harvested in association with the proposed project.	Approximately 1.8 million board feet of saw timber would be harvested.
Reduce the occurrence of Mountain Pine Beetle to improve forest health and capture value	Acres of Mountain Pine Beetle infected stands to be treated.	No stands would be treated in association with the proposed project.	Approximately 330 acres of Mountain Pine Beetle infected stands would be treated.
Maintain and enhance timber stand vigor and growth.	Acres treated to remove dead and dying trees and suppressed trees.	No Acres would be treated to reduce the number of dead, dying and suppressed trees.	Tree thinning and sanitation would occur on approximately 300 acres.
Move stands toward desired future condition.	Stands would move toward the Desired Future Condition – healthy, desired tree species would remain	No change in cover type, therefore, no change toward DFC would be expected.	Approximately 330 acres would shift to desired DFC.

Table 2.4: Summary comparison of predicted Environmental Effects

ISSUE	ALTERNATIVE A: NO ACTION	ALTERNATIVE B: ACTION
SOIL RESOURCES	Minimal effects to soil resources.	Harvest mitigation measures (e.g., skid trail planning and limits on season of use) would limit soil impacts to 15% or less of harvest area. Retention of coarse woody debris on site would have long term beneficial effects on nutrient cycling, maintain long-term soil productivity and reduce on-site erosion.
WATER QUALITY	Implementation of the No Action Alternative would not change the current condition.	Harvest activities and road construction are not expected to significantly increase sediment yield to stream channels.
CUMULATIVE WATERSHED EFFECTS	Implementation of the No Action Alternative would not change the current condition.	Erosion control, BMPs and other mitigation measures expected to minimize long-term impacts to downstream water quality.
COLD WATER FISHERIES	Implementation of the No Action Alternative would not change the current condition.	Potential direct and indirect impacts to fisheries resources range from negligible to low. Minor positive cumulative effects to fisheries resources are expected in the Warm Springs analysis area; very low cumulative effects are expected in the Unnamed Tributary to East Twin Creek analysis area.
FOREST CONDITIONS AND FOREST HEALTH	Ecological health of the stands would continue to decline as ponderosa pine is replaced by Douglas-fir. Trees would continue to stagnate due to overstocking. Frequent outbreaks of pine beetle could be expected due to stressed condition of the stand. Large diameter ponderosa pine would likely not be restored on the site. There would be an increased potential for stand replacement wildfire in the long term.	Harvesting would move the stands closer to their pre-settlement open grown condition dominated by large Ponderosa Pine and Western Larch. Growth rates and health of trees would improve due to a reduction in stocking levels. Historic ecological processes and features would be enhanced. The stands would move toward the desired future condition for this site.

ISSUE	ALTERNATIVE A: NO ACTION	ALTERNATIVE B: ACTION
VISUAL QUALITY	No change from current state. Increased potential for stand replacement wildfire in the long term and its associated effect on visual quality.	Following treatment all stands would have a more open appearance. Steeper slopes that are visible from a distance would have a mottled green and white appearance in the wintertime due to the thinning of the stand in contrast to the solid green appearance now.
ECONOMIC BENEFITS AND EXPECTED REVENUES	No revenue would be produced for the school trust fund	This alternative would generate $150,000-$300,000 in revenue distributed to the Common School Trust.
LOG TRUCK USE OF PUBLIC ROADS	No use of public roads by log trucks.	Approximately 400 loads of logs would be hauled over the Gold Creek Road. There would be no decking or loading on the main Gold Creek Road.

ENDANGERED SPECIES		
BALD EAGLE	Low risk of effects.	Low risk of direct, indirect and cumulative effects by restricting hauling dates.
GRIZZLY BEAR	Low risk of effects.	Low risk of direct, indirect and cumulative effects.
GRAY WOLF	Low risk of effects.	Low risk of direct, indirect and cumulative effects due to distance between project area and nearest know territory.

SENSITIVE SPECIES		
FLAMMULATED OWL	No Change.	Minor positive indirect and cumulative effect.
PILEATED WOODPECKER	Low risk of effects.	Low to moderate risk of direct, indirect and cumulative effects.
FISHER	Low risk of effects	Low to moderate effects.

3.0 Affected Environment

3.1 Introduction

Chapter 3: Affected Environment describes the relevant resources that would affect or be affected by the alternatives if they were implemented. This chapter also describes the existing environment and includes effects of past and ongoing management activities within the analysis area that might affect project implementation.

In conjunction with the description of the Alternative A: Deferred Harvest (No Action) in Chapter 2 and with the predicted effects of the alternatives, the public can compare the effects of Alternative B: Harvest.

3.2 Description of Relevant Resources

3.2.1 Vegetation Analysis Areas

Two analysis areas were selected to assess the potential direct, indirect and cumulative effects on forest cover type, the distribution of age classes, forest health, and forest fuels.

The **McNamara Landing Project Area** which includes approximately 580 acres in Section 36, Township 14 N, Range 17 W was used to assess direct and indirect effects to forest vegetation.

The analysis area used to assess cumulative effects to forest vegetation includes all scattered forested trust land parcels, administered by the Missoula Unit for DNRC. State lands administered by the Missoula Unit geographic area fall within two climatic sections as defined by B. John Losensky in Historical Vegetation of Montana (1997) --Lower Flathead Valley Climatic Section (M333B) and Bitterroot-Blackfoot Climatic Section (M332B)--and includes school trust lands in Mineral County, MT, all but the northeastern portion of Missoula County, MT, and the northwestern portion of Granite County, MT. The project area falls within the Bitterroot-Blackfoot Climatic Section (M332B). Current and desired future conditions related to forest cover types were analyzed on the Missoula Unit scale.

The DNRC is committed to maintaining biodiversity by managing for appropriate stand structures and compositions on state lands (ARM 36.11.404). Appropriate stand cover types are determined by a site specific model (ARM 36.11.405) that considers the ecological characteristics of the site (habitat type, current stand conditions, climate, disturbance regime, etc.) and estimated historical cover type conditions that existed on the site prior to European settlement. Approximately 20% of stands in the project area currently exist as appropriate cover types as identified by the DNRC Forest Management Bureau SLI.

Table 1 - Current cover types and desired future conditions for the Missoula Unit.

Cover Type	Current Cover Type (net acres*)	Desired Future Condition (net acres*)	Current Cover Type - (minus) Desired Future Condition (net acres*)
Douglas-fir	9145	4461	4684
Hardwoods	870	547	323
Lodgepole Pine	2061	1699	362
Mixed Conifer	3852	182	3670
Other**	8410	4349	4061
Ponderosa Pine	29461	43214	-13753
Subalpine Fir	2226	1761	465
Western Larch/Douglas-fir	11368	10987	382
Western White Pine	157	350	-193
Grand Total	67550	67550	

* Net acres refers to the acres in a stand polygon excluding road clearing widths.

** Other includes nonstocked, nonforest, noncommercial, water, or non-forest roads.

Table 2 - Current cover types and desired future conditions for the McNamara Landing Project Area.

Cover Type	Current Cover Type (net acres*)	Desired Future Condition (net acres*)	Current Cover Type - (minus) Desired Future Condition (net acres*)
Douglas-fir	173	0	173
Ponderosa Pine	63	461	-398
Western Larch	296	120	176
Non Commercial	49	0	49
Grand Total	581	581	

* Net acres refers to the acres in a stand polygon excluding road clearing widths.

Table 2 illustrates that there is an excess western larch and Douglas-fir cover types in the project area and fewer acres of the ponderosa pine and western larch/Douglas-fir cover types than desired.

Table 3 - Historic and current age class distribution.

Percent of Analysis Areas by Age Class Groups				
Analysis Area	0-39	40-99	100-149	150+
Missoula Unit (historic*)	35%	24%	18%	23%
Missoula Unit (current)	14%	27%	37%	22%
McNamara Landing Project Area (current)	0%	44%	56%	0%

* Because the Missoula Unit falls within two climatic sections, a weighted average of the historic age class distribution for climatic sections M333D and M332B was calculated to determine an historic age class distribution for the Missoula Unit

Table 3 illustrates that the Missoula Unit has a greater proportion of acres in older age classes than occurred historically, and this is reflected to an even greater degree in the project area.

3.2.2 Forest Conditions and Forest Health

This section was logged, practicing even aged management, in 1892 by the Big Blackfoot Milling Company in Bonner, Montana. It was logged again in 1949 – 1955 by the Anaconda Company. As a result, the overstory stands are predominately even aged. The stands are becoming overstocked and beginning to stagnate. Overstocking and the associated stress due to competition between trees for moisture and nutrients can lead to increased attacks by insects and diseases. There has been some Mountain Pine Beetle activity in the recent past which has killed patches of Ponderosa and Lodgepole Pine in the project area.

3.2.3 Fisheries Analysis Areas

Five separate analysis areas were initially identified to evaluate the existing and potential impacts to fisheries and fisheries resources associated with the proposed project. The initially selected analysis areas include: Burnt Bridge Creek drainage, Warm Springs Creek drainage, Unnamed Tributary to East Twin Creek drainage, Small Face Drainage to East Twin Creek, and Small Face Drainage to Gold Creek (see Map 1).

However, after considering comments received during scoping and project-specific issue statements (Section 1.4) and the extent of the proposed actions (Section 2.1) the following three areas were dismissed from further analysis: Burnt Bridge Creek, Small Face Drainage to East Twin Creek, and Small Face Drainage to Gold Creek. (Please see Section 2.2 for detailed rationale.)

The two remaining analysis areas (Warm Springs Creek drainage and Unnamed Tributary to East Twin Creek drainage) were chosen because they include (1) the watershed of current or historic fish-bearing streams and (2) the proposed harvest units and haul routes that could have foreseeable measurable or detectable impacts to those fish-bearing streams.

None of the streams within the five analysis areas are identified on the 2008 Montana 303(d) list as having impairments to aquatic life and coldwater fisheries. Surface waters in all analysis areas are classified as B-1 in the Montana Surface Water Quality Standards (ARM 17.30.610). For more details on these regulations, water quality standards, and beneficial uses please see the Soils and Hydrology analyses.

Fish Species

Current and historic fisheries distribution within affected portions of the analysis areas are identified in Table 1. Westslope cutthroat trout (WCT) are classified as an S2 Montana Animal Species of Concern. Species classified as S2 are considered to be at risk due to very limited and/or potentially declining population numbers, range and/or habitat, making the species vulnerable to global extinction or extirpation in the state. The Department of Natural Resources and Conservation (DNRC) has also identified WCT as a sensitive species (ARM 36.11.436).

TABLE 1 – Current and historic fish species distribution across analysis areas.

			ANALYSIS AREA	
			Warm Springs Creek	Unnamed Tributary to East Twin Creek
SPECIES	native spp.	bull trout		
		westslope cutthroat trout	**X**[1]	**X**[2]
	nonnative spp.	eastern brook trout	**X**	**X**[2]
		brown trout	**X**	**X**[2]
		rainbow trout	**X**	**X**[2]

[1] Species currently not distributed within affected portion of analysis area; affected portion of analysis area is likely within species' historic distribution.
[2] Species presence not verified; species presence estimated based on survey results in adjacent Warm Springs Creek.

3.2.4 Water Resources, Analysis Methods & Area

The primary issues relating to water resources within the analysis area are potential impacts to water quality from sediment sources and excessive increases in water yield. Sediment sources are roads and forest sites that can deliver sediment to stream channels as well as within the stream channels. Timber harvest reduces forest cover and can lead to increased water yields. Excessive

increases in water yield can reduce stream channel stability. In order to address these issues the following criteria are analyzed for each alternative:

- ◊ Miles of new road construction and road improvements
- ◊ Potential for sediment delivery to streams
- ◊ Potential for water yield increase impacts to stream channel stability

A watershed analysis and field survey was completed by a DNRC Hydrologist for the proposed project to determine direct, indirect and cumulative effects to water quality. The water quality evaluation included a review of existing inventories for soils and water resources (NRIS 2011), road inventories, and reference to previous DNRC projects. Aerial photos of the project area were compared and combined with GIS analysis to estimate the area of past timber harvest and vegetative recovery. Several field reviews were completed for the proposed harvest units, access roads and associated streams, then the observations, information and data were integrated into the watershed analysis and design of project mitigations.

Sediment delivery

The analysis for direct, indirect and cumulative effects to sediment delivery considers the area of harvest units and roads used for hauling and will focus on the streams described as affected watersheds. The sediment delivery analysis includes in-channel and upland sources of sediment that could result from this project. In-channel areas include the stream channels adjacent to and directly downstream of harvest areas. Upland sources include harvest units and roads that may contribute sediment delivery as a result of this project.

Water Yield

The analysis for direct, indirect and cumulative effects to water yield considers the area of harvest units and roads within the project drainages described as the affected watersheds. A DNRC Hydrologist completed a coarse filter qualitative assessment of watershed conditions and cumulative effects as outlined in the Forest Management Rules (ARM 36.11.423) and the commitments described in the HCP concerning watershed management. Based on past logging within the area, a fine filter assessment of sediment sources and stream channel conditions was also completed that included channel stability evaluations (Pfankoch 1978).

3.2.5 Wildlife

Issue: There is a concern that the proposed action may negatively affect habitat connectivity for resident bird and mammal populations.

Connectivity is a measure of how connected or spatially continuous a corridor or matrix is, which may be quantified simply by the number of breaks per unit length of a corridor. To understand the connectivity in a landscape, one must first identify the underlying matrix that comprises the landscape. As such, the matrix is the most extensive and most connected landscape element type present, which plays the dominant role in landscape functioning (Forman and Godron 1986). Additionally, a high level of connectivity in a landscape element type has several consequences (Forman and Godron 1986):

1. The element may function as a physical barrier separating the other elements.
2. When the connectivity takes the form of an intersecting of thin, elongated strips, the element may function as a series of corridors facilitating both migration and gene exchange among species.
3. The element may encircle other landscape elements to create isolated biological "islands." Thus, genetic interchange may be limited when separated within a landscape.

Because of these important effects, when one landscape element is completely connected and encircles all the others, it has to be considered the matrix (Forman and Godron 1986).

Fragmentation is the creation of a complex mosaic of spatial and successional habitats from formerly contiguous habitat (Lehmkuhl and Ruggiero 1991). Studies in western forests have found vertebrate richness or abundance only weakly related to stand size and isolation, although some negative effects were suggested for particular species (Lehmkuhl and Ruggiero 1991). In western forests, the boundaries between older forest and clearcuts, although initially distinct, are dynamic and become increasingly ambiguous with secondary succession of clearcuts. Accompanying such boundaries, some research suggests that a fundamental change in microclimate occurs within 160 m of the forest edge, which creates conditions different from the patch interior (Harris 1984). This, and other edge effects, act to reduce the effective size and functional viability of patches for plant and animal communities, but are reduced over time through secondary succession. While such fragmentation may typically be temporary in nature, it may span several generations of a vertebrate population.

The approximately 30,623 acre cumulative effects analysis area is bounded by the Blackfoot River to the south, Woody Mountain and Blue Point to the West, Shoofly Meadows to the north, and Sunflower Mountain and Kinneys Ridge to the east. It is comprised of approximately 1.9% School Trust land (the project area), approximately 20.5% historical USFS land, approximately 4.1% BLM land, and approximately 62.8% current or former industrial forest lands. Within this area, there are eleven patches of "older" forest (broadly defined as merchantable sawtimber, generally with canopy closure > 50%), that typically occur on USFS, DNRC, or BLM lands. These eleven patches total approximately 5,678 acres (mean = 516.2 ac, SD = 361.0, range = 57 – 1396 ac), and the remaining approximately 24,945 acres (81.5% of the analysis area) is second growth forest approximately 30 to 50 years old. Among the eleven older forest patches, the nearest distance among patches averages 328.5 m (SD = 190.1, range = 72.5 – 707 m). Applying a 160 m internal buffer from the edge of these eleven patches to account for potential edge effects, these patches are further fragmented into 25 patches totaling approximately 1,857 acres (mean = 74.2 ac, SD = 111.4, range = 0.04 – 382.2 ac). Thus, the analysis area is typified by a matrix of younger forest with widely spaced patches of older forest that could be temporarily influenced by edge effects and may have ramifications for interior forest wildlife species. However, such ramifications may be lessened for highly mobile species, such as birds and medium to large mammals.

Within the project area, there are approximately 506 acres of "older" forest (broadly defined as merchantable sawtimber, generally with canopy closure > 50%), with an interior forest core (after applying an internal buffer of 160 m) of approximately 318 acres. The project area occurs near the base of a broad, north-south ridge, with the nearest older forest patch along the ridge

occurring approximately 2.5 km north of the project area following the ridgeline, or approximately 2.3 km by straight line distance. The closest older forest patch is a streamside management zone on industrial forest land approximately 700 m to the west of the project area.

Issue: There is a concern that the proposed action's resulting road densities and vegetation management may negatively affect grizzly bears.

Grizzly bears are listed as federally threatened under the Endangered Species Act, and are the largest terrestrial predators in North America, feasting upon deer, rodents, fish, roots and berries, as well as a wide assortment of vegetation (Hewitt and Robbins 1996). Depending upon climate, abundance of food, and cover distribution, home ranges for male grizzly bears in northwest Montana can range from 60 - 500 mi^2 (Waller and Mace 1997). The search for food drives grizzly bear movement, with bears moving from low elevations in spring to higher elevations in fall, as fruits ripen throughout the year. However, in their pursuit of food, grizzly bears can be negatively impacted through open roads (Kasworm and Manley 1990). Such impacts are manifested through habitat avoidance, poaching, and vehicle collisions.

The project area is located approximately 7 miles southeast of the Northern Continental Divide Ecosystem grizzly bear recovery area. As such, the area may receive use by grizzlies in the early spring and late summer. Thus, the proposed project area could be part of one or more grizzly bear home ranges. Therefore, the cumulative effects analysis area for grizzly bears encompasses 462 square miles (295,687 acres), including portions of the Rattlesnake subunit of the NCDE.

Grizzly bears are known to be more vulnerable to human interaction in areas with high open road densities or ineffective road closures. Currently there are 2.1 miles of open road per square mile (simple linear calculation; 950 miles of open road), and 3.62 total miles of road per square mile (1,671 miles of road), within the 462 square mile grizzly bear analysis area. Within the project area, there are approximately 0.17 miles of open road per square mile (project area is approximately 0.91 square miles), and approximately 6.17 miles of total road per square mile (simple linear calculation).

Issue: There is a concern that the proposed action may negatively affect bald eagles.

Bald eagles typically nest and roost in large diameter trees within 1 mile of open water. They are sensitive to a variety of human caused disturbances, ranging from residential activities to resource use and heavy equipment operation, among others (Montana Bald Eagle Working Group 1994). Bald eagle response to such activities may range from spatial and temporal avoidance of disturbance activities to total reproductive failure and abandonment of breeding areas (MBEWG 1994). While foraging, they typically perch within 500 m of shoreline habitat (Mersmann 1989); and roost in trees ranging in diameter from 12 to 39 inches and 49 to 200 feet in height (Stalmaster 1987). Eagles are generally associated with aquatic foraging habitat. However, roost trees are located away from houses and roads throughout their range (Buehler 2000).

The affected School Trust parcel is located within 0.6 mile of a bald eagle nest cluster (3 nests; Rainbow Bend eagle territory) for which the Montana Bald Eagle Working Group has records dating back to 1997. The territory has averaged 1 to 2 young fledged for the past 5 years, and

nesting occurred in 2009. This territory was established *after* Highway 200 and the Gold Creek Road were established. Thus, eagles inhabiting this territory are accustomed to varying levels of disturbance (motorized activity on Hwy 200 and recreational use along the Blackfoot River) within 0.5 mile of several nest trees. The proposed haul route along the Gold Creek Road would be approximately 0.3 mile from the 2001 nest, and within 0.7 mile of the 2009 nest.

Issue: There is a concern that the proposed action may negatively affect flammulated owls.
The flammulated owl is a tiny forest owl that inhabits warm-dry ponderosa pine and cool-dry Douglas-fir forests in the western United States and is a secondary cavity nester. Nest trees in 2 Oregon studies were 22-28 inches dbh (McCallum 1994). Habitats used have open to moderate canopy closure (30 to 50%) with at least 2 canopy layers, and are often adjacent to small clearings. It subsists primarily on insects and is considered a sensitive species in Montana. Periodic underburns may contribute to increasing habitat suitability for flammulated owls because low intensity fires would reduce understory density of seedlings and saplings, while periodically stimulating shrub growth. Within the project area there are approximately 380 acres of flammulated owl preferred habitat types.

Issue: There is a concern that the proposed action may negatively affect peregrine falcons.
Peregrine falcons typically nest and perch on ledges and cliff faces. Additionally, a water source (e.g., river or lake) is usually close to the nest site, which is important for providing a localized and adequate prey base (Johnsgard 1990). Such foraging habitat is present along the Blackfoot River corridor. The closest known nest site (i.e., eyrie) is the Johnsrud Eyrie, located approximately 0.46 mile southeast of the affected parcel (Montana Natural Heritage Program, April 2011).

Issue: There is a concern that the proposed action may negatively affect pileated woodpeckers.
The pileated woodpecker is one of the largest woodpeckers in North America (15-19 inches in length), feeding primarily on carpenter ants (*Camponotus* spp.) and woodboring beetle larvae (Bull and Jackson 1995). The pileated woodpecker nests and roosts in larger diameter snags, typically in mature to old-growth forest stands ((McClelland 1979, Bull et al. 1992, McClelland et al. 1979). Due primarily to its large size, pileated woodpeckers require nest snags averaging 29 inches dbh, but have been known to nest in snags as small as 15 inches dbh in Montana (McClelland 1979). Pairs of pileated woodpeckers excavate 2-3 snags for potential nesting sites each year (Bull and Jackson 1995). Snags used for roosting are slightly smaller, averaging 27 inches dbh (Bull et al. 1992). Overall, McClelland (1979) found pileated woodpeckers to nest and roost primarily in western larch, ponderosa pine, and black cottonwood. The primary prey of pileated woodpeckers, carpenter ants, tend to prefer western larch logs with a large end diameter greater than 20 inches (Torgersen and Bull 1995). Thus, pileated woodpeckers generally prefer western larch and ponderosa pine snags > 15 inches dbh for nesting and roosting, and would likely feed on downed larch logs with a large end diameter greater than 20 inches.

The project area is a mixture of Douglas-fir/dwarf huckleberry Douglas-fir/elk sedge, Douglas-fir/snowberry, and Douglas-fir/twinflower habitat types, with approximately 183 acres having an average stand diameter $\geq$ 15 inches dbh (Stand Level Inventory database). Within the forested

areas of the project area, canopy closure is generally in excess of 50%. This species has historically been observed within the project area (Montana Natural Heritage Program database, April 2011; M. McGrath, Montana DNRC Wildlife Biologist, personal observation 21 September 2010). The cumulative effects analysis area encompasses a 1-mile radius surrounding the project area.

Issue: There is a concern that the proposed action may negatively affect fishers.
The fisher is a medium-sized animal belonging to the weasel family. Fishers prefer dense, lowland spruce-fir forests with high canopy closure, and avoid forests with little overhead cover and open areas (Powell 1978, Powell 1977, Kelly 1977, Clem 1977, Coulter 1966). For resting and denning, fishers typically use hollow trees, logs and stumps, brush piles, and holes in the ground (Coulter 1966, Powell 1977).

The project area occurs within 300 yards of Gold Creek, a class 1 stream, with three perennial streams that drain the parcel into Gold Creek. The affected parcel contains approximately 477 acres of fisher preferred habitat types. However, within a 1-mile radius of the project area, the only potential fisher habitat is disconnected from the affected parcel, and totals approximately 272 acres. Thus, approximately 64% of the potential fisher habitat within the cumulative effects analysis area occurs on the affected parcel.

Issue: There is a concern that the proposed action may negatively affect interior forest songbird habitat.
Numerous species of birds utilize forested habitat. One way to examine the effects of forest management on avifauna is to group species based on similar characteristics. A guild is a group of species that exploit environmental resources in a similar way (Root 1967). For example, birds that exploit aerial insects, or nest in cavities could be considered a guild. In theory, all the members of a guild should respond similarly to a change in the habitat, and this would allow a manager to focus attention on just one species that would represent an entire guild. However, this concept has limitations due to species differing habitat requirements (Hunter Jr., Malcolm L. 1990, Reynolds et al. 1982).

The affected parcel contains approximately 506 acres of "older" forest (broadly defined as merchantable sawtimber, generally with canopy closure > 50%), with an interior forest core (after applying an internal buffer of 160 m) of approximately 318 acres. The project area occurs near the base of a broad, north-south ridge, with the nearest older forest patch along the ridge occurring approximately 2.5 km north of the project area following the ridgeline, or approximately 2.3 km by straight line distance. The closest older forest patch is a streamside management zone on industrial forest land approximately 700 m to the west of the project area. Within a one-mile radius of the affected parcel, 47 species of birds have been reported (Montana Natural Heritage Program database), representing forest interior-, early successional-, and riparian-associated species. This would be expected based upon the parcel's proximity to abundant early successional forest and the Blackfoot River.

Issue: There is a concern that the proposed action may negatively affect pine marten habitat.

The pine marten (*Martes americana*) is a carnivorous mammal about the size of a small house cat. They occupy a narrow range of habitat types, living in or near coniferous forests. More specifically, they associate closely with late-successional stands of mesic conifers, especially those with complex physical structure (e.g., downed logs) near the ground. Typically, pine martens eat bird eggs and nestlings, insects, fish, and young mammals. In winter, martens hunt for small mammals that live below the snow by entering access points to the subnivean space created by coarse woody debris and other structures (Buskirk and Ruggiero 1994). In an industrial forest setting, marten home ranges were typically approximately 640 acres to approximately 1200 acres, with a median of only 20% of the home range in regenerating clearcuts. Hargis and Bissonette (1997) reported that captures of individual marten in Utah declined to zero when openings occupied over 25% of the landscape. Chapin et al. (1998) indicate that social interactions among marten require that spatial requirements of the breeding unit (i.e., resident adult marten of the opposite sex with overlapping territories) be considered when recommendations for forest management are developed.

Within a one mile radius of the project area the only potential pine marten habitat is disconnected from the affected parcel, and totals approximately 272 acres. The remaining potential pine marten habitat consists of approximately 719 acres within and adjacent to the project area, with approximately 523 acres within the project area. The remaining approximately 4,242 acres of the analysis area is 30 to 50 year old regenerating clearcuts. Thus, for an approximately 1,200 acre hypothetical pine marten home range centered on the project area, approximately 40% would be in regenerating clearcuts.

Issue: There is a concern that the proposed action may negatively affect northern goshawk habitat.

The northern goshawk (hereafter goshawk) is a forest habitat generalist with specific nesting habitat requirements (McGrath et al. 2003, Squires and Reynolds 1997, Reynolds et al. 1992). The goshawk forages on a wide range of species, with the most predominant prey being snowshoe hare, Columbian ground squirrels, red squirrels, blue and ruffed grouse, northern flickers, American robins, gray jays, and Clark's nutcrackers (Squires 2000, Clough 2000, Watson et al. 1998, Cutler et al. 1996, Boal and Mannan 1996, Reynolds et al. 1992). Thus, given the diverse array of prey species, goshawks forage from a diverse array of habitats. However, (Beier and Drennan 1997) found goshawks to forage in areas based primarily on habitat characteristics rather than prey abundance. Beier and Drennan (1997) found goshawks to forage selectively in forests with a high density of large trees, greater canopy closure, high basal area, and relatively open understories. For nest stands, goshawks will nest in pine, fir, and aspen stands on north-facing slopes that are typically in the stem exclusion or understory reinitiation stages of stand development, with higher canopy closure and basal area than available in the surrounding landscape (McGrath et al. 2003, Finn et al. 2002, Clough 2000, Squires and Reynolds 1997, Reynolds et al. 1992). Nests are typically surrounded by stem exclusion and understory reinitiation stands (with canopy closure $\geq$ 50%) within the 74 acres surrounding the nest; higher habitat heterogeneity than the surrounding landscape, and an avoidance of stands in the stand initiation stage of stand development typify habitat in the 205 acres surrounding

goshawk nests (McGrath et al. 2003). Goshawk home ranges vary in area from 1,200 to 12,000 acres depending on forest type, prey availability, and intraspecific competition (Squires and Reynolds 1997).

Goshawks have not been observed within the project area during field visits. However, the project area does contain ample habitat suitable for nesting by goshawks, based on the abundance of stands with canopy closure > 50% in the stem exclusion and understory reinitiation stages of structural development (McGrath et al. 2003 (Oliver and Larson 1996)). However, the abundance of 30 to 50 year old regenerating clearcuts in the one mile radius surrounding the project area would likely hamper occupancy of the area by nesting goshawks (Finn et al. 2002).

Issue: There is a concern that the proposed action may negatively affect great gray owl habitat.

Great gray owls forage upon a variety of rodents, including: voles, pocket gophers, shrews, moles, deer mice, and red squirrels (Bull and Duncan 1993). They are primarily a rodent specialist that favors areas near bogs, forest edge, montane meadows, and other openings. Like many other owl species, great gray owls do not build their own nests, they must use existing platforms constructed by other raptors (e.g., northern goshawks, red-tailed hawks) or native materials (e.g., broken-top snags, mistletoe brooms). Because this species must rely upon nests of other species and the availability of natural structures, the habitat surrounding great gray owl nest sites is also variable. However, given habitat needs of red-tailed hawks and northern goshawks, as well as the size of trees necessary to provide the area for a family of owls on a mistletoe broom or broken-top snag, many of the nests (47 of 49; 96%) in a study in northeastern Oregon were located in stands with $\geq$ 2 canopy layers and a canopy closure > 60% at most nests (Bull, Evelyn L. and Henjum, Mark G. 1990). For foraging habitat within the section there is a south-facing grassy slope to the south, and a cleared meadow near the northeast corner of the section. Additionally, the regenerating clearcuts on adjacent parcels may provide openings that provide rodent habitat for great gray owls.

Issue: There is a concern that the proposed action may negatively affect barred owl habitat.

Barred owls historically inhabited the forests of eastern North America. During the last century, they expanded their range to include forests throughout the southern provinces of Canada, southeastern Alaska, British Columbia, Montana, Idaho, Washington, Oregon, and northern California (Livezey 2007). They typically prefer old or mature, mixed deciduous/coniferous forests with fairly high canopy closure. Barred owl nests occur in cavities, hawk nests, tops of broken-top snags, squirrel nests, and other locations (Livezey 2007). Barred owl nests also may be close to openings, more edge, more forest patches, and more small forest patches (Livezey 2007). Home ranges during the year typically range from approximately 600 acres during the nesting season to approximately 2,200 acres during the non-nesting season (Livezey 2007).

In terms of habitat diversity, or amount of edge habitat, the project area and a one mile radius surrounding it are fairly limited. Within the project area, the forested area is of similar age and structure (Stand Level Inventory database). The surrounding analysis area, as previously mentioned, largely consists of 30 to 50 year old regenerating clearcuts that form a somewhat hard edge with the project area. Thus, edge habitat exists, but diversity of edge habitat is limited.

For nesting habitat, the project area has numerous potential nest sites through an abundance of broken-top Ponderosa pine snags (M. McGrath, SWLO Wildlife Biologist, personal observation, 21 September 2010).

3.2.6 Existing Conditions- Geology and Soils

3.2.6.1 Project Area Geology and Parent Materials

The proposed harvest areas are located in section 36, T14N, R17W, which straddles the divide between the East Fork Twin Creek and lower Gold Creek. Parent materials are a mixture of shallow to deep soils derived from mixed bedrocks of argillite and quartzite with surface deposits of tertiary mudstones/clay along the access road and mid-slope terrain. There is no other especially unique, unusual or unstable geology in the project area, and no known mineral potential. There is an old gravel pit on the existing access road just north of the project section that is a suitable gravel source if needed. Elevation range in the project section is 3600-4100 ft; average annual precipitation is 16 - 20 inches, mainly as snow. The vegetation in the project area ranges from moderately moist Douglas fir to drier Ponderosa pine sites. The majority of the DNRC project area is located on moderate sideslopes less than 45% with small included areas of steeper slopes. Rock outcrops and shallow soils are common on ridgelines, yet most sites are common excavation or rippable. The fractured bedrock that is throughout the project area is mainly stable belt bedrock that is resistant to erosion and has a high infiltration rate that generally exceeds precipitation rates.

3.2.6.2 Project Area Soils

The soils of the McNamara project area are mainly gravelly loam residual soils on the mountain sideslopes. Areas of more heavy textured, silty clay loam, tertiary age sediments are located on moderate slopes less than 30% in the NW ¼ of the section. Soils in the project area are Bignell gravelly silty clay loams in complex and Winkler very gravelly loams, with lesser areas of Mitten, Shooflin and Sharrott soils. Soil descriptions are generally described here and noted in table S-1 and on soil map.

Bignell and Shooflin soils are deep silt loams with clayey subsoils forming in tertiary age mudstones on generally concave terrain and occur along portions of the private access road and in the NW 1/4 of the section. The fertile Bignell soils are well drained and have higher cobble contents with cobbly clay loam subsoils. Shooflin soils occur in the north ½ of the section and have higher clay contents and a lower coarse fragment content. Both soils tend to remain moist late into spring and are susceptible to soil displacement, compaction , and road rutting if operated on when wet. Soil infiltration rates exceed precipitation rates. These higher clay content soils generally dry out adequately by June for ground skidding operations without excessive soil effects. The higher moisture retention leads to higher productivity, and thus greater forest growth than the more gravelly Winkler soils. Bignell soils have a moderate susceptibility for erosion and Shooflin soils have moderate to high potential for erosion. Material quality for road construction is limited by low gravel contents and low soil strength when wet.. The existing forest access roads cross Shooflin and Bignell soils and segments of the secondary roads have ruts and inadequate drainage. The main access road is in good condition and adequate for all

season use but requires maintenance blading. Roads would require average drainage spacing and segments of ditching based on site specific conditions. These limitations can be mainly overcome by reducing soil disturbance, operating when soils are relatively dry frozen or snow covered and grading the roads.

The coarse textured, gravelly Winkler soils are well drained and form good road materials. Winkler soils are moderately deep very gravelly loam soils forming in fractured bedrock and colluvium and occur mainly on convex slopes where soil depth is shallower. Winkler soils in this area are somewhat excessively well drained (soil infiltration exceeds precipitation) and the subsoils have high gravel contents exceeding 50% by volume. These coarse textured soils have a long season of use and have low rates of erosion. High gravel content soils and drier sites on road cut and fill-slopes can be slow to revegetate, unless promptly reseeded. Where Winkler soils occur on southerly aspects and ridges, the surface soils are shallow with lower moisture retention and productivity. Northerly aspects have slightly deeper surface soils, moisture retention and productivity, supporting Ponderosa pine and Douglas-fir. There is a draw with short steep slopes in the east half of the project section with Winkler soils on 30-60 % slopes and common bedrock outcrops

Mitten soils which occur on northerly aspects in the project area are very gravelly silts loams that have a reddish volcanic ash, silt loam surface soil with gravelly subsoil and occur on north aspects in the area. These are moderate to high productivity soils and support Douglas-fir, Lodgepole pine and western larch. Both soils have a low potential for erosion on slopes < 45% which can be effectively controlled by limiting disturbance and standard drainage practices. Erosion potential is low for both of these soils and moderate on short steep slopes> 45%. The main soil concern is displacement of the shallow topsoils, which are important for seedling establishment. Displacement potential for ground based operations is high for slopes over 45%. Soil displacement can be mitigated by limiting ground based operations to slopes less than 45%. Few soils related problems are expected in these areas.

3.2.6.3 Previous Harvest History and Soil Disturbance

Initial harvest of the most accessible slopes occurred in the late 1890's and later in 1955 when the road system was developed in this section. Residual soils effects are minimal with few major skid trails still apparent on less than 10% of the old units and the previous harvest units are stocked with young conifers. Historic skid trails were vegetated and no BMP maintenance needs within past harvest areas were identified. Previous harvest sites across the section are well regenerated to conifer species. On all sites reviewed, there are moderate to high levels of existing downed coarse woody debris on the forest floor across the proposed harvest areas, similar to historic conditions established by Graham et al. (1994).

Soil Interpretations Table S1 McNamara Timber Sale Section 36, T14N, R17W						
	Mapping Unit Name	**Soil Description**	**Erosion Potential**	**Displacement hazard**	**Compaction Hazard**	Notes
6	Meadow Aquolls & Aquepts 0-2%	Deep, Poorly drained soils,	Low			NOT IN SALE AREA
23	Bignell gravelly clay loam, 8 to 30 percent slopes 38.7% of section 36	Thick Gr. Loam surface over deep Gr. & cobbly clay loam subsoils from tertiary deposits. High clay (25-60%) content subsoil	Moderate K .25	Mod	Prone to rutting and compaction if operated on when wet Mod	Productive soils suited to Ponderosa Pine, Douglas fir and larch
24	Bignell Gr clay Loams/Winkler very Gr loams, Cool site 30 to 60 percent slopes 9.3 % of section 36	Bignell, deep Gr clay loam, moist sites, High clay High clay (25-60%). Winkler, mod deep very Gr. loams from colluvium , dry site, Low clay 5-15%	Bignell Moderate K .24, Winkler Low K.05	Mod to high on slopes >45%	Prone to rutting and compaction if operated on when wet Mod	Mainly north aspects, Productive soils suited to Ponderosa Pine, Douglas fir and larch Limit ground skid to slopes less than 45%
25	Bignell Gr clay Loams/Winkler very Gr loams, Warm/Dry site 30 to 60 percent slopes 19.2 % of section 36	Same soil properties as Map unit 24, but drier site, mainly south aspects	Bignell Moderate K .24, Winkler Low K.05	Moderate	Prone to rutting and compaction if operated on when wet	Mainly south aspects Productive soils suited to Ponderosa Pine, Douglas fir. Check soil moisture prior to operations
69	Mitten Gr silt loams, 30-60% slopes 14.7 % of section 36	Gr Silt Loam Colluvium from argillites / quartzite Volcanic ash Surface Low clay content	Moderate K .17	Mod to high on slopes >45%	Mod	Limit ground skid to slopes less than 45% Avoid excessive disturbance of ash surface

Soil Interpretations Table S1 McNamara Timber Sale Section 36, T14N, R17W						
	Mapping Unit Name	**Soil Description**	**Erosion Potential**	**Displacement hazard**	**Compaction Hazard**	Notes
100	Shooflin silt & clay loam, 4 to 15 percent slopes 14.7 % of section 36 near ridge	Deep Silt loam and clay from tertiary mudstone, low gravel content 60-80% clay subsoil	Mod/High K .49	Mod	Prone to rutting and compaction if operated on when wet	Clayey subsoil prone to rut. Moist productive soil. Remains wet in spring. Check soil moisture prior to operations
99	Sharrott-Rock Outcrop complex, 4-30 percent slopes, South of project No Harvest proposed	Shallow residuum & colluvium fractured rock outcrops common	Low, very coarse K .02	Mod to high on slopes >45%	Low, very dry	Shallow soils with fractured rock and outcrops common, includes some deeper Winkler soils,
134	Winkler-Rubble land complex, 50 to 80 percent slopes No Harvest proposed	Shallow residuum & colluvium fractured rock outcrops common	Low, very coarse K .05	Mod to high on slopes >45%	Mod	Shallow-Mod depth soils with fractured rock at shallow depth, northerly aspect cool and more productive than 131 .Limit ground skid to slopes less than 45%

Erosion Factor **K** indicates the susceptibility of a soil to sheet and rill erosion and considers rock fragments. K of .02 is low and .69 is highest

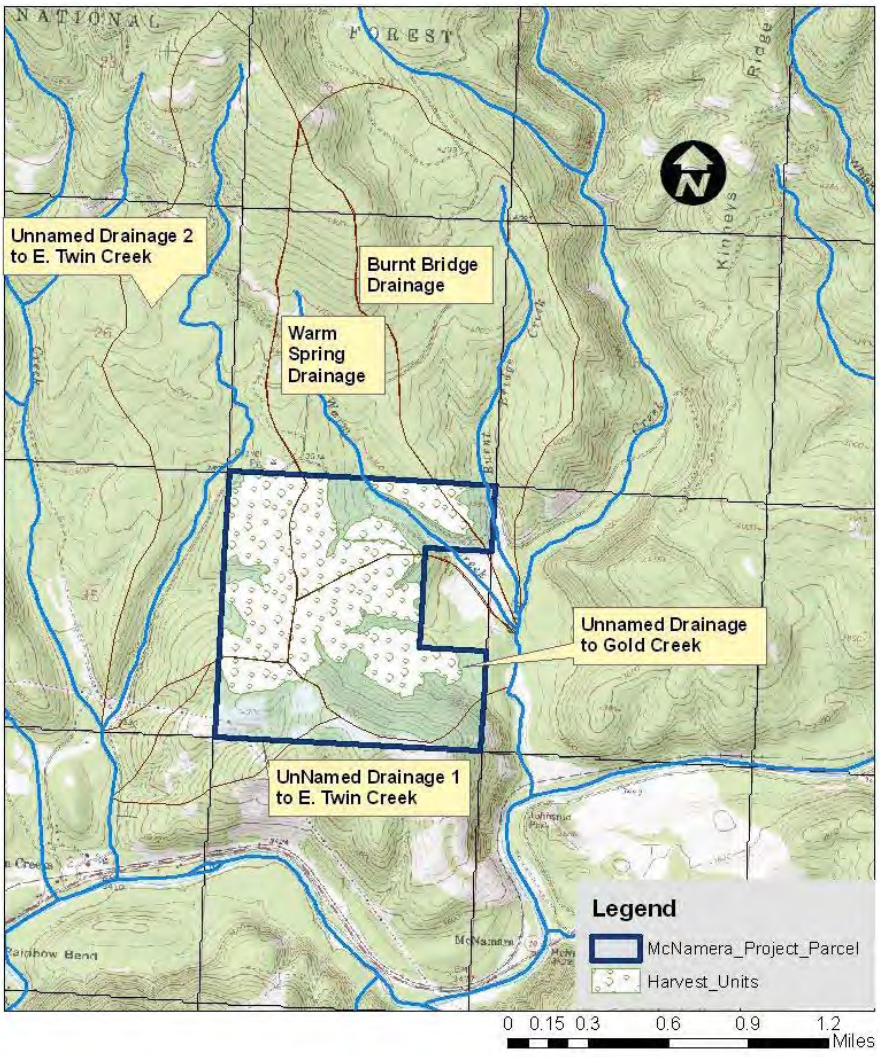
Soil Map S- 1 McNamara Timber Sale - Section 36, T14N, R17W

Map Number	Mapping Unit Name
6	Meadow Aquolls & Aquepts 0-2%
23	Bignell gravelly clay loam, 8 to 30 percent slopes
24	Bignell Gr clay Loams/Winlker very Gr loams, Cool site, 30 to 60 percent slopes
25	Bignell Gr clay Loams/Winlker very Gr loams, Warm/Dry site, 30 to 60 percent slopes
69	Mitten Gr silt loams, 30-60% slopes
100	Shooflin silt & clay loam, 4 to 15 percent slopes
99	Sharrott Rock Outcrop complex, 4-30 percent slopes, South of project, **No Harvest proposed**
134	Winkler-Rubble land complex, 50 to 80 percent slopes, **No Harvest proposed**

3.2.7 Existing Condition -Water Resources, Affected Watersheds

The proposed harvest and thinning areas are located in the lower Blackfoot River basin, within DNRC Section 36, T14N, R17W, which is about 5 miles west of Potomac, Montana. The project section straddles the divide between the Gold Creek (HUC 17010231303 = 14,827 acres) and East Twin Creek (HUC 17010231307 = 14,827 acres) drainages that flow to the Blackfoot River. The project section is drained by several first and second order tributaries to Gold Creek and East Fork Twin Creek. The water resource analysis for water quality, water yield and cumulative effects considered 5 sub-drainages, referred to in this report as Unnamed Drainage 1 to East Twin Creek, and Unnamed Drainage 2 to Twin Creek, Unnamed Drainage to Gold Creek, Warm Springs Creek Drainage, and Burnt Bridge Creek Drainage, (refer to map WS-1). With the exception of the narrow riparian areas adjacent to stream channels, the project section has relatively dry mountain sideslopes of 16-20" average precipitation/year mainly received as snow. Soil infiltration rates generally exceed precipitation.

Map WS-1 DNRC - McNamera Timber Sale Watershed Map



Water Quality Regulations

The Gold Creek and East Twin Creek drainages are classified as B-1 in the Montana Surface Water Quality Standards (ARM 17.30.623). Waters classified B-1 are suitable for drinking, culinary and food processing purposes after conventional treatment for removal of naturally present impurities. Water quality must also be suitable for bathing, swimming and recreation; growth and propagation of salmonid fishes, and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply (ARM 17.30.623 (1&2)). Among other criteria for B-1 waters, no increases are allowed above naturally occurring concentrations of sediment, (except as permitted in 75-5-318, MCA) which will or are likely to create a nuisance or renders the waters harmful, detrimental or injurious to public health, recreation, safety, welfare, livestock, wild animals, birds, fish or other wildlife (ARM 17.30.623(2)(f)).

Naturally occurring includes resource conditions or materials present from runoff on developed land where all reasonable land, soil, and water conservation practices have been applied. Reasonable practices include methods, measures, or practices that protect present and reasonably anticipated beneficial uses. The State has adopted Forestry Best Management Practices (BMP's) through its Nonpoint Source Management Plan as the principle means of controlling non-point source pollution from silvicultural activities. DNRC provides further protection of water quality and sensitive fish through implementation of the Streamside Management Zone (SMZ) Laws and Forest Management Rules.

Water Quality Limited Waterbodies and Beneficial Uses

Twin Creek, Gold Creek and tributary streams in the project area are not listed as impaired on the Department of Environmental Quality 2010 303(d) list of impaired bodies of water. TMDL's (total maximum daily load mitigations) were developed for the Lower Blackfoot River and all TMDL's listed for the Lower Blackfoot River would be implemented with the proposed project. Downstream beneficial uses in Twin Creek and Gold Creek include: domestic surface water rights, fisheries, irrigation, and livestock watering. These drainages are not part of a municipal watershed.

Montana Streamside Management Zone (SMZ) Law

All rules and regulations pertaining to the SMZ Law would be followed. An SMZ width of 100 feet is required on Class I and II streams when the slope is greater than 35%. An SMZ width of 50 feet is required when the slope is less than 35%. Warm Springs Creek and Burnt Bridge Creek are Class 1 fish bearing streams and no equipment operation is allowed within the first 50 ft. of the SMZ.

DNRC Forest Management Rules and Habitat Conservation Plan

All applicable State Forest Land Management rules and regulations regarding watershed and fisheries management would be followed. This includes, but is not limited to rules listed for water quality (ARM 36.11.422), cumulative effects (36.11.423) Riparian Management Zones (ARM 36.11.425), Fisheries (ARM 36.11.427) and Conservation Strategies outlined in the DNRC Habitat Conservation Plan (2011). As part of ARM 36.11.427(3)(a)(i) and (iv) and ARM 36.11.436, DNRC is committed to designing forest management activities to protect and

maintain westslope cutthroat trout and all other sensitive fish and aquatic species as noted in the fisheries assessment.

Water Quality and Quantity
Past management activities in the proposed project area include timber harvest, grazing, road construction and maintenance fire suppression and recreation. Sedimentation sources identified in the area are: road-fill segments adjacent to stream channels, stream crossings with inadequate road surface drainage prior to the crossing sites, historic riparian harvest and dispersed grazing use. The following project area drainages for this analysis are outlined on watershed map WS-1 and described here:

Unnamed Drainage 1 of East Twin Creek:
This is an intermittent drainage 167 acres in size. Within this drainage, the state ownership is about 68 acres which is located along a ridge and upper slopes on the east side of this drainage. There is no surface water or streams within the proposed harvest area on state ownership and no connectivity downslope to East Twin Creek or other surface waters. There are no identified sediment sources on the state parcel and there is low potential for offsite surface runoff on these rocky and dry soils. The proposed harvest within this drainage is a small 18 acre area near the ridgeline. There is very low potential for runoff or impacts resulting from increased water yield. No new road construction is proposed in this area. The proposed harvest would be uphill yarded and impact less than 15% of the soils. This minor drainage will be dismissed from further analysis for the following reasons:

(1) The minor extent of DNRC ownership and harvest/thinning of 18 acres that is not expected to contribute measurably to water yield increases.

(2) The proposed harvest units are on moderate slopes that are stable.

(3) Temporary roads have low risk of off-site erosion.

(4) Locations are not adjacent to streams or sites where sediment delivery could affect water quality. There are not expected to be any potential adverse impacts to water quality associated with the limited actions in this area.

Unnamed Drainage 2 of East Twin Creek:
This is a Class 1 stream with perennial flow to Twin Creek and the Blackfoot River. This unnamed drainage is about 830 acres in size. Within this drainage the state ownership is approximately 118 acres located along a ridge and upper slopes on the east side of this drainage. There is no surface water or streams within the state ownership and no channel connectivity downslope to East Twin Creek or other surface waters. There are no identified sediment sources on the state ownership and there is low potential for offsite surface runoff. The Gold Creek road parallels the unnamed tributary that is downslope of the state section. There is likely dispersed sediment from the year round road use by commercial, homeowner access and recreation traffic. The Gold Creek road is a gravel road maintained by the Forest Service and Plum Creek.

Warm Springs Creek Drainage:
This 432 acre drainage is a class 1 stream that flows across the NE corner of the DNRC project parcel for about 2260 feet. Warm Springs Creek supports several fisheries, which are discussed in the fisheries section. Within this drainage, land ownership is a mix of state and private lands. The State of Montana ownership is approximately 130 acres located along the lower ½ of the drainage.

There is an existing road crossing of Warm Springs Creek that is nearly flat, (part of old railroad grade). The flat crossing site contributes very minor sediment from the road surface and needs a drain-dip prior to the crossing. The culvert is slightly undersized, but the stream channel is stable. Stream channel stability ratings were completed on Warm Springs Creek and Burnt Bridge Creek, using the Stream Reach Inventory and Channel Stability Evaluation Procedure (Pfankuch, 1978). The streambed is a relatively narrow, Rosgen B type channel (Rosgen 1996) with a gravel cobble substrate. Channel stability was rated as good on the state project section and fair to good on adjacent private and Plum Creek ownerships. Historic timber harvest upstream of the DNRC parcel and in the headwaters have influenced past stream channel stability and sedimentation by removal of recruitable large trees for large woody debris.

Burnt Bridge Creek Drainage:
This 643 acre drainage is a class 1 stream that flows across the NE corner of the DNRC project parcel for about 760 feet. Burnt Bridge Creek Drainage supports westslope cutthroat trout and non-native species, which is assessed in the fisheries section. Within this drainage, land ownership is a mix of private lands, Plum Creek Timberlands, Bureau of Land Management and the State of Montana. State ownership is approximately 19 acres.

There is an existing road crossing of Burnt Bridge Creek that is nearly flat, (part of old railroad grade). This road and stream crossing would not be used for timber harvest. The flat crossing site contributes very minor sediment from approximately 30 ft of the road surface and needs a drain-dip prior to the crossing to provide adequate road surface drainage. This is a shared crossing that bisects the property line between State and private ownership. The culvert is slightly undersized, but the stream channel is stable based on a Pfankuch rating of good. The streambed is a relatively narrow, Rosgen B type channel (Rosgen 1996) with a gravel cobble substrate. Historic timber harvest upstream of the DNRC parcel and in the headwaters have influenced past stream channel stability and sedimentation.

Unnamed Drainage to Gold Creek:
This drainage is about 278 acres in size with the state owning approximately 213 acres located on forested hillsides above a meadow. This area drains towards Gold Creek. On these droughty soils, precipitation infiltrates the soil and surface runoff carries only a short distance. A short discontinuous stream of 60-75 ft reach with intermittent flow was noted and flow quickly goes subsurface. There is no runoff with channel connectivity from the DNRC ownership downslope to Gold Creek or other surface waters. The existing main road is stable, but requires some maintenance to restore road surface drainage. There is also a secondary road that is used for year round private access across the state parcel to a home in a meadow past the east boundary of the state parcel. Segments of this secondary road cross clayey soils, parts of which are rutted and

have inadequate drainage, but there are no stream crossings and no sediment runoff to surface waters from this road.

Wetlands

There is a seasonal wetland known as the vernal pond (25 x 30feet) on private land between the Gold Creek County road and the DNRC northern property boundary. There is an ephemeral swale that drains toward this seasonal wetland, but it appears the primary water source is from shallow groundwater. The private lands surrounding the wetland have been thinned of trees. No Riparian Wetland Research Program Sites (RWRP), or wetlands >1/10th acre were identified in the project area. There are no other wetlands identified in the project area except for narrow bands of riparian vegetation adjacent to segments of Warm Spring Creek and Burnt Bridge Creek where they flow through the DNRC section.

Water Yield

Concerning water yield, tree canopy reduction by timber harvest activities, tree mortality or wildfire can affect the timing of runoff, increase peak flows and increase the total annual water yield of a particular drainage. Moderate to high increases in water yield can increase stream channel scour and in-stream sediments that impact water quality, so we assess stream channel conditions as part of the project analysis. Stream reaches on Warm Springs Creek and Burnt Bridge Creek were evaluated and found to have good stream channel stability on-site and directly downstream. All the project drainages were evaluated, although there are no streams in the proposed harvest areas of the Unnamed Gold Creek drainage and the Unnamed East Twin Creek drainage 2, and very low potential for downslope runoff.

Within the proposed drainage areas, average annual precipitation rates are low to moderate at 18-30” with soil infiltration rates exceeding most precipitation rates. The proposed harvest areas have lower average precipitation levels of 16-20 inches of precipitation/year and soil infiltration rates generally exceed 10 inches/ hour, therefore even in rapid snowmelt, surface runoff carries only a short distance before infiltrating into the soil. A rain on snow event could cause short term increased runoff but effects to stable stream channel conditions would be expected to be minor.

Currently, older lodgepole pine and a portion of ponderosa pine that are dead, dying and at risk of mountain pine beetle mortality comprise less than 20% of stand volume in proposed DNRC harvest areas. Pine mortality from insects will have a minor effect on changes in available water due to reduced levels of evapo-transpiration, and tree mortaility is expected to have a minor change to water yield, similar to natural conditions.

Timber harvest has occurred in Gold and Twin Creeks drainages since the late 1800’s with the first recorded entry on DNRC parcels in 1890. Based on aerial photos and site reviews, the more extensive harvests and road construction on adjacent ownership area occurred between 1960 and the 1980’s. There has been considerable regrowth and vegetative recovery in the area. A harvest history was developed for the project area from aerial photos to estimate the annual water yield increases using Equivalent Clearcut Area (ECA) analysis (Haupt 1985). ECA is a procedure used to index the relationship between vegetative condition and water yields from forested

watersheds. ECA is a function of the total area which is roaded and harvested, the % crown removal in harvest units and the amount of vegetative growth recovery that has occurred in the harvest areas. This procedure equates the area of the percent of canopy removed by harvest or road to an equivalent clearcut area. The existing ECA was calculated for the project drainages and is noted in table WS-1. After reviewing the beneficial uses, existing channel conditions that are good and existing watershed condition per ARM 36.11.423, a threshold of concern for water yield increase (WYI) in the project watersheds was set at 15% reduction compared to a fully forested condition. ECA below the 15% level is expected to ensure compliance with water quality standards and protection of beneficial uses with a low to moderate degree of risk.

Table WS-1 Annual Water Yield Increases for project drainages using Equivalent Clearcut Area (ECA) analysis (Haupt 1985).

Project Drainage	Stream Class	Total Acres	Existing ECA	Existing WYI	Status
Warm Springs Creek	Class 1 fisheries I st order perennial	432	90	10.5 %	58 ECA Remain
Burnt Bridge Creek	Class 1 fisheries I st order perennial	642	226	14.8 %	16 ECA Remain
Gold Creek Unnamed Trib.	Class 3 segment ~70 ft Ephemeral Does not deliver	278	Minor < 2	2.1 %	95 ECA Remain
E. Twin Creek Unnamed Trib2	Class 1 fisheries I st order perennial	830	203	9.8 %	93 ECA Remain

3.2.8 Existing Conditions - Noxious Weeds

Noxious weeds occurring in the project parcels are mostly knapweed (Centaurea maculosa), houndstongue (Cynoglossum officinale L) and spot infestations of thistle (Cirsium arvense) within project sections and on adjacent lands. Knapweed (Centaurea maculosa) was found along roadsides as well as in some forested portions of the project area. Houndstongue was found mostly along roadsides along the access haul route. Historic cattle grazing, timber harvest activities, and recreational uses, are most likely the reasons for the existing rate of spread of noxious weeds and the potential future spread and introduction of noxious weeds. Previous weed management treatments in the area have been limited to reseeding of some roadcuts and treatments on adjacent private lands.

3.2.9 Existing Condition – Fisheries Analysis Areas

Warm Springs Creek Analysis Area

The entire Warm Springs Creek drainage defines the boundaries of this analysis area. The proposed activities that may affect fisheries resources in this analysis area include timber harvest, log transport activities, and road maintenance actions within riparian zones, a road/stream intersection, and upland areas.

All reaches of Warm Springs Creek within the project area and downstream to Gold Creek are fish-bearing. An electrofishing survey of Warm Springs Creek was conducted during 2010 within approximately 22% of the total stream length in the project area. The fish species presence/absence survey found rainbow trout, eastern brook trout, and brown trout [all 3 species are nonnative] well established in Warm Springs Creek. Native westslope cutthroat trout were not found during the survey, although this species' presence was expected and its historic distribution likely included this stream. Several factors (discussed below) have likely contributed to the absence of westslope cutthroat in Warm Springs Creek; however, the promotion of nonnative salmonids for recreational purposes, and consequent native species displacement, in the lower Blackfoot River drainage is likely – at least partially – the reason for the species' absence. The likely displacement of native westslope cutthroat trout in Warm Springs Creek is considered a high existing impact to fish populations in the analysis area.

The existing conditions of channel forms in fish-bearing reaches are addressed by evaluating the collective characteristics of sediment, flow regime, and woody debris features. Field reviews to assess the condition of Warm Springs Creek within the project area were conducted by DNRC fisheries and hydrology specialists during 2010. Within the project area, the stream exhibits gradients ranging from 5% to 8%, bankfull widths ranging from 3' to 6', and a gravel-dominated substrate with lesser amounts of sands and cobbles. The channel type is B4, and the contributing geomorphological processes are likely influenced to a large degree by relatively stable spring-fed flows. Considering the stream morphologies of the watershed, field reviews have found that the relative proportions of surface substrate size classes in the stream appear to be generally representative of the expected ranges of substrates that would be found in unmanaged watersheds. The Soils and Hydrology Analysis estimates that existing sedimentation from road-stream crossings in the drainage is low. The Soils and Hydrology Analysis has also determined that an existing departure in flow regime (increase in water yield and changes in peak flows) in the watershed is low. Stream surveys found that the frequency of in-stream woody debris is well below the average rates found in nearby, undisturbed watersheds. Although, the riparian forest stands adjacent to Warm Springs Creek are mature, the existing riparian stands are mono-cultural in age and lack the diverse stand structure that supports long-term, consistently higher levels of woody debris recruitment to stream channels. It is unknown if the riparian forest stand condition is a result of natural disturbance events (e.g. fire) or past harvest; however, the observed existing rates are still below the range of rates found in watersheds otherwise exhibiting natural disturbance events. Minor levels of historic riparian timber harvest have occurred adjacent to Warm Springs Creek upstream of the project area and may affect LWD frequencies in that part of the analysis area. RMZ species include mixed conifer and cottonwood, and the average tree

age is approximately 90 years. The average riparian site potential tree height at 100 years is 71'. Considering existing sediment conditions, flow regime, and woody debris recruitment rates, a moderate risk of moderate impacts to channel form complexity occurs in Warm Springs Creek. Although channel condition ratings in the project area are generally good (see Soils and Hydrology Analysis), existing impacts to channel forms are due to an apparent departure in woody debris recruitment rates.

Many different variables affect the natural fluctuations and ranges of stream temperatures (e.g. groundwater inflows, loss of flow, canopy closure, stream gradient, stream width to depth ratio, volume). Important variables affected by management activities within the Warm Springs Creek drainage include shading from riparian shrub components, woody debris canopy closure, and sedimentation. No impacts to woody debris canopy closure were observed within the project area during field reviews; however, minor levels of historic riparian timber harvest upstream of the project area and several permanent road prism clearing widths may affect canopy closures in that part of the analysis area, and loss of flows due to an irrigation diversion downstream of the project area may also adversely affect stream temperatures. Based on existing sedimentation and flow regime impacts, potential upstream affects to canopy closures, and loss of flows to an irrigation diversion, a moderate risk of moderate impacts to stream temperatures likely exists in the Warm Springs Creek drainage.

Connectivity is the measure of fish passage or migration potential throughout a stream system. One road-stream crossing and one irrigation diversion structure occurs on fish-bearing reaches of Warm Spring Creek. The road-stream crossing structure is known to partially limit connectivity to 2,200' of fisheries habitats (approximately 34% of fisheries habitats in the analysis area), and the irrigation diversion downstream of the project area may also limit fisheries connectivity; a high risk of moderate impacts to this resource variable occurs in the analysis area.

Other related existing direct and indirect effects within the analysis area may include minor grazing-related trampling of spawning redds, riparian soil compaction, and adverse nutrient effects to water quality in the lowest reaches of the drainage. Several open, public roads in the analysis area are utilized year-round for forest management and recreational purposes. Unapproved off road vehicle use also likely occurs within the analysis area. No other related existing effects to fisheries resources are known to occur in the analysis area. Other related existing actions are expected to have a moderate risk of low impacts to fisheries resources in the analysis area.

Considering a high impact to native species presence, a risk of moderate impacts to channel form complexity and stream temperatures, moderate impacts to connectivity, and risk of low impacts from other related actions, an existing moderately adverse cumulative impact to fisheries resources likely occurs in the analysis area.

Unnamed Tributary to East Twin Creek Analysis Area

The entire Unnamed Tributary to East Twin Creek drainage defines the boundaries of this analysis area. The proposed activities that may affect fisheries resources in this analysis area include upland timber harvest and log transport activities.

Fish species presence/absence surveys were not performed in this analysis area; however, due to proximities, watershed location, and drainage size, the species in this analysis area are expected to be similar to those found or expected in the Warm Spring Creek analysis area (see Table 1). Existing impacts to fish species in the analysis area are unknown for analysis purposes, but none of the proposed actions in the project area are expected to directly or indirectly affect this fisheries resource variable. Consequently, potential effects to fish species will not be carried through analysis in Section 4, Environmental Effects.

Considering similarities in stream morphologies, the existing sediment budgets and substrates in this analysis area are expected to be similar to those found in the Warm Springs Creek drainage. The Soils and Hydrology Analysis estimates that existing sedimentation from road-stream crossings in the drainage is low. The Soils and Hydrology Analysis has also determined that an existing departure in flow regime (increase in water yield and changes in peak flows) in the watershed is low. Varying levels of historic riparian timber harvest has occurred adjacent to Unnamed Tributary to East Twin Creek and may affect LWD frequencies throughout the analysis area. Considering existing sediment conditions, flow regime, and woody debris recruitment rates, a moderate risk of moderate impacts to channel form complexity occurs in Unnamed Tributary to East Twin Creek. Existing impacts to channel forms are due to potential sedimentation from existing road-stream crossings and to potential departures in woody debris recruitment rates.

Varying levels of historic riparian timber harvest throughout the analysis area may affect canopy closures and aggradations due to sedimentation from road-stream crossings may adversely affect stream temperatures. Based on potential sedimentation and affects to canopy closures, a moderate risk of moderate impacts to stream temperatures likely exists in the Unnamed Tributary to East Twin Creek drainage.

Several road-stream crossings in the analysis area may adversely affect fisheries connectivity. Existing impacts to connectivity in the analysis area are unknown for analysis purposes, but none of the proposed actions in the project area are expected to directly or indirectly affect this fisheries resource variable. Consequently, potential effects to connectivity will not be carried through analysis in Environmental Effects.

Other related existing direct and indirect effects within the analysis area may include minor grazing-related trampling of spawning redds, riparian soil compaction, and adverse nutrient effects to water quality in the lowest reaches of the drainage. No other related existing effects to fisheries resources are known to occur in the analysis area. Other related existing actions are expected to have a low risk of low impacts to fisheries resources in the analysis area.

Considering potential impacts to native species presence, a risk of moderate impacts to channel form complexity and stream temperatures, potential impacts to connectivity, and risk of low impacts from other related actions, an existing moderately adverse cumulative impact to fisheries resources likely occurs in the analysis area.

4.0 Environmental Consequences

4.1 Introduction

This Chapter describes the environmental effects of the implementation of each proposed alternative on the resources described in Chapter 3 and provides a scientific and analytic basis for the comparison of alternatives found in Chapter 2. This chapter is also designed to provide the analytic process used to evaluate impacts.

4.2 Predicted Effects of Alternatives on Relevant Resources

4.2.1 Wildlife

Issue: There is a concern that the proposed action may negatively affect habitat connectivity for resident bird and mammal populations.

No Action Alternative
Direct and Indirect Effects
Within the affected parcel (i.e., project area), the proposed timber harvest would not occur under this alternative. However, a road within the parcel would continue to serve as a private driveway to access an adjacent parcel within the affected section, and recreational use (e.g., hunting, hiking, paintball, horseback riding, etc.) would continue, and possibly increase over time due to the parcel's proximity to Missoula. The parcel receives a high level of recreational use throughout the snow-free period. Such recreation has been demonstrated to impact wildlife through altering behavior, spatial distribution, and habitat use (Joslin and Youmans 1999). During the nesting season, recreation can impact birds through nest desertion, increased risk of predation, trampling of eggs or chicks, premature fledging, and separation of young from parents (Hamann et al. 1999). For deer and elk, high hunting pressure can overwhelm any level of security on the parcel, and has the potential to negatively affect herd productivity as mature males are lost from the population (Canfield et al. 1999).

The affected parcel has approximately 506 acres of "older" forest (broadly defined as merchantable sawtimber, generally with canopy closure > 50%), with an interior forest core (after applying an internal buffer of 160 m) of approximately 318 acres. Because these areas consist of a single patch transected by several roads within the affected parcel, there are few issues of connectivity. However, because of the existing recreational use on the affected parcel, there may be moderate risk of direct and indirect effects to habitat connectivity for endemic bird and mammal populations from the no action alternative.

Cumulative Effects
The eleven patches of "older" forest disbursed throughout the analysis area are roughly clustered into three groups: 1) three patches in the headwaters of Johnson Gulch and Wisherd Ridge totaling approximately 1,959 acres; 2) two patches in the SMZ and headwaters of East Twin Creek totaling approximately 1,410 acres; and 3) three patches, including the project area, near Burnt Bridge and Spring Creeks, totaling approximately 1,721 acres. The matrix surrounding

these patches is second growth forest that is approximately 30 to 50 years old. As such, there would likely be movement by forest-interior mammals among the patches within a group, but with distance and topography among groups, there may be little movement by forest-interior mammals among the groups. For forest-interior birds, the "older" forest patches are within dispersal distance for young birds, but may be beyond individual birds' home range or territory (e.g., song birds). For early-successional species, particularly mammalian predators (e.g., raccoons, foxes, skunks, etc.), the analysis area is well-connected, with interspersed edge habitat in which to hunt. The No Action Alternative would have minimal risk of cumulative effects to habitat connectivity for resident bird and mammal populations.

Action Alternative

Direct and Indirect Effects

The proposed action would thin timber on approximately 330 acres of the affected parcel's approximately 506 acres of "older" forest (broadly defined as merchantable sawtimber, generally with canopy closure > 50%). Approximately 96 acres of the proposed harvest would occur in the approximately 188 acres of "older" forest habitat influenced by edge conditions (a 160 m interior buffer), and approximately 234 acres of proposed harvest would occur within the approximately 318 acres of interior forest. The proposed harvest would concentrate on: 1) thinning the merchantable Douglas-fir, western larch, and Ponderosa pine, 2) harvesting beetle hit and dead Ponderosa pine, and 3) retaining 50 to 70 percent of the existing crown cover. Resulting stands would likely retain uneven aged structure, where it currently exists.

Post-harvest, recreational use of the affected parcel would very likely continue for hunting, hiking, horseback riding, skiing, etc., and could continue to exert influence on wildlife behavior, spatial distribution, and habitat use. While the proposed harvest would bring a degree of vegetative change to the parcel through a reduction in tree density and canopy closure, there would likely be a low risk of decreases in habitat connectivity for resident bird and mammal populations beyond existing conditions. Thus, there would be a low risk of direct or indirect effects to habitat connectivity from the proposed action.

Cumulative Effects

As previously discussed, the proposed action would treat approximately 96 acres of edge-influenced "older" forest, and approximately 234 acres of interior "older" forest on the affected parcel. The proposed treatment would retain legacy trees, approximately 50% to 70% of existing crown cover, and uneven aged structure, where it exists. Resulting stand structure would be very similar to existing conditions, albeit, with approximately 30% to 50% less crown cover. Such expected post-harvest conditions would likely retain desirable habitat conditions for forest interior species, albeit with potentially reduced suitability for crown cover-influenced species, such as the pileated woodpecker. Edge-influenced habitat within the affected parcel may increase slightly due to the proposed harvest, but would be difficult to estimate due to variability within the proposed harvest units. As a result, habitat connectivity may increase slightly for edge associated birds and mammals, while decreasing slightly for forest-interior associated species.

The proposed action would be expected to have minor influence on the habitat connectivity among the East Twin Creek and Burnt Bridge/Spring Creek "older" forest clusters, with likely no influence on the Wisherd Ridge "older" forest cluster. These influences on habitat connectivity would be expected based on the proposed action's light thinning, retention of existing forest structure, and expected minor changes in edge-influenced habitat within the project and analysis areas. As a result, there would likely be minor to low risk of cumulative effects to habitat connectivity for resident bird and mammal populations within the analysis area beyond existing conditions.

Issue: There is a concern that the proposed action's resulting road densities and vegetation management may negatively affect grizzly bears.

No Action Alternative

Direct and Indirect Effects

No change to existing conditions would be expected under this alternative. Road densities and vegetation would not be expected to change, except through natural processes. There would likely be minor risk of direct and indirect effects to grizzly bears from the No Action Alternative.

Cumulative Effects

Plum Creek Timber Company recently sold two adjacent 160 acre parcels to private interests within the analysis area. As such, road densities and vegetation may change within that analysis area. Thus, under this alternative, there may be changes to existing road densities and vegetation within the analysis area. There would likely be low risk of cumulative effects to grizzly bears from the No Action Alternative.

Action Alternative

Direct and Indirect Effects

The proposed action would construct approximately 0.5 miles of new road that would not be accessible to the public for motorized use. At the completion of the proposed harvest, the newly constructed roads would be blocked to motorized use. Thus, there would be no increase in open road density, but total road density would increase from approximately 6.17 miles of total road per square mile to approximately 6.67 miles of total road per square mile.

The proposed action would thin timber on approximately 330 acres of the project area, largely removing intermediate-sized trees. Resulting stands would likely retain uneven aged structure, where it currently exists, while reducing stand density. As a result of the proposed reductions in stand density, sight distance would likely increase where understory vegetation or topography permit. However, such increases in sight distance would likely result in minor to low increases from existing conditions. Thus, there would likely be low risk of direct or indirect effects to grizzly bears from the proposed action's resulting road densities and vegetation management.

Cumulative Effects

The proposed new road construction would not increase open road density within the analysis area, and would result in only minor increases in total road density, due to the existing quantity of roads within the analysis area (approximately 1,671 miles). Vegetatively, much of the analysis area is currently in various stages of natural regeneration from past timber harvest on

private industrial lands. Much of the regenerating forest provides visual screening cover for grizzly bears through the density of sapling and pole timber. The proposed thinning would likely result in minor decreases in visual screening cover within the analysis area. As a result, there would likely be minor risk of cumulative effects to grizzly bears from the proposed action's resulting road densities and vegetation management.

Issue: There is a concern that the proposed action may negatively affect bald eagles.

No Action Alternative
Direct, Indirect, and Cumulative Effects
No change to existing conditions would be expected under this alternative.

Action Alternative
Direct, Indirect, and Cumulative Effects
Proposed activities on the affected parcel would not occur within 0.5 mile of any bald eagle nest, and most large trees and snags within the proposed harvest units would be retained and could serve as potential perch or roost trees in the future. Activities associated with the proposed action that have potential to disturb bald eagles would be the hauling of logs along the Gold Creek Road. As such, to mitigate the effects of such actions on nesting bald eagles, log hauling along the Gold Creek Road would be limited to the time period between August 16 and January 31, which occurs outside of the nesting season. As a result, there would likely be low risk of direct, indirect, or cumulative effects to bald eagles from the proposed action.

Issue: There is a concern that the proposed action may negatively affect flammulated owls.

No Action Alternative
Direct, Indirect, and Cumulative Effects
No change to existing conditions would be expected under this alternative.

Action Alternative
Direct, Indirect, and Cumulative Effects
Of the approximately 380 aces of flammulated owl preferred habitat types within the project area, the proposed action would treat approximately 220 acres with a commercial thinning that would retain as many large diameter trees and broken top snags as possible, as well as favoring retention of Ponderosa pine and western larch, while removing primarily Douglas-fir from the treated area. As a result, post-harvest conditions would be a more open stand condition with approximately 50 to 70% of pre-harvest canopy closure. Such conditions would likely foster good flammulated owl habitat through the likely stimulation of shrub and tree seedling and sapling growth, which would foster increased stand complexity as well as insect abundance, conditions which are favorable to flammulated owls. Thus, there would likely be low risk of negative direct, indirect, or cumulative effects to flammulated owls from the proposed action.

Issue: There is a concern that the proposed action may negatively affect peregrine falcons.

No Action Alternative
Direct and Indirect Effects
No change to existing conditions would be expected under this alternative.

Cumulative Effects
No change to existing conditions would be expected under this alternative.

Action Alternative
Direct and Indirect Effects
The proposed timber harvest, and associated log hauling, would occur > 0.5 mile and >0.25 mile, respectively, from the Johnsrud Eyrie. As a result, there would be minimal risk of direct and indirect effects to peregrine falcons from the proposed action.

Cumulative Effects
The proposed action would be associated with upland forested habitat, rather than wetland or river habitat. As a result, there would likely be minimal risk to peregrine habitat and associated prey. Thus, there would likely be minimal risk of cumulative effects to peregrine falcons from the proposed action.

Issue: There is a concern that the proposed action may negatively affect pileated woodpeckers.

No Action Alternative
Direct and Indirect Effects
No change to existing conditions would be expected under this alternative.

Cumulative Effects
No change to existing conditions would be expected under this alternative.

Action Alternative
Direct and Indirect Effects
The proposed action would treat approximately 125 acres of the approximately 183 acres of potential pileated woodpecker habitat within the affected parcel with a commercial thinning that would retain as many large diameter trees and broken top snags as possible, as well as favoring retention of Ponderosa pine and western larch, while removing primarily Douglas-fir from the treated area. As a result, post-harvest conditions would be a more open stand condition with approximately 50 to 70% of pre-harvest canopy closure. Thus, many habitat components that are desirable to this species would be retained, albeit with a reduced habitat suitability due to reductions in canopy closure. Because of the likely reduction in habitat suitability from reduced canopy closure, there would likely be low to moderate risk of direct and indirect effects to pileated woodpeckers that utilize this parcel from the proposed action.

Cumulative Effects
Within the approximately 5,233 acre analysis area, there are approximately 793 acres of older forest, of which, approximately 521 acres (66%) occurs within the project area. Given the compromised nature of the analysis area for pileated woodpecker habitat, additional habitat modifications that would remove additional pileated woodpecker habitat would likely have negative cumulative effects for members of this species that occur within the analysis area. However, the proposed treatment of approximately 125 acres of potential pileated woodpecker habitat within the project area would retain many habitat components (e.g., large diameter trees, broken-top snags, etc.) that are desirable to this species, while retaining approximately 50% to 70% of pre-harvest canopy closure. Thus, the proposed action would likely reduce the habitat suitability of the affected habitat for pileated woodpeckers, while likely not converting the affected acres to unsuitable habitat. As a result, there would likely be low to moderate risk of cumulative effects to pileated woodpeckers that utilize the analysis area from the proposed action.

Issue: There is a concern that the proposed action may negatively affect fishers.

No Action Alternative
Direct and Indirect Effects
No change to existing conditions would be expected under this alternative.

Cumulative Effects
No change to existing conditions would be expected under this alternative.

Action Alternative
Direct and Indirect Effects
The proposed action would not harvest within 50 feet of any stream. Additionally, the proposed action would treat approximately 303 acres of the approximately 477 acres of fisher preferred habitat types on the affected parcel with a commercial thinning that would retain as many large diameter trees and broken top snags as possible, as well as favoring retention of Ponderosa pine and western larch, while removing primarily Douglas-fir from the treated area. As a result, post-harvest conditions would be a more open stand condition with approximately 50 to 70% of pre-harvest canopy closure. Thus, habitat features that fisher prefer would be retained, albeit with a reduced habitat suitability due to reduced canopy closure. The proposed action would likely have low risk of direct and indirect effects to fisher.

Cumulative Effects
Within the approximately 5,233 acre analysis area, there are approximately 793 acres of older forest, of which, approximately 521 acres (66%) occurs within the project area. Given the compromised nature of the analysis area for fisher habitat, additional habitat modifications that would remove additional fisher habitat would likely have negative cumulative effects for members of this species that occur within the analysis area. However, the proposed treatment of approximately 303 acres of fisher preferred habitat types within the project area would retain many habitat components (e.g., large diameter trees, broken-top snags, etc.) that are desirable to this species, while retaining approximately 50% to 70% of pre-harvest canopy closure. Thus, the proposed action would likely reduce the habitat suitability of the affected habitat for fishers,

while likely not converting the affected acres to unsuitable habitat. As a result, there would likely be low to moderate risk of cumulative effects to fishers that may utilize the analysis area from the proposed action.

Issue: There is a concern that the proposed action may negatively affect interior forest songbird habitat.

No Action Alternative
Direct and Indirect Effects
No change to existing conditions would be expected under this alternative.

Cumulative Effects
No change to existing conditions would be expected under this alternative.

Action Alternative
Direct and Indirect Effects
The proposed action would thin timber on approximately 330 acres of the affected parcel's approximately 506 acres of "older" forest (broadly defined as merchantable sawtimber, generally with canopy closure > 50%). Approximately 96 acres of the proposed harvest would occur in the approximately 188 acres of "older" forest habitat influenced by edge conditions (a 160 m interior buffer), and approximately 234 acres of proposed harvest would occur within the approximately 318 acres of interior forest. The proposed harvest would concentrate on:

(1) Thinning the merchantable Douglas-fir, western larch, and Ponderosa pine.

(2) Harvesting beetle hit and dead Ponderosa pine.

(3) Retaining 50 to 70 percent of the existing crown cover.

Much of the thinning would occur among the intermediate and codominant canopies. Resulting stands would likely retain uneven aged structure, where it currently exists.

Given the likely multi-storied structure that would result post-harvest and that existing large diameter snags would be retained to the extent practicable, there may be some adverse short term effects for some interior forest bird species, while others may exhibit no effect, and others may benefit (Mannan et al. 1984). Through canopy gaps created by the proposed harvest, shrub growth would likely be stimulated, thereby further advancing the multi-storied structural development of the proposed harvest units. Such commercial thinning may benefit many interior forest bird species because in may enhance vertical diversity within a forest stand (Hunter 1990:227-230), which may in turn increase wildlife species diversity, particularly for birds (Hagar et al. 1996). In fact, Hagar et al. (1996) found that the commercial thinning of structurally homogenous forest in western Oregon benefitted bird species diversity. However, Mannan et al. (1984), found that intraguild response to forest management varied, with some species benefitting, and others being negatively affected. Given that post-harvest conditions would likely be similar to existing conditions, and existing snag levels would not likely be

significantly reduced, there would likely be low risk of direct and indirect effects to interior forest birds, with a likelihood that there would be more species whose populations remain unchanged post-harvest, than those that would exhibit population decreases (*sensu* Mannan et al. 1984).

Cumulative Effects
As previously discussed for habitat connectivity, the proposed treatment would retain legacy trees, approximately 50% to 70% of existing crown cover, and uneven aged structure, where it exists. Resulting stand structure would be very similar to existing conditions, albeit, with approximately 30% to 50% less crown cover. Such expected post-harvest conditions would likely retain desirable habitat conditions for forest interior species, albeit with potentially reduced suitability for crown cover-influenced species, such as the pileated woodpecker. Edge-influenced habitat within the affected parcel may increase slightly due to the proposed harvest, but would be difficult to estimate due to variability within the proposed harvest units. As a result, habitat connectivity may increase slightly for edge associated birds, while decreasing slightly for forest-interior associated species.

Issue: There is a concern that the proposed action may negatively affect pine marten habitat.

No Action Alternative
Direct and Indirect Effects
Although no change to existing conditions would be expected under this alternative, because approximately 40% of a hypothetical pine marten home range would be in 30 to 50 year old regenerating clearcuts, there likely would not be a resident pine marten within the project area.

Cumulative Effects
Although no change to existing conditions would be expected under this alternative, because approximately 40% of a hypothetical pine marten home range would be in 30 to 50 year old regenerating clearcuts, there likely would not be a resident pine marten within the analysis area.

Action Alternative
Direct and Indirect Effects
The proposed action would thin timber on approximately 330 acres of the project area while concentrating on:

(1) Thinning the merchantable Douglas-fir, western larch, and Ponderosa pine.

(2) Harvesting beetle hit and dead Ponderosa pine.

(3) Retaining 50 to 70 percent of the existing crown cover.

(4) Retaining large diameter snags, where possible.

Much of the thinning would occur among the intermediate and codominant canopies. Resulting stands would likely retain uneven aged structure, where it currently exists. As such, much of the

post-harvest project area may provide suitable habitat for likely a single pine marten, albeit at a reduced level due to likely reductions in canopy cover. Thus, there would likely be low to moderate risk of direct or indirect effects to pine marten from the proposed action.

Cumulative Effects
Due to the project area's older forest being surrounded by more than 4,000 acres of 30 to 50 year old regenerating clearcuts, there likely would not be a resident pine marten within the analysis area (Chapin et al. 1998). However, the proposed action would retain multi-story forest, large diameter snags, and coarse woody debris, where available. With the proposed thinning targeting intermediate and codominant trees, approximately 50 to 70 percent of the existing crown cover would be retained post-harvest. As such, there would likely be small to moderate reductions in existing habitat suitability for pine marten from the proposed action. Thus, there would likely be low risk of cumulative effects to this species from the proposed action.

Issue: There is a concern that the proposed action may negatively affect northern goshawk habitat.

No Action Alternative
Direct and Indirect Effects
No change to existing conditions would be expected under this alternative.

Cumulative Effects
No change to existing conditions would be expected under this alternative.

Action Alternative
Direct and Indirect Effects
As previously stated, the proposed action would retain multi-story structure and large diameter snags, where possible, as well as 50% to 70% of pre-harvest canopy closure. As such, there would likely be small decreases in nest site suitability within the project area post-harvest (McGrath et al. 2003). Additionally, the proposed harvest would be limited to August 1 through January 31, which would occur late in the nesting season. As a result, there would likely be low risk of direct or indirect effects to northern goshawk nesting habitat from the proposed action.

Cumulative Effects
Given the abundance of 30 to 50 year old regenerating clearcuts in the analysis area surrounding the project area, the likelihood of occupancy of a potential nest site by goshawks would be low (Finn et al. 2002). Additionally, given that the projected reductions in nest site suitability within the project area would be small from the proposed harvest, there would likely be minor to low risk of cumulative effects from the proposed action on northern goshawk habitat.

Issue: There is a concern that the proposed action may negatively affect great gray owl habitat.

No Action Alternative
Direct and Indirect Effects
No change to existing conditions would be expected under this alternative.

Cumulative Effects
No change to existing conditions would be expected under this alternative.

Action Alternative
Direct and Indirect Effects
As previously stated, the proposed action would retain multi-story structure and large diameter broken-top snags, where possible, as well as 50% to 70% of pre-harvest canopy closure. As such, there would likely be small decreases in nest habitat suitability within the project area post-harvest. Additionally, the proposed harvest would be limited to August 1 through January 31, which would avoid much of the nesting season. As a result, there would likely be low risk of direct or indirect effects to great gray owl habitat from the proposed action.

Cumulative Effects
Given that the proposed harvest would likely have small reductions in potential nest habitat suitability within the project area, there would likely be minor to low risk of cumulative effects from the proposed action on great gray owl habitat.

Issue: There is a concern that the proposed action may negatively affect barred owl habitat.

No Action Alternative
Direct and Indirect Effects
No change to existing conditions would be expected under this alternative.

Cumulative Effects
No change to existing conditions would be expected under this alternative.

Action Alternative
Direct and Indirect Effects
As previously stated, the proposed action would retain multi-story structure and large diameter broken-top snags, where possible, as well as 50% to 70% of pre-harvest canopy closure. Because of the reductions in canopy closure, there would likely be moderate decreases in nest habitat suitability within the project area post-harvest. Additionally, the proposed harvest would be limited to August 1 through January 31, which would avoid much of the nesting season. As a result, there would likely be low to moderate risk of direct or indirect effects to barred owl habitat from the proposed action.

Cumulative Effects
Given that the proposed harvest would likely have moderate reductions in potential nest habitat suitability within the project area, there would likely be low to moderate risk of cumulative effects from the proposed action on barred owl habitat.

4.2.2 Soils

Direct-Indirect and Cumulative Effects of the No Action Alternative on Soils
The effects of the No Action Alternative would be the same as previously described under existing conditions for soils. Previous harvest impacts from 1892 and 1955 have mainly recovered, with few skid trails still evident and less than 5% of the area impacted. Previous trails and lands are revegetated with very minor erosion. There would be no additive effect of ground disturbance from timber harvest operations or road construction and soil properties would continue to recover to natural conditions. With no action, segments of roads that have inadequate surface drainage would continue to erode, depending on vegetative cover and maintenance implemented.

Direct and Indirect Effects of the Action Alternative on Soils
The proposed project would tractor harvest up to 1.8 mmbf from up to 330 acres within DNRC Section 36, T14N, and R17W. The proposed harvest would be a combination of selective tree harvest and thinning that would remove dead, diseased, and overstocked trees to; improve tree spacing, reduce plant competition and improve growth. Douglas-fir, lodgepole and ponderosa pine trees that have stagnant growth, are dead or at risk of insect mortality, would be targeted for removal. The proposed haul route is primarily across existing roads and site specific road recommendations would be implemented on existing roads to maintain, restore and improve road surface drainage to control erosion. Less than 1/2 mile of new road would be constructed that would result in up to 2 acres of disturbance and reduced tree growth. The road system was planned to combine existing road segments to minimize the extent of road required for harvest access. Disturbed roads and landings would have adequate drainage installed and grass seeded after use.

The primary risks to long term soil productivity and hydrologic function are excessive impacts to soil properties caused by rutting, compaction, displacement and erosion of surface soils by equipment operations and road construction. The most sensitive soils to harvest effects are small areas of steep slopes which would be avoided or protected with mitigation measures. For the proposed harvest, BMP’s and mitigations would be implemented to minimize the area and degree of detrimental soil impacts (displacement, erosion, and compaction). Mitigations include skid trail planning, limiting ground based harvest to moderate slopes less than 45%, and controlling soil disturbance to meet silvicultural goals to promote conifer regeneration. To reduce soil disturbance and potential erosion, ground based harvest operations would be limited relatively dry, frozen or snow covered ground. Ground conditions would be monitored during on-going harvest administration to meet contract requirements and BMP’s. The proposed harvest activities and road operations under the action alternative present a low risk of excessive impacts to soils based on implementation of BMP's and the recommended mitigation measures.

On all proposed harvest areas, a portion of old and new coarse woody debris (CWD >3" dia.) at ~5-10 tons/acre and fine litter (similar to historic ranges) would be retained or return skidded on harvest units. CWD and fine litter return organic matter to the soil and acts as a mulch to enhance protection of surface soils, maintain soil moisture and provide media for healthy soil fungi and conservation of soil nutrients important to tree growth. Protection of established regeneration and healthy over-story trees would be a priority. The wider tree spacing would be expected to result in improved growth, due to reduced competition for limited soil moisture and nutrients. Retaining fine and coarse woody debris at levels recommended by Graham et al (1994) within harvest units mitigates the potential impacts to soil nutrient pools to a low level of risk.
The DNRC has completed soil monitoring on comparable sites and found that soil impacts from harvest operations similar to those proposed were 15 % or less of the harvest units (DNRC 2005).We expect that soil properties important to soil productivity would be maintained by protecting over ~80 % of a harvest area in non-detrimental soil impacts. Sale administrators would monitor soil conditions and the on-going harvest and road construction activities to meet contract requirements, BMP'S for soil and water protection and silvicultural objectives. For all of these reasons the proposed harvest operations and mitigation measures would be expected to maintain soil properties important to plant growth and hydrologic function and present low risk of excessive direct and indirect impacts to soils.

Cumulative Effects of the Action Alternative to Soils
Cumulative effects to soils can occur from repeated ground skidding entries into the harvest area, depending on area and degree of detrimental impacts. The initial entries on portions of these forested site occurred in the late 1890's and in 1955. Previous harvest impacts have mainly recovered, with few skid trails still evident and less than 10% of the area impacted. The observed trails have revegetated, and are stable, with very minor erosion and the sites have been regenerated to young trees. This level of effects is consistent with soil monitoring (DNRC 2004) and are within levels generally accepted to maintain soil properties conducive to hydrologic function, plant growth and to maintain long term productivity.

There is low risk of cumulative effects to soils with the proposed harvest based on implementation of BMP's, skidding and slash disposal mitigation measures to limit the area impacted. All newly disturbed roads and landings would be grass seeded to promote prompt revegetation and reduce erosion. Any future harvest, including this entry, would likely use the same road system, skid trails and landings resulting in a low risk of low level cumulative effects.

4.2.3 Water Quality and Quantity

Direct and Indirect Effects of the No Action Alternative on Water Quality and Quantity
With no-action, the direct, indirect or cumulative effects to water quality or quantity would be similar to effects described under the existing conditions. There would be no additive effect of ground disturbance from timber harvest operations or road construction. With no action, segments of roads that have inadequate surface drainage would continue to erode depending on the level of maintenance implemented. There is minor sediment delivery from the road surface at the Warm Springs and Burnt Bridge crossing sites on the old railroad grade. Sedimentation is

low because this is a flat grade and very short segments of road. Grass seeding can reduce the sediment and would be implemented, yet it would be sometime before maintenance work was completed, based on road priorities.

Mountain pine beetle attacks to mainly older age lodgepole pine and some ponderosa pine are increasing tree mortality and resulting in a spotty loss of forest canopy within the area. Water yields may increase naturally as a result of continued tree mortality from insects or wildfire, but are expected to decline as current young stands of trees from previous harvest activities, advance in growth and increase tree cover. There has been light grazing of the area and conditions are consistent with management requirements (ARM 36.11.444 & HCP Grazing Conservation Strategy 2.2.3.4) with minimal effects on riparian areas. No follow-up changes in grazing management requirements or corrective actions were noted during lease inspection n the DNRC ownership. Riparian conditions are good and meet management requirements as indicated by the good stream channel stability ratings on both Warm Springs Creek and Burnt Bridge Creek. Grazing management within the drainage would continue and riparian conditions are expected to remain similar to current conditions, considering the same grazing licensee has managed this area since 1977.

Direct and Indirect Effects of the Action Alternative on Water Quality and Quantity
The proposed project would harvest up to 1.8 mmbf from approximately 330 acres of the DNRC section with a modified shelterwood treatment as described in the vegetation section. The proposed harvest would remove beetle hit and dead Ponderosa Pine and thin the merchantable Douglas fir, Western Larch and Ponderosa Pine to increase tree vigor and help reduce the spread of Mountain Pine Beetles. These actions would improve tree spacing while retaining the dominant overstory and a distribution of tree size classes. Following harvest, the residual forest stands would retain 50 to 70 percent of the existing crown cover and would consist of the large and intermediate diameter Western Larch, Ponderosa Pine and Douglas fir with a residual stand of Douglas fir seedlings and saplings in the understory.

The primary risks to water quality are sediment from roads and stream crossings and potential channel effects of increased water yield. Water yield, including potential changes to timing, duration and magnitude of peak flow are further discussed under cumulative effects. The proposed timber harvest is designed to prevent impacts to water quality from off-site erosion through the implementation of BMP's, road maintenance, protection of riparian areas with adequate buffers and site specific mitigations. The bulk of the harvest would be on moderate slopes less than 30% that would minimize soil displacement and erosion to less than 15% of the units, and presents low risk of sedimentation. Maintenance work would be completed on all existing DNRC roads used to implement to proposed actions to improve drainage adequate to meet BMP's. There would be no increase in open road density.

Unnamed drainage 2 of East Twin Creek: The proposed harvest would include approximately 105 acres located along a ridge and upper slopes on the east side of this drainage. The timber would be skidded up to the ridgeline road and expected to impact less than 15% of the soil area. There is no surface water or streams within the state ownership and no connectivity downslope to East Twin Creek or other surface waters. There are no identified sediment sources on the state ownership in this drainage and there is low potential for offsite surface runoff and very low risk

of offsite sedimentation impacts to water quality from the proposed harvest and road use. The Gold Creek Road parallels the unnamed tributary of East Twin Creek which is downslope of the state section. There is likely dispersed sediment from the year round road use by commercial log hauling, homeowner and recreation traffic. The Gold Creek Road is gravel and maintained by the U.S. Forest Service and Plum Creek.

There is very low potential for departures in flow regime associated with canopy removal (increase in water yield and changes in duration and magnitude of peak flows) and not measurable. The proposed harvest would add an estimated 3% increase in water yield over the existing 9.8% water yield compared to a fully forested condition, therefore, there is low potential for runoff or impacts from increased water yield. See table WS-2.

Burnt Bridge Creek

The proposed harvest within this drainage would include a small 6 acre portion of Unit 3 near the ridgeline with very low potential for runoff. No new road construction is proposed in this drainage and the proposed harvest would be uphill yarded and expected to impact less than 15% of the soil area. No harvest would occur within 260 feet of Burnt Bridge Creek. There would be no harvest effects in the SMZ or RMZ.

The existing access road would not be used for hauling. The culvert would not be replaced, but a drain-dip would be installed for road drainage prior to the crossing to prevent sedimentation, and water quality would improve slightly. The Burnt Bridge drainage is near the established water yield threshold at 14.8%. This minor harvest/thinning of 6 acres is calculated to increase water yield 0.2% to 15%. There is very low potential for departures in flow regime associated with this minor harvest and canopy removal (increase in water yield and changes in duration and magnitude of peak flows) and is not measurable. There would not be any expected potential impacts associated with the limited actions in the Burnt Bridge Creek drainage, based on the good channel stability, no log hauling in this drainage, and improving the road surface drainage.

Warm Springs Creek

The proposed harvest within this drainage would consist of approximately 85 acres located over 100 feet from the west side of the creek and over 50 feet away on the easterly side of the creek. On the easterly side of the stream a Riparian Management Zone (RMZ) would be established at 80 feet from the stream, and at least 50% of representative trees would be retained in the 50-80ft zone, as noted in the fisheries analysis

Approximately ½ mile of road reconstruction would occur in the drainage area. The Warm Springs Creek crossing would be replaced with a larger streambed simulation designed culvert to improve connectivity for fish passage as discussed in the fisheries assessment. The crossing would be replaced during low flows to reduce sediment and effects to fish habitat. There would be a short duration effect on stream sedimentation when the crossing is replaced that is expected to subside and stabilize quickly. DNRC expects the duration and magnitude of these short-term impacts to be similar to those found in the following two studies.

A study of sediment concentration and turbidity changes during culvert removals (Foltz 2007) found that sediment concentrations on average of 810m (2656 feet) downstream of the culvert outlet were similar to sediment concentrations above the culvert for the entire excavation period and turbidity regulations were met. A report by Jakober 2002, of a culvert replacement in the Bitterroot National Forest in Montana found that 95% of the construction-related sediment occurred in the first 2 hours after diversion removal. Jakober further stated that sediment concentrations decreased to near pre-project levels within 24 hours. Jakober sampled stream sediment concentrations after the new culvert had been installed and the stream returned to its bed. To minimize erosion and sedimentation, erosion control measures would be implemented as:

(1) Referenced in the timber sale contract.

(2) As required in 124 Permit issued by MTFWP.

(3) As directed by the MT-DNRC Forest Officer on site.

Long term, there would be a minor reduction in sediment delivery.

This proposed harvest in the Warm Springs Creek drainage is calculated to increase water yield 4.2% to 14.7%. The increase in water yield is below the 15% established threshold and would present a low risk of impacts to stream channel stability based on the good channel stability rating and resilient B-3 channel type. There is low potential for departures in flow regime associated with canopy removal (increase in water yield and changes in duration and magnitude of peak flows) considering retention of 50% or more of tree cover and low annual precipitation as described.

Unnamed Drainage to Gold Creek

The unnamed drainage to Gold Creek is about 278 acres in size with the state ownership being approximately 213 acres located on forested hillsides above a meadow. This area drains towards Gold Creek. On these droughty soils, precipitation infiltrates the soil, and runoff carries only a short distance. A short 60-75 ft reach of intermittent flow was noted below the harvest are, the flow quickly goes subsurface. There is no runoff connectivity downslope to Gold Creek or other surface waters. As a conservative approach DNRC sale planning will provide a class 3 SMZ to provide protection to this discontinuous stream segment. The existing main road is stable, but requires some maintenance to restore road surface drainage. There is also a secondary road that is used for year round private access to a home in a meadow past the east boundary of the state parcel. Segments of this secondary road cross clayey soils which result in rutted areas which have inadequate drainage, but there is no sediment runoff to surface waters.

The proposed harvest would add a 9.8% increase in water yield over the existing 3% water yield compared to a fully forested condition. The increase in water yield is below the 15% established threshold and would present a low risk of impacts from potential runoff considering there is no stream channel in this drainage and no downslope connectivity.

In summary, overall there would be minor sediment increase during the culvert replacement on Warms Springs Creek and low risk of impacts to water quality and beneficial uses associated with the proposed timber harvest and road construction due to the following reasons: 1) no SMZ harvest is proposed to protect stream channels and provide an undisturbed vegetative buffer to capture sediment runoff, 2) RMZ boundaries would be established to retain recruitable trees, limit disturbance near riparian areas and protect vegetation to trap sediment, 3) combined mitigation measures for harvest operations and season of use are all directed at minimizing soil disturbance to prevent erosion and sedimentation, 4) proposed road construction is approximately ½ mile on a dry hillside with very low potential for erosion and sediment delivery ; no new stream crossings and no new roads would be constructed adjacent to streams 5) road surface drainage would be improved and repairs are expected to prevent water quality impacts from erosion and reduce current sediment sources, 6)one stream crossing would be upgraded to a larger culvert to provide fish connectivity during low flow. The short term sediment impacts during the replacement of the Warm Spring crossing would quickly subside. The improved crossings would reduce erosion and sedimentation improving overall watershed condition and water quality in the lower drainage.

Cumulative Watershed Effects of No Action Alternative:

Cumulative watershed effects can be characterized as impacts on water quality and quantity that result from the interaction of past, current or foreseeable future disturbances, both natural (fire) and human-caused. Past, current, and future planned activities have been taken into account for the cumulative effects analysis. Concerns for cumulative effects include sedimentation (principally from roads) and potential water yield increases that may affect stream channel stability. Past management activities in the proposed project areas include timber harvest, road construction, grazing, and fire suppression. A detailed watershed analysis of sediment sources and harvest areas was conducted to determine the cumulative watershed effects for the project and listed project drainages. Under the No Action Alternative, cumulative effects would remain the same as described in existing conditions. No new road construction would occur on the DNRC project parcel. Minor sediment would continue at the crossing sites until maintenance is completed. Water yield would remain constant or change slightly as patchy tree mortality occurs and hydrologic recovery improves with growth of younger trees. Stream channel stability would be expected to remain stable on the streams described.

Cumulative Watershed Effects of the Action Alternative

The extent of previous timber harvest and activities on adjacent lands in the project area would indicate a concern for water yield increase effects to stream channel stability. When we look more specifically at the good stream channel conditions and proposed harvest, there is a low risk of cumulative watershed impacts due to water yield increases occurring from this proposal. Within the cumulative effects analysis area, DNRC has proposed to harvest approximately 330 acres distributed across 5 defined watershed analysis areas. The proposed action would be a sanitation and selection harvest of dead/ diseased lodgepole, ponderosa pine and Douglas fir trees while retaining a healthy overstory of 50 to 70 % western larch, Douglas-fir and ponderosa pine as described in the vegetative section. This moderate level of harvest would not contribute substantially to increased water yield as summarized in table WS-2.

The water yield increases are based on ECA calculations that include the effects of past timber harvest, the existing and proposed roads and hydrologic recovery from forest vegetation and regrowth over time since disturbance. The proposed timber harvest would not exceed the water yield threshold levels established for the Warm Springs drainage and would present a low risk of affecting channel stability or water quality. A rain on snow event could cause short term increased runoff but effects to stable stream channel conditions would be expected to be minor considering the retention of 50% or more of the exiting tree cover in the proposed harvest areas and no harvest in associated SMZ's. The wide vegetative buffers adjacent to Burnt, Bridge Creek and Warm Springs Creek would maximize infiltration and moderate the potential for overland flow

Table WS-2 Alternative Effects on Water Yield WYI = Water Yield Increase ECA= Equivalent Clearcut Area				
	E. Twin Creek Unnamed Trib2	**Warm Springs Creek**	**Burnt Bridge Creek**	**Gold Creek Unnamed Trib**
Allowable Water Yield Increase	**15%**	**15%**	**15%**	**15%**
No Action Alt. % Water Yield Increase	**9.8 %**	**10.5**	**14.8 %**	**3**
Action Alt. % Water Yield Increase	**12.8**	**14.7 %**	**15 %**	**14.8 %**
Action Alt. Harvest Acres	**105**	**85**	**6**	**115**
Action Alt. Miles of New Road	**0**	**0**	**0**	**.5**
No-Action Alt. ECA Existing	**203**	**90**	**223**	**4**
ECA Increase	**53**	**34**	**3**	**47**
Total ECA	**256**	**124**	**226**	**51**
Allowable ECA	**296**	**148**	**238**	**99**

The minor proposed harvest of 6 acres in Burnt Bridge Creek would increase calculated water yield to 15%, but would not affect runoff with a vegetative buffer distance of over 150 ft to the stream and the current good channel stability. The unnamed drainages of Gold Creek and East Twin Creek are also below the threshold levels and do not have streams or connectivity to downslope surface waters. Departures in flow regime associated with canopy removal (increase in water yield and changes in duration and magnitude of peak flows) are expected to be low. Studies on similar watersheds, when the total annual precipitation is less than 18-20 inches and less than 20% of the drainage is harvested or dead, have found no increase in stream flow. For

the proposed harvest sites of 16-20" total average precipitation, the increased water yield would be unlikely to be detectable (MacDonald & Stednick. 2003, Romme et.al.2006). With minimal, if any, increases in water yield, there is a low risk of cumulative effects to water quality, in-stream sediments and channel stability within and directly below the DNRC project parcel.

4.2.4 Noxious Weeds

Noxious Weeds- Direct and Indirect Effects of the No- Action Alternative
With no action, noxious weeds will continue to spread along roads and may increase on the drier site habitats. Following disturbance events such as timber harvest activities, fires, or grazing, the establishment and spread of noxious weeds can be more prevalent than in undisturbed areas. DNRC would treat selected sites on DNRC roads based on priorities and funding availability. If new weed invader species are found, they would have highest priority for management. The grazing licensees would be required to continue weed control efforts consistent with their use.

Noxious Weeds- Direct and Indirect Effects of the Action Alternative
The Action Alternative would involve ground-disturbing activities that have the potential to introduce or spread noxious weeds in susceptible habitat types. For the Action Alternative, an Integrated Weed Management (IWM) approach would be considered for treatment of existing and prevention of potential noxious weeds. For this project: prevention, revegetation and weed control measures for spot outbreaks are considered the most effective weed management treatments. Prevention measures would require operators to clean off-road equipment prior to arrival on site. Roadsides would be sprayed prior to operations. Weed control and revegetation would slow noxious weed spread and reduce weed density and occurrence compared to no-action. There would be a similar or potential slight increase in weed infestation within harvest units due to soil disturbance and reduction of tree canopy. The silvicultural prescriptions are designed to control disturbance and scarification to goals needed for sustained forest growth. Control efforts would promote rapid revegetation and emphasize treatment of any new noxious weeds found.

Herbicide application would be completed on segments of DNRC roads along the haul route to reduce weed spread along roads while promoting desired vegetation for weed competition and to reduce sedimentation. Herbicide would be applied according to labeled directions, laws and rules and would be applied with adequate buffers to prevent herbicide runoff to surface water. Implementation of IWM measures listed in the mitigations would reduce existing weeds, limit the possible spread of weeds and improve current conditions to promote existing native vegetation. More weed control would occur compared to the No Action Alternative which would increase grass and competitive vegetation along roads.

Noxious Weeds- Cumulative Impacts of No Action
Impacts of noxious weeds within the project areas are moderate. Weeds have spread through the drainage across ownerships over time and are prone to more dispersal along open roads. Weeds also have spread by multiple uses from wind, traffic, forest management and wildlife. Current weed infestations are mainly limited to roadsides within the project parcel and open forest sites.

No control occurs along the main access road, and this increases the potential for windblown seed. Timber harvest and roads throughout these drainages has increased grass growth and the risk for noxious weeds to spread though ground disturbance. As tree density and vegetation increase, weeds are reduced through vegetative competition.

Noxious Weeds- Cumulative Impacts of the Action Alternative
Impacts of noxious weeds within the project areas are moderate. Weeds have spread through the drainage across ownerships over time mainly along roadsides and open forest sites with multiple uses and by seed dispersal from wind, traffic and wildlife. Timber harvest throughout these drainages has increased grass growth and the risk for noxious weeds to spread though ground disturbance. Within the project area, overall cumulative effects of increased noxious weeds would be expected to be low to moderate, based on herbicide treatments of existing weeds along roads and implementing prevention measures to reduce new weeds, by cleaning equipment and planting grass on roads to compete against weeds.

4.2.5 Fisheries

NO ACTION ALTERNATIVE

WARM SPRINGS CREEK AND UNNAMED TRIBUTARY TO EAST TWIN CREEK ANALYSIS AREAS

As a result of implementing the No Action Alternative, no additional direct or indirect effects to fisheries resources would occur within the project area in these analysis areas beyond those described in the Existing Conditions.

Future related actions considered part of cumulative impacts include continued, various, widespread grazing impacts, potential flow diversions, and displacement of native fisheries by nonnative fisheries. Forest management activities similar to those developed under the proposed actions are likely to occur on adjacent land ownerships in the future. Several open, public roads in both analysis areas will continue to be utilized year-round for forest management and recreational purposes. Unapproved off road vehicle use will also likely occur within both analysis areas in the future. Most future related actions that do occur are expected to be risks to sediment and channel forms.

Consequently, foreseeable cumulative impacts to fisheries resources are expected to be similar to those described in Existing Conditions.

ACTION ALTERNATIVE

WARM SPRINGS CREEK ANALYSIS AREA

No changes to fisheries presence/absence or distribution in the analysis area are expected to occur as a result of implementing the proposed actions. Species densities may change throughout the analysis area as a result of improved fisheries connectivity at the road-stream crossing (see below); however, no net changes to the existing impacts to native species would be expected.

Effects to channel forms in the analysis area would be addressed by evaluating the collective potential impacts to sediment, flow regime, and woody debris. An increase in the proportion of fine substrates is an impact that would be expected to adversely affect channel forms. Approximately 0.5 total miles of road reconstruction and new temporary road would be built in upland zones of the analysis area, and approximately 19% of the acreage in the analysis area would be harvested using commercial thinning and selection treatments that would retain 50-70% of the canopy. The single road-stream crossing of Warm Springs Creek within the project area would be replaced to improve water quality and fisheries connectivity. Construction associated with this action would cause short-term impacts to sediment in the stream; however, long-term risks of sedimentation at this site would be reduced compared to the existing condition (see Soils and Hydrology Analysis.) Short-term and long-term impacts to substrates comprising stream channel forms are not expected to occur as a result of adjacent upland harvest or road construction activities (see Soils and Hydrology analysis.) Departures in flow regime associated with canopy removal (increase in water yield and changes in peak flows) are expected to be low (see Soils and Hydrology analysis). The northwestern boundary of Unit 3 would facilitate upland timber harvest within 90’ to 120’ of Warm Springs Creek for approximately 650’ downstream of the road-stream crossing on state land; upstream of the road-stream crossing on state land harvest within 52’ of Warm Springs Creek may occur along a 150-foot reach of the stream. Since the average riparian site potential tree height at 100 years is 71’, the proposed harvest may have a minor measureable affect to woody debris recruitment to the stream. Considering the potential effects of these variables, short-term impacts to channel forms are expected during and shortly after the road-stream crossing structure replacement. If the proposed actions are implemented, long-term risks of adverse impacts to channel forms are expected to be lower than the existing condition, which is primarily due to the improvement of the road-stream crossing structure and low potential impacts to flow regime and woody debris recruitment.

Due to the expected levels of canopy closure retention adjacent to Warm Springs Creek, a low risk of low impacts to stream temperatures would be expected in the analysis area.

The replacement of the road-stream crossing structure on Warm Springs Creek would allow full levels of fisheries connectivity at the site, which would expand access for all life stages of fisheries to approximately 2,200’ of habitat. This proposed action would be a positive impact to connectivity in the analysis area.

As part of the consideration of cumulative effects, all grazing-related impacts to channel forms and all other related impacts described in the Existing Conditions for this analysis area would be

expected to continue. Additionally, short-term impacts to sediment would occur, but long-term risks of sedimentation would be greatly reduced. Low impacts to flow regime, woody debris recruitment, or stream temperatures are expected; and a positive impact to habitat connectivity would occur. Considering all of these potential impacts collectively, a net, minor, yet positive, long-term cumulative impact to fisheries resources is expected in the analysis area.

UNNAMED TRIBUTARY TO EAST TWIN CREEK ANALYSIS AREA

No short- or long-term risks to sedimentation from road use in the analysis area would be expected to occur (see Soils and Hydrology Analysis.) Short-term and long-term impacts to substrates comprising stream channel forms are not expected to occur as a result of adjacent upland harvest or road construction activities (see Soils and Hydrology analysis.) Departures in flow regime associated with canopy removal (increase in water yield and changes in peak flows) are expected to be low (see Soils and Hydrology analysis). No upland harvest would occur within 330' of the Unnamed Tributary to East Twin Creek; no proposed harvests in the analysis area are expected to affect woody debris recruitment to the stream. Considering the potential effects of these variables, a low risk of very low direct and indirect impacts to channel forms would be expected beyond those described in the Existing Conditions.

Due to the expected levels of canopy closure retained by not conducting any upland timber harvest within 330' of the Unnamed Tributary to East Twin Creek, no impacts to stream temperatures would be expected in the analysis area.

No changes to fisheries connectivity would occur in this analysis area from the Action Alternative.

As part of the consideration of cumulative effects, all grazing-related impacts to channel forms and all other related impacts described in the Existing Conditions for this analysis area would be expected to continue. Although very low direct and indirect impacts from the Action Alternative may occur, the possibility of measuring or detecting these levels of potential impact when compared to other ongoing, existing impacts is unlikely. The potential effects of the Action Alternative [when compared to the Existing Conditions] would consequently be expected to have a low risk of additional very low cumulative effects to fisheries resources in the analysis area.

4.2.6 Forest Conditions

Alternative A: Deferred Harvest (No Action) – Direct, Indirect and Cumulative Effects

No immediate changes to the forest conditions would be expected. Ponderosa and Lodgepole pine stands would likely experience continued mortality and subsequent accumulation of heavy fuels, resulting in increased potential for catastrophic fire. The Douglas fir would continue to become the dominant species in the absence of disturbance.

Alternative B: Harvest (Action) – Direct and Indirect Effects

Implementation of the proposed action would alter stand conditions toward a more historic condition. Silvicultural systems would emulate appropriate natural disturbance, primarily the mixed severity fire regime. Many of the large ponderosa pine and western larch would likely survive a mixed severity fire and be represented in the forest much as they are today. Many of the smaller encroaching Douglas fir would be removed and the forest would approach the ponderosa pine and western larch mix of a more natural condition.

Post harvest stands would vary in density and have more openings than at present. This pattern would be common in post fire stands where fire intensity increased as it encountered heavy fuel loads. The proposed harvest would leave 50 – 70% of the present canopy. Seral ponderosa pine and western larch would become more dominant in all stands.

5.0 List of Individuals and Groups Associated with the Project:

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6.0 References

Wildlife

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