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Deadman Gulch Timber Sale

Environmental Assessment

March 2003
Montana Department of Natural Resources and Conservation
Southwestern Land Office
Missoula Unit

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FINDING
DEADMAN GULCH TIMBER SALE

An interdisciplinary team (ID Team) has completed the Environmental Assessment (EA) for the proposed Deadman Gulch Timber Sale prepared by the Montana Department of Natural Resources and Conservation (DNRC). After a review of the EA, project file, public correspondence, Department policies, standards and guidelines, 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. Alternative A: Deferred Harvest
2. Alternative B: Harvest

Alternative B: Harvest proposes to harvest approximately 1.5-2.5 MMBF of timber on 645 acres. Alternative A: Deferred Harvest does not include the harvest of any timber.

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

a) Alternative B: Harvest meets the Purpose of Action and the specific project objectives as described on page 1-2 of the EA. Alternative B: Harvest would produce an estimated $375,000-$625,000 return to the School 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 identify any reason compelling the DNRC not to implement the timber sale.

c) Alternative B: Harvest 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 Alternative B: Harvest will not have significant impacts on the human environment:

Soils- Harvest mitigation measures such as skid trail planning and season of use limitations will limit the potential for severe soil impacts.

Water Quality- Alternative B: Harvest would improve the surface drainage on existing roads. BMPs and the SMZ law will be strictly adhered to during all operations involved with the implementation of Alternative B: Harvest.

Cumulative Watershed Effects- There are no perennial streams within the project area. Increases in sediment yield are expected to be negligible due to the area treated, location along the landscape and mitigations designed to minimize erosion.

Cold Water Fisheries-There are no documented fish bearing streams draining the state sections within the proposed sale area. Due to planning and associated mitigation, it is unlikely that the proposed timber sale will affect large woody debris recruitment, shade or in-stream temperature within nearby fish-bearing streams.

Air Quality-Any slash burning conducted as part of the Turah Creek Timber Sale will be conducted in coordination with the Montana/Idaho Airshed group in order to ensure that ideal smoke dispersion conditions exist prior to ignition and throughout the duration of any burning operations. As a result, impacts to air quality should be minor and short in duration.

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 weed infestations should they occur.

Natural Forest Conditions-The proposed harvest operations will begin the process of returning the timber stands within the project area to those conditions that most likely existed on the site(s) prior to organized fire suppression.

Heavy Truck Traffic and Public Safety- With realignment and widening of Cochise Drive, application of dust abatement if hauling takes place during dry conditions and the requirement that all loaded log trucks turn right when entering Highway 93 from Cochise Drive risks to the public safety should be minimal.

Visual Quality- A harvest prescription that leaves 40-65 of the largest trees per acre, minimizing the width of skyline corridors and aligning them away from common viewpoints will result in a minimal visual impact in the short term. The aesthetic quality of the project area should improve in the long term as trees remaining within treated stands increase in size and their crowns expand.

Economics- Alternative B: Harvest would provide approximately $375,000-$625,000 in short-term revenue to the School Trust and does not limit the DNRC's options for generating revenue from these sites in the future.

Endangered Species-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.

Sensitive Species- The proposed harvest operations present a minimal likelihood of negative impacts to those species that have been identified as "sensitive" by the DNRC. Those potential impacts that do exist have been mitigated to levels within acceptable thresholds.

Big Game- The proposed harvest would reduce winter cover values and increase road density in the project area. However cover values will increase with time as crowns of remaining trees expand and regeneration becomes established. All roads would be closed to all but administrative traffic following completion of harvest.

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 in the SFLMP 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 indicate that significant impacts to the human environment will not occur as a result of the implementation of Alternative B: Harvest.

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Robert M. Rich

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Forest Management Supervisor
Missoula Unit
March 13, 2003

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Missoula Unit
March 13, 2003

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Deadman Gulch Timber Sale

Cover Sheet

Proposed Action:	The Montana Department of Natural Resources and Conservation (DNRC), proposes the harvest of timber on state School Trust Lands. The sale under consideration would harvest approximately 1.5-2.5 million board feet of timber from approximately 645 acres in sections 15 and 16, T12N, R20W. See Figure 2-1. The proposed action would be implemented as early as July 2003 and could be completed by February 2006. Slash work and burning associated with the sale may not be completed until 2008. These dates are approximate.
Type of document:	Environmental Assessment
Lead agency:	Montana Department of Natural Resources and Conservation (DNRC)
Responsible official:	Bob Rich Forest Management Supervisor Missoula Unit 1500 Tower Missoula, MT 59804 (406) 542-4345
For further information:	Cindy Bertek Management Forester Missoula Unit 1500 Tower Missoula, MT 59804 (406) 542-4245
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 Deadman Gulch 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 Environmental Quality Council (EQC) Regulations (ARM 36.2.521-36.2.543). This 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 Preparers
6.0 List of Agencies and Persons Consulted
7.0 References
8.0 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 Deadman Gulch Sale. It provides a very brief description of the proposed Deadman Gulch Timber Sale 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: Deferred Harvest (No Action) and Alternative B: Harvest. 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 and Alternative B. These predictions include the direct, indirect, short term, long term, irreversible, irretrievable, and cumulative effects of implementing the alternatives.

1.0 Chapter 1: Purpose of and Need for Action

1.1 Proposed Action: Harvest

The Montana Department of Natural Resources and Conservation (DNRC) proposes to harvest timber in the Deadman Gulch area. Under Alternative B: Harvest, the department would harvest approximately 1.5-2.5 million board feet of timber from 645 acres. The proposed action would be implemented as early as July 2003 and could be completed by February 2006. Slash work and burning associated with the sale may not be completed until 2008.

1.2 Location

The location of the proposed project is: Sections 15 and 16, T12N, R20W, Missoula County. The proposed sale is located approximately 3 miles southwest of Missoula, Montana in the watershed of the Bitterroot River. Nearly all of the project area is visible from Highway 93 as well as from a number of homes in the community.

1.3 Need for the Action

The lands involved in this proposed project are held by the State of Montana in trust 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 and Department of Natural Resources and Conservation (DNRC) are required by law to administer these Trust Lands to produce the largest measure of reasonable and legitimate advantage over the long run for these beneficiary institutions (Section 77-1-202, MCA). On May 30, 1996, the Department released the Record of Decision on the State Forest Land Management Plan (SFLMP). The Land Board approved the SFLMP's implementation on June 17,1996. The SFLMP outlines the philosophy of DNRC for the management of state forested Trust Lands.

The Department will manage the lands involved in this project according to the philosophy in the SFLMP, which states the following:

> Our premise is that the best way to produce long-term income for the trust is to manage intensively for healthy and biologically diverse forests. Our understanding is that a diverse forest is a stable forest that will produce the most reliable and highest long-term revenue stream. ... In the foreseeable future timber management will continue to be our primary source of revenue and our primary tool for achieving biodiversity objectives (DNRC, SFLMP Record of Decision 1996 [ROD-1]).

1.4 Objectives of the Action (desired outcomes and conditions)

In order to meet the goals of the management philosophy adopted through programmatic review in the SFLMP, the Department has set the following specific project objectives:

1.4.1 Objective #1: To manage the forest for appropriate desired future conditions, characterized by the proportion and distribution of forest types and structures typical of those represented under average historic conditions.

1.4.2 Objective #2: Harvest between 1.5 and 2.5 million board feet (MMBF) of sawtimber to generate revenue for the Common School (CS) trust grant.

1.5 Decisions to be Made

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

1.6 Relationship to the State Forest Land Management Plan

In June 1996, DNRC began a phased-in implementation of the SFLMP. The SFLMP established the agency's philosophy for the management of forested Trust Lands. The management direction provided in the SFLMP comprises the framework within which specific project planning and activities take place.

The plan philosophy and appropriate resource management standards have been incorporated into the design of the proposed action.

The proposed action is limited to specific management activities that are needed to implement the timber sale and provide resource protection. This assessment documents site-specific analysis and is not a general management plan or a programmatic analysis of the area. The scope of this environmental analysis (EA) was determined through DNRC interdisciplinary analysis and public involvement.

1.7 History of the Planning and Scoping Process Public Involvement - Agencies, Individuals or Groups Contacted

Comments from the general public, interest groups, and agency specialists were solicited in the fall of 2001. A newspaper article was published in the Missoulian, on October 24, 2001. Public notices regarding the proposed sale were posted along

roads adjacent to the sale area. Notices were also posted near local residents' mailboxes and at a few local businesses. Scoping letters were mailed to 25 organizations and individuals (a list of the organizations/individuals contacted is available in the project file). Reports were also aired on local TV stations: KPAX and KECI. Written and/or verbal comments were received from the following individuals and/or organizations: Elaine Anderson and Brady Wood, Roy and Jody Anderson, Dr. Bob Griffin, Eric Douglas Hafer, Elden and Ione Inabnit, The Ecology Center Inc, Montana Fish Wildlife and Parks, Alliance for the Wild Rockies, and Myra Shults. A public meeting concerning the proposed sale was held on October 24, 2001 at the Boone and Crockett Club. A public tour of the proposed sale area and the Sixmile Timber Sale (a state sale previously harvested) was held on November 6, 2001.

The following resource specialists were involved in the project design, assessment of potential impacts, and development of mitigation measures: Cindy Bertek – Forester, Missoula Unit, Bob Rich – Forester, Missoula Unit, Brian Gibert - Wildlife Ecologist, Gilbert Environmental, George Mathieus - Hydrologist, Forest Management Bureau, Pat Rennie - Archeologist, Agriculture and Grazing Management Bureau, DNRC, Helena.

1.8 Other Environmental Assessments (EAs) Related to this Project

1.8.1 None

1.9 Permits, Licenses, and Other Authorizations Required

1.9.1 Temporary road use permit from Anderson/Wood

1.10 Issues

1.10.1 Issues Studied in Detail

1.10.1.1 Soil Resources (Issue #1)

Equipment operations and timber harvest on wet sites or sensitive soils can result in soil impacts that effect soil productivity depending on area and degree of physical effects and amount or distribution of coarse woody debris retained for nutrient cycling.

1.10.1.2 Water Quality (Issue #2)

Land management activities such as timber harvest and road construction can impact water quality primarily by accelerating sediment delivery above natural levels to local stream channels and draw bottoms. These impacts are caused by erosion from road surfaces, skid trails, log landings and by the removal of vegetation along stream channels.

1.10.1.3 Cumulative Watershed Effects (Issue #3)

Cumulative watershed effects can be characterized as impacts on water quality and quantity that result from the interaction of disturbances, both human-caused and natural. Timber harvest activities can affect the timing of runoff, increase peak flows and increase the total annual water yield of a particular drainage.

1.10.1.4 Cold Water Fisheries (Issue #4)

Land management activities such as timber harvest and road construction can impact fish habitat primarily by accelerating sediment delivery above natural levels to local stream channels and by decreasing large woody debris through the removal of recruitable trees near the stream channel.

1.10.1.5 Air Quality (Issue #5)

Prescribed burning of logging slash can produce large amounts of smoke that may adversely impact air quality. This is of particular concern adjacent to populated areas such as Missoula that are subject to cold air inversions, which trap pollutants in the valley bottom.

1.10.1.6 Noxious Weeds (Issue #6)

Following disturbance events such as timber harvest activities, invasion and spread of noxious weeds is more prevalent than in undisturbed areas. Noxious weed invasion and spread detrimentally influences surface cover, erosion and native species growth.

1.10.1.7 Natural Forest Conditions (Issue #7)

Due to extensive timber harvesting near the turn of the century and decades of effective fire exclusion in the project area, the timber stands in the project area today are very different in structure and species composition than the stands that occupied the site prior to European settlement. Some species are dependent, or at least prefer the type of forest stand that existed in the pre-settlement era, which no longer occurs on the site.

1.10.1.8 Heavy Truck Traffic and Public Safety (Issue #8)

1.10.1.8.1 Dust

Dust produced by log truck traffic adjacent to residential areas could reduce visibility and be a nuisance to local residents.

1.10.1.8.2 Cochise Drive

Heavy truck traffic on Cochise Drive could create a safety problem due to its narrow width.

1.10.1.8.3 Entering Highway 93 from Cochise Drive

Log trucks entering Highway 93 could create a potential hazard to motorists.

1.10.1.9 Visual Quality (Issue #9)

Timber harvesting and road construction associated with the proposed action could adversely affect the visual quality of this area. Harvesting timber can create aesthetically unpleasing views for some individuals' tastes. From a distance this is often caused by unnatural appearing features on the landscape such as roads, skid trails, skyline yarding corridors, and hard edges created by cutting unit boundaries. From within the harvest units untreated logging slash, damaged trees, and heavily scarified skid trails are often found to be aesthetically unappealing. Some people also find the perfectly spaced appearance of a thinned stand of trees to be rather unnatural looking.

1.10.1.10 Economic Benefits and Project Revenue (Issue #10)

Concern has been raised that this proposed project might not be economically viable.

1.10.1.11 Endangered Species (Issue #11)

1.10.1.11.1 Bald Eagles

Timber harvest and associated activities could alter habitat or create disturbance that could be detrimental to bald eagles.

1.10.1.11.2 Grizzly Bears

Timber harvest and associated activities could alter habitat or create disturbance that could be detrimental to grizzly bears.

1.10.1.11.2 Gray Wolves

Timber harvest and associated activities could alter habitat or create disturbance that could be detrimental to gray wolves.

1.10.1.12 Sensitive Species (Issue #12)

1.10.1.12.1 Flammulated Owls

Timber harvesting could alter habitat or create disturbance that could be detrimental to the flammulated owl.

1.10.1.12.2 Pileated Woodpeckers

Timber harvesting could alter habitat and create disturbance that could be detrimental to pileated woodpeckers.

1.10.1.12.3 Black Backed Woodpeckers

Timber harvesting could alter habitat or create disturbance that could be detrimental to black-backed woodpeckers.

1.10.1.13 Big Game (Issue #13)

Timber harvesting activities associated with this project could alter habitat or create disturbance that could adversely affect big game species that use the project area.

1.10.2 Issues Eliminated from Further Study

1.10.2.1 Endangered Species (Issue #11)

1.10.2.1.1 Lynx

1.10.2.1.1.1 Lynx Issue

Issue: There is concern that timber harvesting could alter habitat or create disturbance that would be detrimental to lynx.

The lynx is currently listed in Montana as a threatened species under the Endangered Species Act (ESA). Lynx are a forest dwelling, medium sized carnivore with home ranges averaging between 17 and 45 square miles in Montana studies (Aubry et al. 1999). Due to these large home ranges, the Analysis Area used in the grizzly bear and wolf assessment would be used here.

Although we lack specific information on optimum habitats and conditions that provide for lynx and their prey in western Montana (Ruggiero and McKelvey 1999), intensive research is currently being conducted on lynx and their prey in the Seeley Lake area approximately 32 miles to the northeast of the Analysis Area. From this research, it has been found that lynx generally occur between 3,939 and 6,890 feet in elevation in forests dominated by mesic mixed forest composed primarily of Douglas-fir, western larch, and lodgepole pine at lower elevations and subalpine fir, whitebark pine, and Engelmann spruce at upper elevations (Aubry et al. 1999). The primary prey species of lynx are snowshoe hares and hence lynx habitat use occurs predominantly in early to mid-successional stands that produce high densities of hares, while lynx appear to avoid openings with little cover or foraging opportunity (Aubry et al. 1999). Lynx denning habitat is less well documented, however denning stands are generally characterized as mature to old, subalpine fir and Engelmann spruce dominated stands on moist sites (north facing slopes) with moderate to high canopy closure (i.e. at least 50% canopy closure) and accumulations of coarse woody debris (i.e. at least 40 logs/50 m) that provide security and escape cover for kittens (Koehler 1990, Koehler and Brittell 1990).

Although within the elevational range of the species, the forest types found in the Project Area are dominated by warm, dry vegetation and

stands composed primarily of dry Douglas-fir and ponderosa pine. These forest types are not preferred by lynx, and although some lynx occurrence has been noted in the literature within Douglas-fir and lodgepole pine forests, these areas have generally been associated with areas of boreal forest dominated by subalpine fir and Engelmann spruce (Aubry et al. 1999). More extensive mixed Douglas-fir/lodgepole pine forests are found approximately 4 miles to the southwest, however, the portion of the Analysis Area near the Project Area is dominated by dry Douglas-fir and ponderosa pine forest types not preferred by lynx. Therefore, it is not likely that lynx will effectively use the Project Area for breeding or foraging, although some transient occurrence is possible.

1.10.2.1.1.2 Rationale for Elimination of Lynx from Further Study

The forest conditions in the Project Area would not generally be considered lynx habitat and consequently there is a very low likelihood of lynx occurrence. Therefore, no direct, indirect, or cumulative effects are likely on lynx if either Alternative were selected.

1.10.2.2 Sensitive Species (Issue #12)

1.10.2.2.1 Boreal Owl

1.10.2.2.1.1 Boreal Owl Issue

There is concern that timber harvesting could alter habitat or create disturbance that would be detrimental to the boreal owl.

Boreal owls prefer mature spruce/fir forests dominated by Englemann spruce. In these forest types, subalpine fir, Douglas-fir, western larch and lodgepole pine can also be well-represented species (Hayward et al. 1987). Boreal owls tend to be confined to cool sites at elevations greater than 5,200 feet in elevation (Hayward et al. 1987). Elevations on this Project Area range from about 3,200-4,500 feet, which is generally below boreal owl habitat. In addition, mature and over mature spruce/fir habitats are virtually non-existent within the Project and Analysis Areas, where forest conditions are warmer and drier than those typically preferred by boreal owls. Therefore, the treatment sites on all parcels involved in this project do not provide conditions normally considered suitable for boreal owls.

1.10.2.2.1.2 Rationale for Elimination of Boreal Owl from Further Study

Preferred boreal owl habitat does not occur on the Project or Analysis Areas and therefore there would be no direct, indirect, or cumulative effect from adoption of either Alternative.

1.10.2.2.2 Fisher

1.10.2.2.2.1 Fisher Issue

There is concern that timber harvesting could alter habitat or create disturbance that would be detrimental to the fisher.

Fishers prefer densely forested riparian mature forests that have an abundance of coarse woody debris and large snags (≥30" dbh)(cited in Powell and Zielinski 1994). They also tend to use moist forest types at mid to low elevation with mature to old forest structure (cited in Powell and Zielinski 1994). Although the Project Area is at lower elevation, the stands are generally composed of warm, dry vegetation dominated by mid-successional ponderosa pine and dry Douglas-fir cover types, which are generally not thought to be high quality fisher habitat. Deadman Gulch generally does not contain developed riparian habitat features and is lacking in structures important for fishers. Lolo Creek is the closest developed riparian system, it is located outside the Analysis Area approximately 2.5 miles to the south, however the close association of a major highway with this riparian system reduces the value of the lower reaches to fishers. In addition, the large amount of private commercial forestland in this area has created a landscape dominated by early to mid-successional forest types. Therefore, it is unlikely that fisher would occur in the Project or Analysis Area.

1.10.2.2.2.2 Rationale for Elimination of Fisher from Further Study

The forest conditions in the Project and Analysis Area would not generally be considered fisher habitat and consequently there is a very low likelihood of fisher occurrence. Therefore, no direct, indirect, or cumulative effects are likely on fisher if either Alternative were selected.

1.10.2.2.3 Peregrine Falcon

1.10.2.2.3.1 Peregrine Falcon Issue

There is concern that timber harvesting could alter habitat or create disturbance that would be detrimental to peregrine falcon.

Peregrine falcons were de-listed from Threatened Species status under the Endangered Species Act in 1999; however, the DNRC still considers it a sensitive species. In Montana, peregrine falcons typically nest in areas with large rock and cliff features. Foraging habitats are usually open areas such as marshes, estuaries and croplands. A small amount of such croplands (hay fields and grazing lands) occur within the Analysis Area, and the Bitterroot River and

associated wetland complexes would likely provide a moderate level of foraging habitat. Although minor rock outcroppings occur within the Analysis Area, preferred nesting cliffs are generally not available. A review of the Montana Natural Heritage Database indicated that there are no nesting pairs of peregrine falcons within the Analysis Area. Due to the lack of adequate nesting habitat, it is not likely that nesting peregrine falcons will occur within the Project or Analysis Areas.

1.10.2.2.3.2 Rationale for Elimination of Peregrine Falcons from Further Study

Due to the lack of potential use of the forested types within the Project Area by peregrine falcons for nesting and foraging, and the fact that peregrines are not known to nest in the Analysis Area, there would be no direct, indirect, or cumulative effects from adoption of either Alternative.

1.10.2.3 Other Sensitive Species (Issue #14): Coeur d'Alene salamander, common loon, harlequin duck, mountain plover, Townsend's big-eared bat, northern bog lemming, Columbian sharp-tailed grouse, ferruginous hawk.

1.10.2.3.1 Issue of Other Sensitive Species Listed Above

The above is an additional list of sensitive species that are known to occur, or could occasionally occur on State Trust Lands administered by the Southwestern Land Office.

1.10.2.3.2 Rationale for Elimination of Other Sensitive Species Listed Above from Further Study

Due to limitations of available habitat, these species were determined to have a low likelihood of being adversely affected by this proposal or are not likely to occur in the vicinity of the activities proposed by Alternative A: Deferred Harvest (No Action). Species occurrence records provided by the Montana Natural Heritage Program Database were also acquired and reviewed to document the presence or absence of these sensitive species in the Project Area vicinity. No impacts on any of these species are expected to occur as a result of this project.

2.0 Alternatives Including the Proposed Action

2.1 Introduction

Chapter 2: Alternatives Including the Proposed Action is the heart of this EA. The purpose of Chapter 2 is to describe each alternative and compare them by summarizing their environmental consequences. Alternatives were planned through scoping and development of issues, input from Interdisciplinary Team (IDT) specialists, and guidance from resource management standards from the SFLMP. In addition, compliance with trust mandates helped to shape alternatives. This chapter describes the activities of Alternative A: Deferred Harvest (No Action) and all action alternatives. Then based on the descriptions of the relevant resources in Chapter 3: Affected Environment and the predicted effects of all alternatives in Chapter 4: Environmental Consequences, this chapter presents the predicted attainment of project objectives and the predicted effects of all alternatives on the quality of the human environment in **comparative** form, providing **a clear basis for choice among the options for the decisionmaker and the public.**

This chapter has six sections:

- History and Process Used to Formulate the Alternatives
- Alternative Design, Evaluation, and Selection Criteria
- Alternatives Considered But Eliminated from Detailed Study
- Description of Proposed Alternatives
- Description of Relevant Past, Present, and Reasonably Foreseeable Future DNRC Actions Not Part of the Proposed Action
- Summary Comparison of the Activities, the Predicted Achievement of the Project Objectives and the Predicted Environmental Effects of All Alternatives

2.2 Description of Alternatives

2.2.1 Alternative A: Deferred Harvest (No Action)

Timber harvest would be deferred until a later entry. However, ongoing DNRC permitted and approved activities would continue in the project area.

2.2.1.1 Past Relevant Actions

- **Livestock grazing:** An existing permit is in force within the project area.

- **Fire suppression:** Human and natural caused fires have been suppressed.

- **Hunting and other recreational uses:** Deer, elk, and upland game hunting is ongoing under the rules of the Montana Department of Fish, Wildlife, and Parks. Walk in and non-motorized vehicle recreational use is allowed.

- **Biological control for weeds:** 2 insect species have been released to control leafy spurge and 3 insect species have been released to control knapweed.

- **Public vehicle access:** All existing roads are closed to motorized use except during emergencies, such as fire suppression and rescue operations. Existing roads are also used for other uses such as use by the grazing permit holder, DNRC administrative use, and Bonneville Power Administration (BPA) maintenance.

2.2.1.2 Present Relevant Actions Not Part of the Proposed Action

Same as Past Relevant Actions

2.2.1.3 Reasonably Foreseeable Relevant Actions Not Part of the Proposed Action

All of these activities would also occur if Alternative B: Harvest, which is described in Section 2.2.2 below, were implemented.

2.2.1.3.1 Right of Way Easements

Plum Creek has expressed interest in attaining permanent access to their land through section 16.

2.2.2 Alternative B: Harvest

- The proposed harvest would yield between 1.5 and 2.5 million board feet (MMBF) of saw timber, from approximately 645 acres (see Figure 2-1 and 2-2).

- Approximately 2.5 miles of permanent road would be constructed in order to access the project area. Following harvests, all new roads would be closed to motorized public traffic.

- Approximately 600 feet of county road would be improved or relocated.

- Harvesting would remove approximately 60% of the tree canopy cover. In areas of Douglas-fir mistletoe infection, all infected trees would be harvested or cut down and removed; this would leave some openings in the stand. The residual stand would be composed of roughly 25% ponderosa pine, 15% western larch and 60% Douglas-fir on north aspects and 90% ponderosa and

10% Douglas-fir on south aspects. Dominant healthy trees would be retained and all ponderosa pine and western larch over 20" dbh would also be retained.

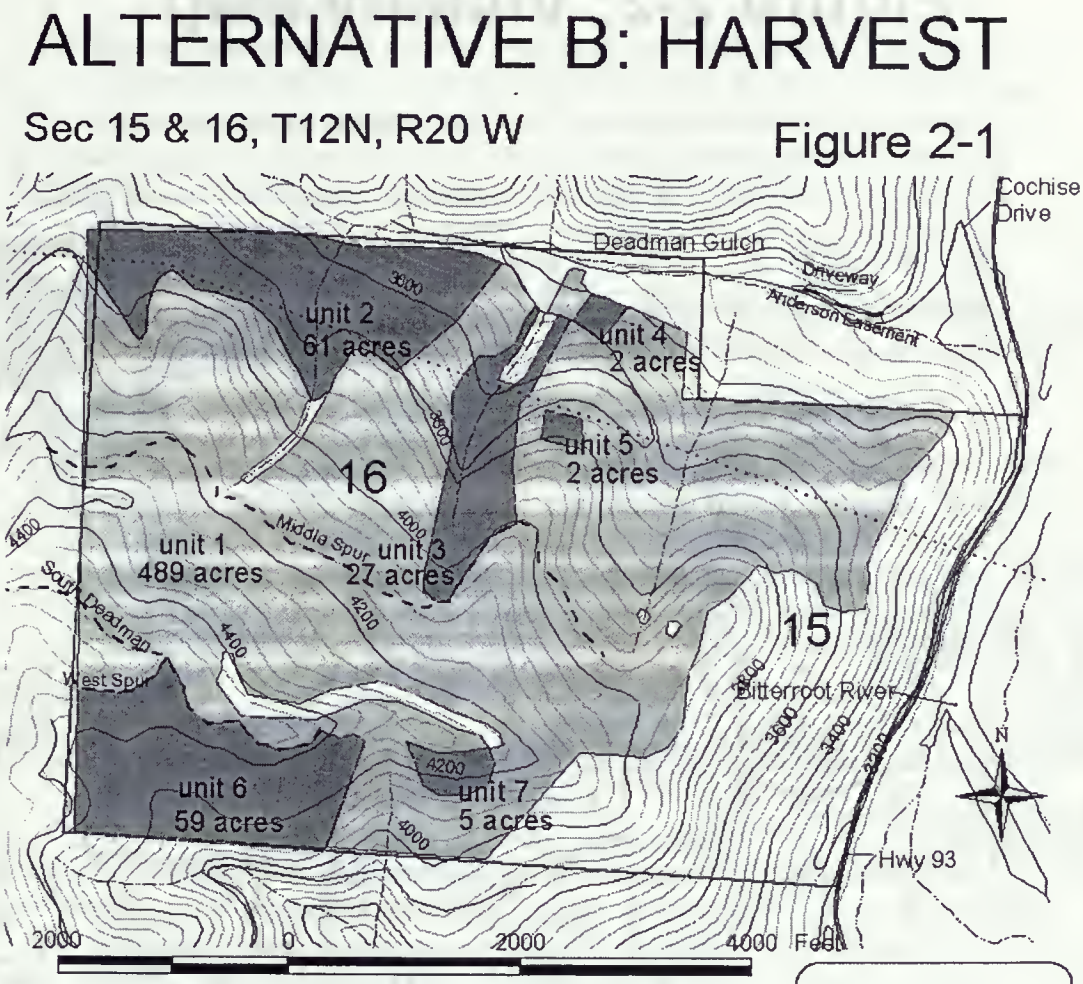
- 489 acres would be harvested with a ground based logging system. 156 acres comprised of steep slopes would be harvested with a skyline cable system.

- There would be minimal change in the area where there is a high amount of recreational use. Most trees would be retained in the areas within 50 feet Deadman Gulch Road along the state's northern property boundary. Trees in this area with barbed wire imbedded in the trunks would be harvested.

- Logging slash would be jackpot piled and burned following the harvest.

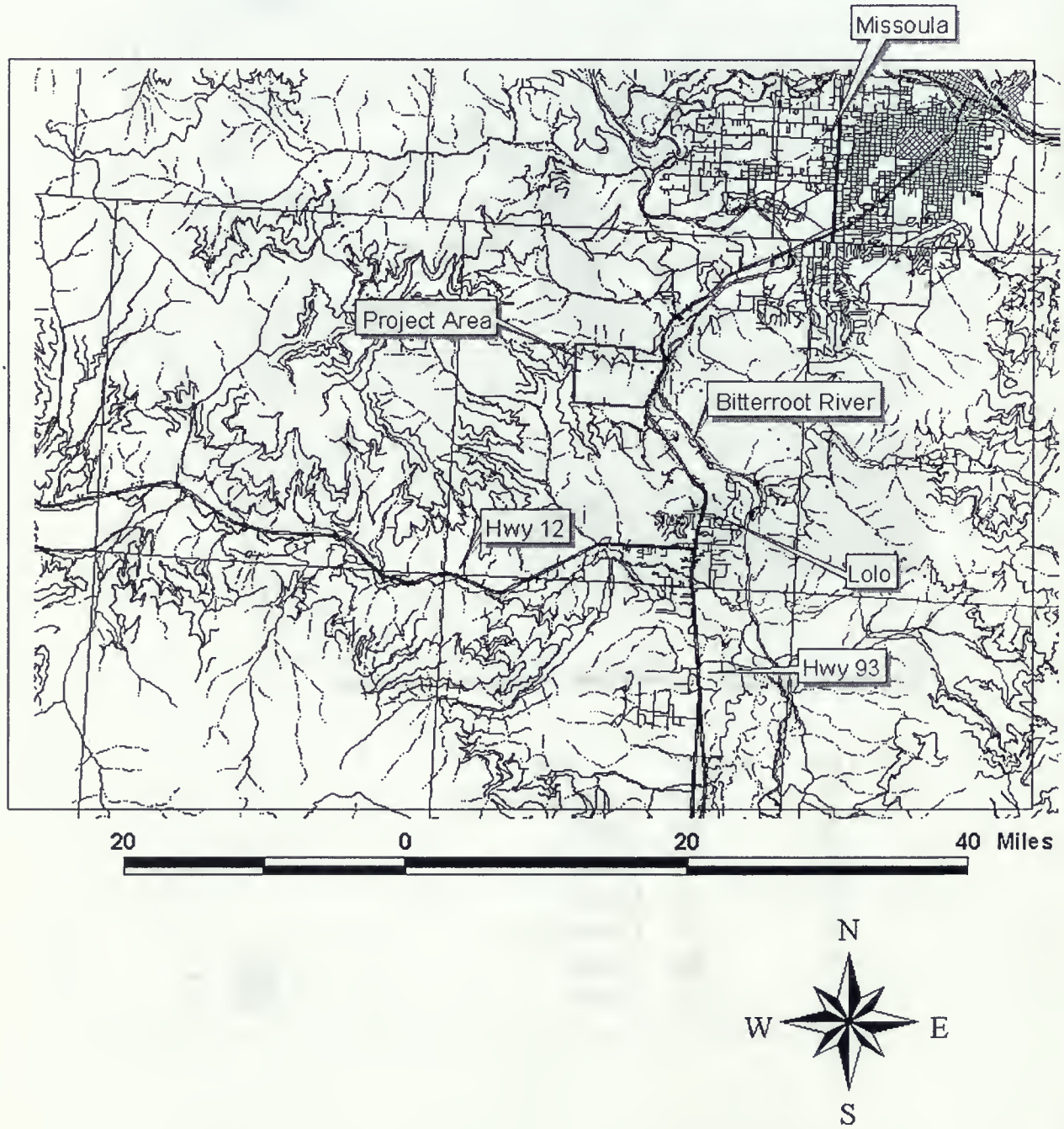
- This alternative would provide between $375,000-$625,000 (see p. 4-12) in revenue to the common school trust.

Figure 2–1: Map of Alternative B:Harvest
Timber Harvest Units, Logging Methods, and Roads



Unit	Acres	Type
1	489	Ground Based
2	61	Cable
3	27	Excaling
4	2	Cable
5	2	Excaline
6	59	Cable
7	5	Cable

Figure 2-2: Vicinity Map



2.3 Mitigation Measures of Alternative B: Harvest

2.3.1 Watershed and Soil Related Mitigation Recommendations

- Operations conducted in or near draw features and on steeper slopes have a higher risk of impacting soil resources and water quality. The following recommended mitigation measures would help minimize risk of impacts during the proposed activities. These mitigation measures are standard practices that may be applied to all harvest activities associated with the proposed harvest.

2.3.2 General Road Design Mitigation Recommendations

- Plan, design and improve existing road systems to meet long-term access needs and to fully comply with current BMPs.

- Construct drain dips, roll grades and construct other drainage features where necessary and practical to insure adequate road surface drainage. Install and maintain all road surface drainage concurrent with harvest activities, reconstruction, and reconditioning. Drain dips constructed on sustained road grades greater than 8% may require gravel surfacing to function properly. Sustained road grades greater than 10% may require installation of water diverters.

- Grass seed newly constructed or reconstructed road cut and fills immediately after excavation.

- Leave temporary or abandoned roads in a condition that would provide adequate drainage and would not require future maintenance. Partially obliterate roads that are abandoned through ripping and seeding. Scatter slash, where it is available, across the ripped road surface. Install water bars at regular intervals to facilitate surface drainage.

- Construct additional drainage features on all approaches to draw and stream crossings to avoid concentrating runoff at crossing sites. Locate drainage features close enough to the crossing to minimize the size of the area contributing runoff, but at an adequate distance away from the crossing to provide for effective sediment filtering.

- Filter ditches with direct delivery to streams or ephemeral draws at the outlet by using slash or filter fabric and straw bales.

- Incorporate slash filter windrows at all draw and stream crossings requiring fills that are more than 2 feet deep.

- Rock armor both the inlet and outlet of all CMP installations. Install energy dissipaters at outfall of all CMP installations. Rock used for armoring should average 12 inches in diameter and not less than 6 inches in diameter.

- When excavating material in and around stream and draw crossings (i.e. installing new CMPs, cleaning inlets and outlets, constructing ditches, etc.) take special care so as not to cause an excessive amount of disturbance to the stream channel or area immediately adjacent to the crossing site. Dispose of excess or waste material at a location where it would not erode directly into the stream or draw bottom.

- Limit road use and hauling to dry, frozen or snow covered conditions. Suspend operations when these conditions are not met before rutting occurs.

- Where feasible, rip, seed, water bar and slash any non-system roads within the sale area concurrent with construction activities.

2.3.3 Site-Specific Design and Mitigation Recommendations

- Following harvest activities, install water bars above and below the draw crossing on Middle Spur Road.

- For new road construction on side slopes greater than 55%, construct ¾ bench road segments. Round off the cutslope edge (top) to 1:1 and construct the main cutslope (lower) to help prevent slumping and subsequent erosion.

- Some locations within the sale area (particularly the E ½ of Section 16 and the W ½ of Section 15) contain slopes greater than 45% (as noted on map). Do not ground skid these areas with tracked equipment. Where these steeper slopes occur in larger areas, designate with clearly marked equipment restriction zones (ERZs) and use winch lines to pull the wood either up or down the slope.

2.3.4 Harvest Unit General Design Mitigation Recommendations

- Implement Forestry Best Management Practices (BMPs) as the minimum standard for all operations with the proposed timber sale.

- Protect all ephemeral draws, springs and wet areas with marked ERZs. If absolutely necessary, designate locations for skid trail crossings. Minimize number of crossings and space 200 feet apart where feasible. This should minimize soil disturbance within the vicinity of the draws. Use designated crossings only under dry or frozen conditions.

- The logger and sale administrator should agree to a skidding plan prior to equipment operations. Skid trail planning would identify which main trails to use, and what additional trails are needed. Do not use trails that do not comply with BMPs (i.e. draw bottom trails) and close with additional drainage installed where needed or grass seeded to stabilize the site and control erosion.

- Scatter 5 – 10 tons per acre of coarse woody material larger than 3 inches in diameter throughout the sale units. The Forest Officer would determine the appropriate amount of material and may designate pieces that would otherwise be skidded and left for this purpose. This may require return skidding.

- Grass seed skid trails with a grade over 30% following use. Scatter slash on skid trails where feasible.

- Do not burn slash in or near areas of concentrated ephemeral flow.

2.3.5 Noxious Weed Mitigation Recommendations

- Clean all road construction and harvest equipment of plant parts, mud and weed seed prior to arrival on the project area to prevent the introduction of noxious weeds. Have a Forest Officer inspect equipment prior to moving on site.

- Seed all newly disturbed soils on road cuts and fills to site adapted grasses for reduction of weed encroachment and stabilization of roads.

- Avoid skidding through areas with leafy spurge infestations. These areas should be clearly marked as ERZs.

- Spot spray small spot infestations of leafy spurge.

- Implement weed control according to the weed plan outlined in the environmental assessment. Monitor the project area for two years after completion of harvest activities to identify occurrence of any new noxious weeds on site.

2.3.6 Air Quality Mitigation Recommendations

Conduct burning under good to excellent smoke dispersion conditions. DNRC should work closely with the Monitoring Unit of the Montana/Idaho Airshed Group and obtain special smoke dispersion forecasts in order to burn only on ideal days.

2.3.7 Heavy Truck Traffic and Public Safety Mitigation Recommendations

2.3.7.1 Dust

Apply dust abatement on Cochise Drive where this road is adjacent to houses if dust becomes a problem during times of hauling.

2.3.7.2 Cochise Drive

Widen Cochise Drive to improve visibility and road width. Relocate the first switchback through the Anderson's pasture to improve approach.

2.3.7.3 Entering Highway 93 from Cochise Drive

Require log trucks entering Highway 93 to make a right hand turn upon entering the highway and should turn around in Lolo at the Town Pump to go north.

2.3.8 Visual Quality Mitigation Recommendations

Locate and build roads so that they are hidden from view by utilizing benches and flatter ground where possible use trees below the roads to create a screen. Keep skyline corridors narrow and do not place at angles viewable by the public. Space or group leave trees according to the present location of healthy dominant trees.

2.3.9 Wildlife Mitigation Recommendations

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

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

- Restrict public access within the Project Area to minimize disturbance to important wildlife, minimize incidental affects to important habitat features such as snags and downed woody debris, to reduce potential mortality effects on threatened, endangered, and sensitive species, and to manage big game harvest vulnerability.

- A no entry zone should parallel the north side of the ridge to facilitate movement of animals to and from the adjacent south-facing slopes.

- Maintain restrictions in areas currently closed to general public motorized access. Install a gate near the switchback near the ¼ corner of sections 16 and 9 to limit vehicle access to all but approximately 5 acres.

2.4 Process Used to Develop the Alternatives

The major environmental issues identified during the scoping process were defined and are summarized in Chapter I. In order to understand how the proposed Harvest would effect the environment, its effects were contrasted to those of Alternative A: Deferred Harvest (No Action).

Following implementation of the proposed Alternative B: Harvest, the project area should have stand structures and conditions more closely resembling those during pre European-settlement times rather than those which exist at present. It was DNRC's intent when designing Alternative B: Harvest to have the following attributes across the project area's landscape:

- A diversity of tree sizes and species.
- A diversity of treatment intensities and stocking levels.
- Retention of the existing large ponderosa pine and western larch. Removal of the shade tolerant trees which have become established due to fire suppression, and reduction of the threat to large, old ponderosa pine, and western larch caused by inter-tree competition, and ladder fuels.
- Reintroduction of fire into part of the project area using jackpot pile burning.

2.5 Alternatives Eliminated from Detailed Study

No other alternatives were developed, because proposed Alternative B: Harvest met all environmental guidance and IDT specialists' specifications, while providing income for the trust.

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

2.6.1 Summary Comparison of Project Activities

Table 2-1: SUMMARY COMPARISON OF PROJECT ACTIVITIES OF ALTERNATIVES A AND B.

The following table provides a comparison of the on-the-ground activities that would occur if either Alternative A or B were implemented.

Activity	Alt. A	Alt. B
TIMBER STANDS SINGLE TREE SELECT HARVEST (ACRES)	0	645
Tractor yarding (acres)	0	489
Skyline yarding (acres)	0	156
Road construction (miles)	0	1.2
County road reconstruction (miles)	0	.2-.3

All roads in the project area would remain closed to motorized public use after the project is completed.

2.6.2 Summary Comparison of predicted Achievement of Project Objectives

Table 2-2: SUMMARY COMPARISON OF PREDICTED ACHIEVEMENT OF PROJECT OBJECTIVES

Objectives	Indicators	Alt. A	Alt. B
Objective #1: To manage the forest for appropriate desired future conditions, characterized by the proportion and distribution of forest types and structures typical of those represented under average historic conditions.	• Acres of land managed to grow toward desired future conditions or naturally growing toward desired future conditions	0	645
Objective #2: Harvest between 1.5 and 2.5 million board feet (MMBF) of sawtimber to generate revenue for the Common School (CS) trust grant.	• Stumpage receipts in dollars	0	$375,000-$625,000

2.6.3 Summary Comparison of Predicted Environmental Effects

Table 2-3: SUMMARY OF ENVIRONMENTAL OF PREDICTED ENVIRONMENTAL EFFECTS

ISSUE	ALTERNATIVE A-DEFERRED HARVEST (NO ACTION)	ALTERNATIVE B-HARVEST
SOIL RESOURCES	Minimal effects on soil resources, Existing roads require routine maintenance to help reduce potential future impacts.	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 effect on nutrient cycling, maintain long-term soil productivity and reduce on-site erosion.
WATER QUALITY	The threat of wildfires would continue to be an issue. In the event of wildfire, air quality would be affected. No burning of logging slash would affect air quality.	Harvest activities and road construction are not expected to increase sediment yield to stream channels.
CUMULATIVE WATERSHED EFFECTS	No Change from current condition.	Erosion control and other mitigation measures are expected to improve and minimize long-term impacts to downstream water quality.
COLD WATER FISHERIES	No effects to fisheries are predicted under the Alternative A: Deferred Harvest (No Action)	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.
AIR QUALITY	No smoke would be produced from slash burning. There would be no effect on air quality due to DNRC slash burning. In the event of wildfire, air quality would be affected.	Burning associated with slash disposal would only be done on days with good to excellent smoke dispersion. DNRC would comply with air quality laws by following the procedures of the Montana-Idaho state airshed group. Smoke may settle along highway 93 and in the area of local homes overnight. However smoke impacts should be minor and of short duration.

ISSUE	ALTERNATIVE A-DEFERRED HARVEST (NO ACTION)	ALTERNATIVE B-HARVEST
NOXIOUS WEEDS	Gradual increase in weed density over time. Integrated weed management efforts would continue on the site.	Greater increase in noxious weed density and occurrence compared to the Alternative A: Deferred Harvest (No Action) due to soil disturbance and decreased tree canopy. Integrated weed management efforts would continue on the site. Control efforts would emphasize treatment of any new noxious weeds.
FOREST CONDITIONS AND FOREST HEALTH	Trees would continue to stagnate due to overstocking. Douglas-fir would continue to replace ponderosa pine on the site. Frequent outbreaks of mountain pine beetle could be expected due to the 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 European-settlement state of open grown stands dominated by ponderosa pine. Growth rates and health of trees would improve due to a reduction in stocking levels.
HEAVY TRUCK TRAFFIC AND PUBLIC SAFETY	No change from current condition.	Dust level may be lower than the present level around homes due to use of dust abatement on Cochise Drive. Realignment and widening of Cochise Drive would improve motorist safety in the long term. Short-term truck traffic entering Highway 93 may increase hazards to motorists.
VISUAL QUALITY	No change from current state. Increased potential for stand replacement wildfire in the long term.	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 winter in contrast to their solid green appearance now. Skyline corridors would be angled away from populated areas therefore, it is unlikely that they would be visible from the valley floor. New roads are located on gentle slopes and would be screened by trees below the road.

ISSUE	ALTERNATIVE A-DEFERRED HARVEST (NO ACTION)	ALTERNATIVE B-HARVEST
ECONOMIC BENEFITS AND EXPECTED REVENUES	No economic contribution or benefits to the School Trust would occur above the current grazing leases from this section within the foreseeable time frame. This would have a direct effect upon the School Trust and DNRC's obligation to provide the School Trusts with income from Trust Lands.	The investment into the road infrastructure within this section would be approximately $45,000 This investment would decrease future management costs within this section. The forest improvement collections would be approximately $52,350-$87,250. This money would be deposited in the forest improvement fund to be used for thinning, prescribed burning, planting, weed management, etc. on Trust Lands. The projected revenue for this alternative to the School Trust is approximately $335,000-$500,000. The proposed project would provide work for a road-building contractor, logging contractor, their subcontractors, and their employees. The forest products would most likely be processed by local mills providing further job opportunities
Endangered Species		
BALD EAGLE	No cumulative effect in short term and only minor effect in the long term.	Minimal direct and cumulative effect.
GRIZZLY BEAR	Minimal potential effect due to low quality habitat.	Minimal direct and cumulative effect.
GRAY WOLF	No Change from current condition. No effect on wolves.	Minimal to no direct and cumulative effect.
Sensitive Species		
FLAMMULATED OWL	No Change. Minor short-term positive effect and a minor long term negative effect.	Minor positive indirect and cumulative effect.
PILEATED WOODPECKER	Positive effect in the short term, negative effect in the long term	Minor negative effect in the short term and positive effect in the long term.

ISSUE	ALTERNATIVE A-DEFERRED HARVEST (NO ACTION)	ALTERNATIVE B-HARVEST
BLACK-BACKED WOODPECKER	No Change from current condition.	Little to no effects.
Big Game		
BIG GAME	No short-term direct or indirect effects and a minor possibility in increased adverse cumulative effects in the future in the event of a stand replacing fire.	Reduction in hiding cover resulting from harvesting. Minor and short term adverse effect.

3.0 Affected Environment

3.1 Introduction

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

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 Affected Resources

3.2.1 Soil Resources (Issue #1)

The terrain within the project area is moderate to very steep mountain sideslopes with some abrupt slope breaks and deeply incised draws that reflect the structural bedrock control of the landscape. The general pattern of the topography consists of flat, benchy ground with steep, dissected draw features scattered throughout the project area. The steeper slopes on south and southwest aspects have shallow soils with little vegetation cover. The bedrock is mainly stable, Missoula Group Argillites and Siltites, with lucustrine deposition in the draw bottoms. Scree slope and rock outcrops are common on the steeper slopes.

Soil types are closely related to the bedrock type and were derived from alluvium and colluvium. Soils mapping units within State Sections 16 and 15 are summarized in table 3-1.

TABLE 3-1: SUMMARY OF SOIL MAPPING UNITS WITHIN SECTION 15 & 16

DEADMAN GULCH PROPOSED TIMBER SALE Soil Types							
Map Unit	**Soil Type**	**Slope**	**Depth Class**	**Drainage Class**	**Erosion Potential**	**Displace-ment Hazard**	**Compac-tion Hazard**
19	Bigarm gravelly loam	30-60%	Very deep	Somewhat excessively drained.	Moderate to High*	Moderate. High on slopes >40%.	Low
89	Repp very gravelly loam	30-60%	Very deep	Well drained.	Moderate to High*	Moderate. High on slopes >40%.	Moderate
90	Repp very gravelly loam, cool	8-30%	Very deep	Well drained	Moderate to High*	Moderate. High on slopes >40%.	Moderate
91	Repp very gravelly loam, cool	30-60%	Very deep	Well drained	Moderate to High*	Moderate. High on slopes >40%.	Moderate
131	Winkler very gravelly sandy loam	30-60%	Very deep	Somewhat excessively drained.	Moderate to High**	Moderate. High on slopes >40%.	Low
133	Winkler gravelly loam, cool	30-60%	Very deep	Somewhat excessively drained.	Moderate to High**	Moderate. High on slopes >40%.	Low

* NOTE: Erosion potential is high to severe on slopes over 40%.
** NOTE: Erosion potential is high on slopes over 40%.

No especially unique or unstable terrain was noted within the project area.

3.2.2 Water Quality (Issue #2)

Watersheds:

The proposed sale area is located approximately 3 miles north of Lolo, Montana. The proposed sale area is located within two state sections. Unnamed tributaries

to Deadman Gulch, a tributary to the Bitterroot River, drain the proposed project areas.

The watershed analysis area (see Figure 3-1) addresses all watercourses draining the sale area to facilitate hydrologic analysis and cumulative watershed effects assessment. A description of those drainage's follows:

Deadman Gulch:
This 1517-acre watershed receives an average of 25 inches of annual precipitation and 683 acre-feet of natural runoff. This 2nd order tributary to the Bitterroot River is intermittent in nature.

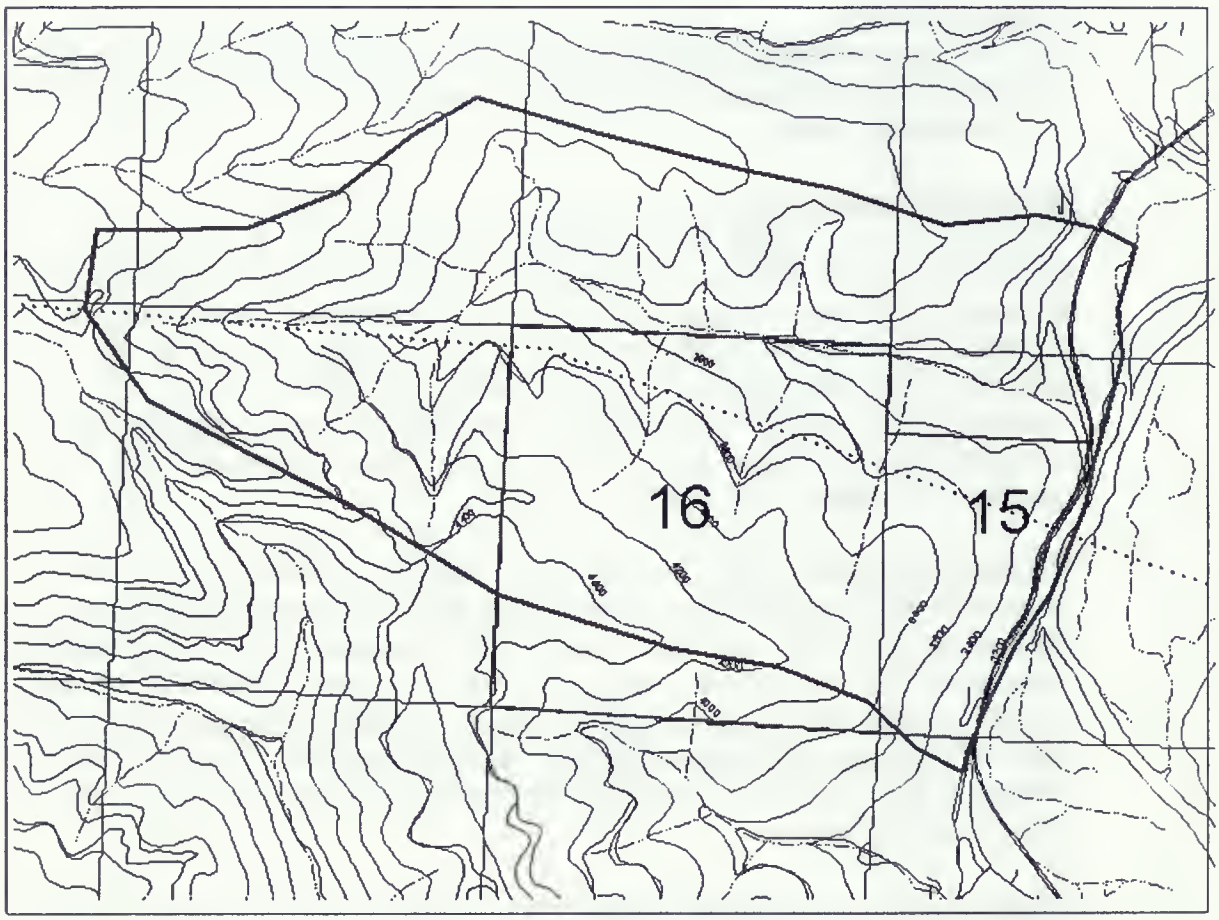
Regulatory Framework:
This portion of the Clark Fork River basin, including the Bitterroot River, is classified B-1 in the Montana Water Quality Standards. Waters classified B-1 are suitable for drinking, culinary and food processing purposes after conventional treatment; bathing, swimming and recreation; growth and propagation of salmonid fishes and associated aquatic wildlife, waterfowl and furbearers; and agricultural and industrial water supply. State water quality regulations prohibit any increase in sediment above naturally occurring concentrations in waters classified B-1 (ARM 16.20.618 2(f)).

Naturally occurring means conditions or materials present from runoff or percolation over which man has no control or from developed land where all reasonable land, soil and water conservation practices have been applied. Reasonable land, soil and water conservation practices include methods, measures or practices that protect present and reasonably anticipated beneficial uses. The state of Montana has adopted Forestry Best Management Practices (BMPs) through its Non-point Source Management Plan as the principal means of meeting Water Quality Standards.

Existing beneficial uses in the analysis area include water rights for groundwater sources to include stock, irrigation, lawn & garden, recreation, commercial and domestic uses. Surface water sources include irrigation, stock, and recreation uses. There are no sensitive beneficial uses in the sale area, however; downstream sensitive beneficial uses include aquatic life support and cold-water fisheries.

The Clean Water Act and EPA Water Quality Planning and Management Regulations require the determination of allowable pollutant levels in 303(d)-listed streams through the development of Total Maximum Daily Load (TMDL) limits. The TMDL process is used to determine the total allowable amount of pollutants in a water body of watershed. Each contributing source is allocated a portion of the allowable limit. These allocations are designed to achieve water quality standards.

Figure 3-1: Watershed Analysis Area



0.5 0 0.5 1 Miles

Legend

Watershed Analysis Area

Project Area

N
W E
S

The Montana TMDL Law (75-5-701MCA) directs the Department of Environmental Quality to assess the quality of state waters and to develop TMDLs for those waters identified as threatened or impaired. Under the Montana TMDL Law, new or expanded nonpoint source activities affecting a listed water body may commence and continue provided they are conducted in accordance with all reasonable land, soil and water conservation practices. DNRC would comply with the rules developed by DEQ through implementation of all reasonable soil and water conservation practices, including Best Management Practices and Resource Management Standards (RMS) as directed under the SFLMP. There are no 303(d) listed streams within the analysis area.

The Montana Streamside Management Zone Law (MCA 77-5-301) and Rules (SMZ Law) regulate timber harvest activities that occur adjacent to streams, lakes and other bodies of water. This law prohibits or restricts timber harvest and associated activities within a predetermined SMZ buffer on either side of the stream. The width of this buffer varies from 50-100 feet, depending on the steepness of the slope and the class of the stream.

The Montana Stream Protection Act (MCA 87-5-501) regulates activities conducted by government agencies that may affect the bed or banks of any stream in Montana. This law provides a mechanism to require implementation of BMPs in association with stream bank and channel modifications carried out by governmental entities. Agencies are required to notify the Montana Department of Fish, Wildlife and Parks (MDFWP) of any construction projects that may modify the natural existing conditions of any stream.

Roads

Approximately 2.6 miles of existing road provides access to the sale area. This is a high standard forest road that is closed to the public. Portions of this road currently meet BMP standards aimed at protecting soil and water quality. Other segments of this road do not meet BMP standards. These segments contain sustained grades where existing road surface drainage is in need of maintenance reshaping and upgrading.

The existing road is expected to continue meeting current BMP standards following minor routine maintenance and season of use restrictions.

3.2.3 Cumulative Watershed Effects (Issue #3)

Past management activities in both watersheds include grazing; fire suppression, road construction and timber harvest. Timber harvest activities have been moderate over the past 15 years, constituting approximately 273 acres in Deadman Gulch.

All drainage features in the proposed sale watershed analysis area were inventoried and evaluated by a DNRC hydrologist. All drainage features within

the proposed analysis area are ephemeral in nature and appeared stable with no evidence of impacts from past management activities.

A cumulative watershed effects (CWE) analysis for the proposed sale was completed to determine the existing conditions of the affected environment. The Deadman Gulch Watershed was selected for the analysis area. This analysis area was selected because it was determined to be the most appropriate scale to detect potential effects.

The CWE analysis was completed using a level II screening (outlined in SFLMP Watershed RMS # 7) by DNRC to determine the existing conditions of the proposed sale. The coarse filter approach consisted of on-site evaluation, mapping the percent forested of each watershed and documenting history of past activities through the use of maps, aerial photographs and harvest records.

Due to the intermittent and ephemeral nature of the local stream channels, low precipitation and moderate level of past timber harvest, a water yield analysis was not conducted. It was determined that existing harvest levels are below those normally associated with detrimental water yield increases. It is generally accepted that up to 20-30% of the watershed area can be harvested before detectable increases in peak flows (USFS, 1974).

Past harvest levels within the analysis area equate to approximately 273 acres, or 18% of the total watershed area. The level of harvest within these 273 acres has been limited to selective harvest that has removed approximately 40% of the original crown cover.

All primary and secondary roads within the proposed sale area were evaluated for past or potential impacts. Field evaluations indicate that past management activities within the analysis area have resulted in impacts to water quality. These impacts are limited to sediment delivery and erosion from roads and cattle use and are restricted to stream crossings and isolated segments of existing roads.

3.2.4 Cold Water Fisheries (Issue #4)

There are no known fish bearing streams draining the State section in the proposed sale area. The entire sale area has drainage features that do not support fish. There is no available fish population data for Deadman Gulch. Due to its intermittent and/or ephemeral nature, it does not support fish.

Past grazing and timber harvest management have likely resulted in increased sediment and a decrease in the riparian shrub component and recruitable trees for in-channel large woody debris along existing stream channels. It is unlikely that these impacts have resulted in loss of shade cover, bank stability, large woody debris and increased temperatures to downstream fisheries. Lack of surface connectivity has resulted in unlikely impacts to downstream fisheries.

3.2.5 Air Quality (Issue #5)

3.2.5.1 Products of Combustion

When forest fuels burn, complex organic molecules composed primarily of carbon, hydrogen and oxygen break down and then recombine with oxygen. If combustion were 100% complete the only products produced would be water vapor and carbon dioxide. However complete combustion is only achieved under very controlled conditions and combustion of forest fuels is very incomplete. Some of the products of incomplete combustion are carbon monoxide, particulate matter and a wide variety of volatile organic compounds (VOCs). A fire that burns at a high temperature burns more completely and produces less particulate and other partial combustion products than a fire that burns at a lower temperature. Dry fuel that burns with flaming combustion burns hotter and therefore cleaner than fuel that is wet and burning at a lower temperature. Fuel that burns with an adequate supply of oxygen burns hotter and cleaner than fuel that is buried by dirt and therefore getting an inadequate supply of oxygen. Fire that is in the smoldering stage of combustion is cooler than the flaming stage and therefore produces more partial combustion products.

3.2.5.2 Characteristics of Smoke in the Missoula Valley

The project area is located approximately 6 miles southwest of downtown Missoula. The mountain valleys of Western Montana are prone to cold air inversions in the fall and winter when stationary high-pressure systems create a stable air mass that traps pollutants in the valley bottom. During the spring season the atmosphere is much more unstable and stable cold air does not settle into the valleys to the extent it does in the fall or winter. Due to this atmospheric instability, smoke is transported out of the valley much better in the spring than in the fall.

3.2.5.3 Effects of Smoke on Human Health

The most problematic pollutant in the Missoula area is particulate matter. Particulate is produced by a number of sources such as road dust from vehicles, forest and agricultural burning, industrial sources, windblown dust from plowed fields, smoke from wildfires and other sources. Particulate is classified by its size. PM-10 is less than 10 microns in diameter. PM-2.5 is less then 2.5 microns. The smaller a particle is, the greater impact it can have on human health. Smaller particles are able to penetrate farther into the human respiratory system. Smaller particles are also more difficult for the human body's natural processes to remove.

3.2.5.4 Regulation of Open Burning

Missoula County is a PM-10 Non-Attainment area as designated by the Environmental Protection Agency and the Montana Department of Environmental Quality. Open burning is allowed in Missoula County from March 1 to August 30 of each year. From September 1 to November 30

burning is permitted for forestry purposes only. No burning is allowed from December 1 to February 28. The Montana DNRC is a member of the Montana-Idaho Smoke Management Group. This group is composed of the major forestry burners in Idaho and Montana. Members of the group report their planned burns to a monitoring unit in Missoula before they are ignited. The goal of the smoke monitoring unit is not to allow the average PM-10 level for a 24 hour period to exceed 50 milligrams per cubic meter of air. Idaho and Montana are divided into "airsheds" which are geographic areas with similar topography and weather patterns. Urban areas within airshed are designated as impact zones. Due to the potential for adverse impacts to air quality in urban areas, burning in these impacts zones is much more restrictive than the airshed it is located in as a whole. The project area is located in Airshed 3A and the Missoula Impact Zone as designated by the Montana/Idaho Airshed Group. The Montana/Idaho Airshed Group Monitoring Unit issues daily smoke dispersion forecasts and burning restrictions for each airshed and impact zone. Restrictions are based on the number of burns planned, their location and atmospheric conditions. These restrictions are designed to limit the adverse impact to air quality resulting from prescribed burning.

3.2.6 Noxious Weeds (Issue #6)

Noxious weeds, including hounds tongue (*Cynoglossum officinale*),sulfer cinquefoil (*Potentilla rectre*), spotted knapweed *(Centaurea maculosa*), spots of thistle (*Cirsium arvense*) and leafy spurge (*Euphorbia esula*) occur within the analysis area. Knapweed is well established along the existing road systems and areas with past harvest activities. Leafy spurge is wide spread throughout the SE ¼ of Section 16 and the SW ¼ of Section 15.

3.2.7 Natural Forest Conditions (Issue #7)

The habitat types (h.t.) in the project area all belong to Fire Group 6 as defined by (Fischer and Bradley 1987). Douglas-fir is both the indicated climax species and a vigorous member of the seral component. It is not uncommon for Douglas-fir to dominate all stages of succession. Ponderosa pine, western larch and lodgepole pine are seral components whose abundance varies by phase. Fire history studies conducted with the PSME/CARU h.t. in southwest Montana indicate a mean fire interval of 42 years, for pre European-settlement stands. A tentative mean fire-free interval of 15.8 years was reported within a PSME/PHMA h.t. near Missoula, Montana. Fire was an important agent in controlling density and species composition. Low to moderate severity fire converted dense stands of pole-sized or larger tress to a more open condition, and subsequent light burning maintained stands in open conditions. Frequent low or moderate fires favored larch and ponderosa pine over Douglas-fir where these species occurred. Severe fires probably occurred on dense, fuel-heavy sites and resulted in stand replacement. Stand replacement fires favored lodgepole pine on sites where this species was present. Fire's role as a stand replacement agent becomes more pronounced when the natural fire-free interval is increased though fire suppression, unless corresponding fuel reduction occurs. The theoretical climax condition on Group

Six is a multistoried Douglas-fir stand, although a fire-maintained open forest condition was the normal situation during the pre European-settlement period. Depending on the stage of stand development and the fire severity, fire may maintain the site in a shrub and herb stage, thin the stand or in the case of a severe fire, replace the stand and revert it to the shrub and herb stage. Climax Douglas-fir stands are more likely to occur on sites where Douglas-fir is the climax species as well as the seral dominant, notably on sites within the PSME/CARU-CARU and PSME/PHMA-PHMA habitat types. Frequent low to moderate fires in the climax conditions on these sites will create a more open, park like stand of Douglas-fir, whereas a severe fire returns the stand to the shrub and herb stage (Fischer and Bradley 1987).

Prior to European settlement forested sites such as the project area were composed of large ponderosa pine, western larch, and Douglas-fir. Drier aspects were predominantly ponderosa pine while western larch became a major component in more moist areas. These stands frequently grew in fairly open conditions that were maintained by frequent low intensity surface fires that occurred on an average interval of once every 13 years. These fires served to maintain the open character of the stand by killing most of the small trees that had become established in the under-story but did not usually damage the large trees in the overstory. Fire also perpetuated the dominance of ponderosa pine on the site as it is more fire resistant than Douglas-fir in the sapling stage. While no records of past harvest exist, the stand was very likely logged in the latter portion of the 1890's when lower slopes in the area were being aggressively harvested. Large snags and snag recruits are limited because of past harvest. The best snags that currently exist within the project area are located in the unentered stands on and near the eastern ridge top. These trees were probably too small to be economically harvested in the early day logging and have now grown to a relatively large size. Following the removal of most of the large trees on the site the area regenerated into a dense stand of Douglas-fir. With effective fire exclusion these stands have regenerated into more dense stands of ponderosa pine and Douglas-fir than was historically present in the stand. Dwarf mistletoe occurs throughout most of the Douglas-fir stands. Due to the stand's dense character the trees are competing with each other for moisture, nutrients and growing space. Mortality from competition is common in the stand. The predominant stand structure within the project area is second growth Douglas-fir, western larch, and ponderosa pine. Tree size ranges from 5" to 26" dbh with most trees between 6" and 8" dbh. Species composition varies throughout the stand but is approximately 40 % Douglas-fir, 20% western larch, and 40% ponderosa pine. The proposed harvesting would reduce the tree canopy cover in the harvested areas by approximately 40-60%. Harvesting would leave the dominant ponderosa pine and western larch whenever possible. Following harvesting the site would have approximately 50 trees per acre ranging from 8" to 26" dbh. Growth rates should increase dramatically due to the thinning, as competition between trees would be substantially reduced. Other plant species currently on the site such as grass, forb and shrub species should also experience an increase in growth and vigor as a

result of tree thinning. Knapweed occurs along the road and in open stands in most of the section. Some south-facing slopes have locally heavy infestations of knapweed. There are areas of spurge on the open hillsides in the eastern portion of section 15 above the highway and some scattered areas of infestation in section 16.

3.2.8 Heavy Truck Traffic and Public Safety (Issue #8)

3.2.8.1 Dust

Cochise Drive is an unpaved county road adjacent to residential areas. This road is a main access road to a road system that services a growing number of private residences. Dust is presently produced by a substantial amount of residential automobile traffic as well as truck traffic related to housing development.

3.2.8.2 Cochise Drive

Cochise Drive is narrow in places and because of curves and trees visibility is not good. Because of the narrow width of the road passenger vehicles must be cautious when passing oncoming vehicles. In places it would be difficult for a commercial log truck and a passenger vehicle to safely pass each other.

3.2.8.3 Entering Highway 93 from Cochise Drive

Cochise Drive was once only a small two-track road called Deadman Gulch Road that accessed a few homesteads and timber harvest areas. Now, traffic on Highway 93 and on Cochise Drive has increased as populations in the Bitterroot Valley and the rural areas surrounding Missoula have increased. There is no traffic light or large turning lane for vehicles attempting to access the highway and travel north.

3.2.9 Visual Quality (Issue #9)

The entire project area is visible from the southern portion of the Missoula valley. The project area has a closed canopy, dense forest appearance from both a near and distant prospective. A number of private homes border the project area. There are approximately 2.5 miles of road within the project area, some of which is screened from view by the trees below and some which appear as a gap in the canopy. There is a Bonneville Power Authority (BPA) power line crossing the project area on a east – west line. This is visible from the south side of Missoula and to southbound traffic on Highway 93.

3.2.10 Economics (Issue #10)

Currently income from the sections includes proceeds from two active Grazing Permits issued for sections 15 and 16.

There is no current revenue being generated from the management and sale of timber in these sections.

The costs related to the administration of the timber sale program are only tracked at the Land Office and statewide level. DNRC does not track project level costs for individual timber sales. An annual cash flow analysis is conducted on the DNRC forest product sales program. Revenue and costs are calculated by Land Office and Statewide. These revenue-to-cost ratios are a measure of economic efficiency.

Revenue cost ratios:

	FY97	FY98	FY99	FY00	FY01
SWLO	2.08	1.8	1.44	2.36	2.69
State	1.89	1.7	1.36	2.78	1.62

3.2.11 Endangered Species (Issue #11)

3.2.11.1 Bald Eagles

Bald eagles occur within the Analysis Area (see Figure 3-2), primarily associated with the Bitterroot River, which is approximately 0.5 miles from the Project Area to the east. Bald Eagles are listed as a Threatened species in Montana under the Endangered Species Act (ESA). Forest habitats frequented by bald eagles are typically near (<1 mile) large, visible bodies of water. Bald eagles show a strong preference for multi-layered, mature forest stands with large emergent trees and snags for nesting and perching sites (MBEWG 1991). Winter habitat generally occurs near local food concentrations, generally along major river drainages and around large lakes (MBEWG 1991).

Known nest sites and nesting habitat: Bald eagles nest and winter along the Bitterroot River, however no bald eagle nest sites or roosting habitats are known to occur within the Project Area. The closest known active nest is the Pulp Mill nest site located approximately 9.5 miles to the northwest. The Schroeder nest site is located along the Bitterroot River approximately 1 mile to the southeast, but this nest site has not been active for the past 2 years and the nest has fallen out of the nest tree (D. McCleerey, BLM, pers. comm., 3/19/02). Potential use by nesting bald eagles is very low within the Project Area due to the limited availability of large, emergent trees preferred for nesting and perching over most of the Project Area, although some large trees do occur scattered along the ridge and in patches in the area outside of the proposed treatments in the southeastern portion of the section 15. Stands proposed for treatment are generally composed of single strata stands of medium to small sized trees. Foraging by bald eagles likely occurs within the Analysis Area, primarily associated with the Bitterroot River, however some foraging on road and winter killed ungulates also likely occurs in the area to the east of the Project Area.

Figure 3-2: Wildlife Analysis Area

Legend

Wildlife Analysis Area

Project Area

Wildlife Analysis Area includes the following townships:
T12N R21W
T12N R20W
T11N R21W
T11N R20W

Wintering areas: Bald eagles are known to winter on the Bitterroot River, however no known high concentration areas or communal roosts occur within the project or Analysis Area. Wintering bald eagles generally roost and concentrate activity near open water (MBEWG 1991). Wintering eagles can also concentrate activity in areas with high densities of wintering ungulates where they forage on winter killed carrion, especially in late winter. However, the project and Analysis Areas generally contain low to moderate concentrations of wintering animals and therefore would not attract concentrations of wintering bald eagles.

3.2.11.2 Grizzly Bears

Grizzly bears are currently classified as Threatened in Montana under the ESA. Grizzly bears are a wide ranging species and therefore a larger Analysis Area was necessary to assess effects. The Analysis Area used in this assessment was the area encompassed by the following Townships: T12NR21W, portion of T12NR20W west of the Bitterroot River, T11NR21W, and portion of T11NR20W west of the Bitterroot River. This area generally encompasses a large portion of the Lolo Creek drainage to the west of Lolo, Montana and the Bitterroot River.

Grizzly bears utilize a wide range of habitats, from low elevation riparian areas to high elevation berry fields, however habitat use is greatly influenced by the presence of human activity, which can result in bear-human conflicts that can increase grizzly bear mortality risk. Human access to preferred habitats, as represented by total and open road densities, is therefore an important factor in grizzly bear habitat use. The proposed harvest activities are approximately 10 miles to the northeast, and separated by a major highway (Montana Hwy. 12), from the Bitterroot Grizzly Bear Ecosystem. This ecosystem is currently not occupied by grizzly bears (USFWS 2000). Therefore, the likelihood that grizzly bears would occur within the Analysis Area in the near term is very low. However, grizzly bears are a wide ranging species and it is feasible that grizzly bears, especially in the future if reintroduction to the Bitterroot Ecosystem occurs, could utilize habitats within the Analysis Area. Grizzly bears utilize low elevation riparian areas in the spring, where they feed on grasses and forbs. In addition, grizzly bears forage in big game winter range areas in the spring in search of winter-killed carrion. The Lolo Creek and Bitterroot Rivers in the central and eastern portions respectively of the Analysis Area are high quality low elevation riparian areas that would be preferred by grizzly bears. However, the presence of a major highway complex and dispersed but extensive human development in and near the Project Area and in the eastern portion of the Analysis Area greatly reduces the value of these habitats and likely precludes the use of these areas by grizzly bears. Within the Project Area, Deadman Gulch generally does not contain riparian habitat features that would attract grizzly bears and do not provide extended foraging opportunities for grizzly bears.

3.2.11.3 Gray Wolves

Wolves are currently classified as threatened in Montana under the ESA. Due to the large territories of wolf packs, the Analysis Area described for grizzly bears was also used for this analysis. There are no documented denning sites or known consistent use areas within the Project or Analysis Area. Activity that would be expected if a pack occupied this area has not been documented (Ed Bangs, USFWS, pers. comm., 18 March 2002). The closest established active wolf pack is the Lupine pack located northwest of Lolo Hot Springs, which is approximately 22 miles to the west, while the Fish Creek pack occurs further to the west in the area south of Tarkio, Montana (Ed Bangs, USFWS, pers. comm., 18 March 2002).

Wolves are wide ranging and forage primarily on big game. The Analysis Area generally contains only moderate levels of white-tailed deer winter range, with some use by elk in the winter as well.

3.2.12 Sensitive Species (Issue #12)

3.2.12.1 Flammulated Owls

Flammulated owls occur mostly in mid-elevation conifer forests that have a significant old ponderosa pine component. They are known to occur on the Lolo National Forest in mature Douglas-fir/ponderosa pine forests (Verner 1994). Flammulated owls appear to select open forest stands with large trees and snags for nesting and foraging (McCallum 1994). In addition, use areas have been found to have occasional clusters of thick vegetation for roosting (Howie and Ritchey 1987), and adjacent grassland or xeric shrubland openings that create edge foraging habitat (Wright 1996). Flammulated owls are secondary cavity nesters, usually utilizing cavities excavated by pileated woodpeckers in large conifer trees (cited in McCallum 1994). Flammulated owls are insectivorous and utilize foraging techniques adapted to open forest conditions or forest/grassland edge habitats (McCallum 1994).

Flammulated owls are unlikely to occur within the Project Area due to the low availability of mature/old ponderosa pine/Douglas-fir stands. Within most of the Project Area, large trees (>21" dbh) are rare, while small patches of mature to old ponderosa pine occur along the main ridge and outside of the treatment areas in the southeastern portion of the parcel. Open, mature to old ponderosa pine stands do occur within the Analysis Area on U.S. Forest Service parcels to the north and northwest of the Project Area. The Project Area is composed of 645 acres of proposed harvest and is dominated by relatively dense, even-aged, small sized (6-8" dbh), second growth Douglas-fir/ponderosa pine forest.

3.2.12.2 Pileated Woodpeckers

Pileated woodpeckers likely occur within the Project and Analysis Areas. Pileated woodpeckers prefer mature conifer forest with a canopy dominated

by large western larch or ponderosa pine. Mature aspen and cottonwood stands are also used by pileated woodpeckers. Pileated woodpeckers typically do not nest in trees less than 15" dbh, and preferred trees are generally over 20" dbh. Sufficient large snags and coarse woody debris are important components of pileated woodpecker habitat.

Quality pileated woodpecker habitat occurs to the north and west of section 16 in mature to old, ponderosa pine stands on Forest Service lands. Within the Project Area, stand structure is of low quality, being dominated by medium to small sized Douglas-fir/ponderosa pine, with scattered larger trees and little downed woody debris. More suitable habitat does occur to the southeast of the Project Area, where stands are composed of larger, older ponderosa pine.

3.2.12.3 Black Backed Woodpeckers

Black-backed woodpeckers are closely associated with standing dead forests, created by large fires of high intensity (Hutto 1995). Burned forests tend to be used soon after fire events occur (~2-5.years), and large, densely stocked stands with an abundance of large trees of various species appear to provide the greatest benefit to black-backed woodpeckers (Heijl et al. 2000, Hitchcox 1996). Black-backed woodpeckers are also found in green forests with high levels of insect activity (Goggans et al. 1989). Black-backed woodpeckers are not migratory, but are known to undertake large movements in response to fire events. Therefore, the Analysis Area used for the grizzly bear assessment will be used for the black-backed woodpecker cumulative effects analysis.

No recent stand-replacement fires or major insect infestations are known to occur within the Analysis Area. Consequently, preferred black-backed woodpecker habitat is rare to non-existent in the Analysis Area and the likelihood of resident populations of black-backed woodpeckers is very low.

3.2.13 Big Game (Issue #13)

Densely stocked thickets of conifer regeneration and overstocked mature stands provide thermal protection and security for elk and deer in winter, which can reduce energy expenditures and stress associated with cold temperatures, wind, and human-caused disturbance. Although thermal cover attributes may be less important for elk than has been thought (Cook et al. 1998), areas with densely stocked mature trees are also important for snow interception, which makes travel and foraging less stressful during periods when snow is deep. Dense stands that are well connected provide for animal movements across wintering areas during periods with deep snow, which improves their ability to find forage and shelter under varied environmental conditions. Thus, removing this "winter cover" important to wintering elk and deer through forest management activities can increase their energy expenditures and stress in winter. Reductions in cover could ultimately result in a reduction in winter range carrying capacity and subsequent increases in winter mortality within local elk and deer herds.

Timber harvest can increase elk vulnerability by changing the size, structure, juxtaposition and accessibility of areas that provide security during hunting season (Hillis et al. 1991). As visibility and human access increase within forested landscapes, elk have a greater probability of being observed and subsequently harvested by hunters. Hillis and others (1991) recommended that effective elk security should be composed of nonlinear blocks of mature forest cover (with at least 50% canopy closure) that are at least 250 acres in size and at least one half mile from any open road (Hillis et al. 1991). They also suggested that security cover is lacking if less than 30% of an area is composed of security cover and stated that maintaining connectivity among security areas is important (Hillis et al. 1991). Relationships of security cover and vulnerability for deer are not well known. However, because mule deer are less social than elk, and are smaller, they tend to use smaller patches of cover more effectively. It is generally assumed that if the security cover needs of elk are met, then those of deer are also met. Further, when elk security is demonstrated to be substantially compromised, adverse effects to mule deer can also be expected (albeit to a lesser degree than for elk). As with elk, affects on deer populations are skewed towards the male segment of the population with regard to security.

The proposed harvest unit provides some winter habitat for deer and elk and is used during fall hunting seasons by elk. Elk were found to winter in the area, with increases in use during the fall hunting seasons (Henderson and Hillis 1998). Although the Project Area was not a security area for elk as defined by Hillis et al. (1991), it was thought to be "de facto security" due to the limited hunter access resulting from the closed gate near occupied private land along Deadman Gulch. Due to the availability of movement data (Henderson and Hillis 1998), the large ranges of elk and the seasonal shifts in habitat use in this area, a larger Analysis Area was developed. The area used in the assessment of effects was described by a polygon bounded by the Bitterroot River to the east, Highway 12 to the south, the Clark Fork River to the north, and the Deep Creek/Albert Creek divide to the west. This area includes two distinct herd units: the Sleeman herd unit, which encompasses the Project Area, and the O'Brien herd unit (Henderson and Hillis 1998).

4.0 Environmental Consequences

4.1 Introduction

Chapter 4: Environmental Consequences forms the scientific and analytic basis for the summary comparison of effects presented in Chapter 2 pgs 2-12 through 2-15 of this EA. This chapter describes the environmental consequences or effects of the proposed action and the cumulative effects of concurrent and future state activities within the analysis area. This chapter focuses on the following effects:

- Direct, indirect, and cumulative effects
- Adverse effects of the proposed action
- Relationship between local short-term uses of the environments and the maintenance and enhancement of long-term productivity
- Irreversible and irretrievable commitment of resources that would be involved if the alternatives were implemented

This chapter has the following two major sections:

- Predicted Attainment of the Project Objectives of All Alternatives
- Predicted Effects on Relevant Affected Resources of All Alternatives

4.2 Predicted Attainment of the Project Objectives of all Alternatives

4.2.1 Predicted Attainment of Project Objective #1

To manage the forest for appropriate desired future conditions, characterized by the proportion and distribution of forest types and structures typical of those represented under average historic conditions.

4.2.1.1 Alternative A: Deferred Harvest (No Action)

Under this alternative, conditions contributing to decreased growth and vigor of trees would continue. It is expected that the regeneration of shade tolerant tree species would continue. This would move stands further away from those conditions that existed prior to organized fire suppression. Douglas-fir would continue to replace ponderosa pine and western larch. At current stocking levels, trees eventually would "stagnate" (grow at very reduced rates). As limited resources for tree growth (water, nutrients, and light) become scarcer, the risk of insect or disease infestations becomes much greater. As insects and disease increase, the potential of large-scale epidemics increases. This would create a cumulative effect of increased incidence of mortality and decreased growth. These factors combined would decrease the growth and vigor of the

stands. A cumulative risk due to these factors would be an increased chance of stand replacement wildfire involving the Deadman drainage area. Salvage of dead and dying timber would still continue as part of the DNRC management, although the lack of a road infrastructure makes this very difficult.

4.2.1.2 Alternative B: Harvest

Under this alternative, the retention of the majority of the largest trees of seral species would occur. Much of the lodgepole pine and Douglas-fir would be removed. By reducing stand density and altering species composition to levels more typical of pre-European settlement conditions, we would expect an increase in growth and vigor. The removal of trees most susceptible to insects and disease and reducing the available fuel loadings reduces the risk of stand replacing wildfire. The reduction of stand density would make limited resources (water, nutrients, and light) much more available to the remaining trees. The proposed prescribed burning would increase the chance of seral regeneration and would also provide a quick flush of nutrients for tree growth. The proposed harvest and regeneration would move these stands closer to "appropriate conditions" as defined by the State Forest Land Management Plan. Improved stand health would decrease risk of stand replacement wildfire and insect and disease infestations that would provide a cumulative benefit.

4.2.2 Predicted Attainment of Project Objective #2

Harvest between 1.5 and 2.5 million board feet (MMBF) of sawtimber to generate revenue for the Common School (CS) trust grant.

4.2.2.1 Alternative A: Deferred Harvest (No Action)

Under this alternative, no economic contribution to the School Trust would occur above the current revenue produced by the Grazing Leases from this section. This would have a direct effect upon the DNRC's obligation to provide the School Trusts with income. Stand decadence and reduced growth of volume would continue which could lead to reduced future value.

4.2.2.2 Alternative B: Harvest

If Alternative B: Harvest was implemented, the harvest would produce a total estimated timber harvest volume of 1.5-2.5 MMBF. This timber sale would generate an estimated $375,000-$625,000 to the Common School Trust.

4.3 Predicted Effects on Relevant Resources of all Alternatives

4.3.1 Soil Resources (Issue #1)

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

Alternative A: Deferred Harvest (No Action) would have minimal effects on soil resources. Existing roads would require routine maintenance to help reduce potential future impacts.

4.3.1.2 Alternative B: Harvest – Direct and Indirect Effects

Soils within the proposal area are fairly resilient and rocky, but skidding activities, slash disposal and site preparation can cause rutting, erosion, soil compaction and displacement. Potential for soil impacts are greater on tractor units on slopes over 40%. Within tractor units, the area of detrimental impacts would be limited to 15% or less of the overall harvest area. These impacts would be minimized by the implementation of mitigation measures to include season of use restrictions. Cable yarded units would have negligible effects on soils because logs would be partially suspended while yarded to the landing. Jackpot pile burning would have a short-term beneficial effect on soil nutrient cycling. Burning would reduce duff and expose mineral soil. Natural regeneration of western larch and ponderosa pine would be expected. Retention of coarse woody debris on site would have a long-term beneficial effect on soil nutrient cycling.

4.3.1.3 Cumulative Effects of Alternative B: Harvest

Following levels of disturbance such as ground skidding; coarse woody debris such as logs, branches and twigs all act to slow expected surface water runoff, intercept and trap soil particles and slow erosion. The closer and more even the distribution of woody debris, the more effective the reduction of erosion. Coarse woody debris also provides many physical, chemical and biological properties that are vital to soil properties and forest growth. In conjunction with the proposed project, mitigation measures aimed at retaining coarse woody debris on site would be implemented. This is expected to maintain long-term soil productivity and reduce on-site erosion.

Cumulative effects to soils can occur from repeated ground skidding entries into the harvest area and additional road construction. Implementation of skidding and slash disposal mitigation measures would limit the area impacted and therefore presents low risk of cumulative effects. Future stand entries would likely use existing trails and landings. Slash disposal operations are planned to retain organic matter for nutrient cycling to maintain long-term soil productivity.

4.3.2 Water Quality (Issue #2)

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

Under Alternative A: Deferred Harvest (No Action), existing roads and associated BMPs would continue to protect soil and water resources, provided routine maintenance is upheld.

4.3.2.2 Alternative B: Harvest – Direct and Indirect Effects

Harvest units can directly impact water quality if not properly located or buffered. The risk of impacts is greatest along streams, wetlands and lakes. The SMZ Law regulates forest management activities that occur adjacent to streams, lakes or other bodies of water. All proposed activities would be conducted in accordance with the SMZ law and Rules. All areas requiring SMZ delineation have been field reviewed by a DNRC Hydrologist to determine their adequacy in meeting the requirements of the law and satisfying the SFLMP guidance to protect water quality and aquatic resources.

The sale area is also drained by ephemeral draws, swales and wet areas that lack discernable stream channels. Equipment restriction zones or designated crossings would be utilized to protect all wet areas and ephemeral draws.

The primary risk to water quality is associated with roads, especially roads constructed along or crossing draws or streams. DNRC would utilize all reasonable mitigation and erosion control practices during any new construction, reconditioning or reconstruction of all roads, stream and draw crossings. Site-specific design recommendations from DNRC Hydrologist and Soil Scientist would be fully implemented under Alternative B: Harvest.

Under the DNRC proposal, up to 2.5 miles of new roads would be constructed to access the sale area. These roads would be built with standard BMPs incorporated into the design. Following the State's harvest activities, these roads would be closed to public use and left in a condition that maintains surface drainage. These measures are expected to reduse sediment erosion and delivery potential to adjacent stream channels and draw bottoms.

4.3.2.3 Cumulative Effects of Alternative B: Harvest

Proper application of BMPs and site-specific designs and mitigation measures would reduce erosion and potential water quality impacts to an acceptable level as defined by the State of Montana water quality standards. Acceptable levels are defined under the Montana Water Quality Standards as those conditions occurring where all reasonable land, soil and water conservation practices have been applied.

The proposed harvest activities are not expected to increase sediment yield to stream channels. This is largely due to the location of the proposed harvest

units along the landscape, the ephemeral nature of the local stream channels and mitigation designed to minimize erosion.

Erosion control measures and other mitigation measures are expected to minimize long term impacts to downstream water quality and beneficial uses. There is little risk of measurable adverse impacts to downstream water quality and beneficial uses occurring as a result of the proposed Alternative B: Harvest.

4.3.3 Cumulative Watershed Effects (Issue #3)

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

Alternative A: Deferred Harvest (No Action) would maintain measurable cumulative effects from past management activities however, as hydrologic recovery continues to occur it is reasonable to assume that these effects would decline.

4.3.3.2 Alternative B: Harvest – Direct and Indirect Effects

There are no cumulative watershed effects (CWE) constraints associated with the proposed sale area. This is due to the following reasons:

- The area receives a low amount of precipitation annually.
- No perennial streams within the project area.
- The proposal is for a selective harvest in stands that are stocked at a higher level than that which occurred prior to organized fire suppression.

Results from the cumulative watershed effects analysis show that projected harvest levels are below those levels normally associated with detrimental water yield increases and thus channel impacts.

It is unlikely that the proposed levels of harvest would contribute to detectable increases in water yield or have any measurable influence on downstream channel conditions.

The risk of only minor detectable increases in water and sediment yield is very low in the areas outside of the Deadman Gulch watershed as a result of the proposed harvest. Increases in sediment yield are expected to be negligible due to the area treated, location along the landscape, and mitigation designed to minimize erosion.

4.3.4 Cold Water Fisheries (Issue #4)

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

Alternative A: Deferred Harvest (No Action) would continue to impact cold-water fisheries habitat through erosion and sedimentation due to existing road locations and the current grazing strategy.

4.3.4.2 Alternative B: Harvest – Direct and Indirect Effects

There are no known fish bearing streams draining the state sections within the proposed sale area. Cable harvesting, application of the SMZ Law, no planned SMZ harvest, and additional BMP mitigation is expected to minimize impacts to downstream perennial stream channels. Due to planning and associated mitigation, it is unlikely that the proposed timber sale would affect large woody debris recruitment, shade or in-stream temperature into fish-bearing streams.

4.3.4.3 Cumulative Effects of Alternative B: Harvest

Alternative B: Harvest does not include any new stream crossings and the new road construction does not cross or run adjacent to any existing stream channels. Mitigations designed to maintain surface drainage and stabilize new road segments are expected to reduce the risk of long-term potential impacts to downstream stream channels.

4.3.5 Air Quality (Issue #5)

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

The threat of wildfires would continue to be an issue. The location of the project area relative to a large population center increases the odds of ignition in the project area. If a wildfire were to start in the area the rate of spread and the intensity of the fire could be high due to the dense structure and presence of ladder fuel on the site. In the event of wildfire, air quality would be affected. No burning of logging slash would affect air quality.

4.3.5.2 Alternative B: Harvest – Direct and Indirect Effects

Approximately 300 acres with an average of 5 tons of slash per acre would be burned as part of this project. Most of this slash would consist of needles, branches and small stems less than 5 inches in diameter. Slash would be placed into small compact piles that are free of dirt as it would be return skid into the unit with a grapple skidder. Burning may be conducted in the spring or fall season depending on weather and fuel conditions. Burning would be done when the piles are relatively dry inside but the layer of duff on the forest floor surrounding the piles is wet or snow covered and the fire is not likely to burn between piles. Atmospheric conditions are much better for smoke dispersion in the spring, however there are days in the fall that also allow for

good smoke dispersion. It is important that fire not be able to spread and smolder between piles as fire that smolders in the duff has the potential to produce smoke over a longer period of time with a higher rate of emissions per pound of fuel than fuel that burns with flaming combustion. Due to the potential impact that this amount of smoke could cause on air quality it would be vital to be very selective in choosing a day to ignite the burn. Strong east winds would be ideal. This would disperse smoke west to very sparsely populated areas in Western Montana and North Idaho. West to northwest winds would also be acceptable, as this would disperse the smoke to the Miller Creek area. South to southwest winds would send the smoke directly into the Missoula Valley. North winds would send smoke into the Bitterroot Valley. Both the Missoula and Bitterroot Valleys are populated areas where impacts from smoke should be minimized. Burning would only be conducted under good to excellent smoke dispersion conditions. Piles would be burned as dry as possible and would be kept free of dirt. DNRC would work closely with the Monitoring Unit of the Montana/Idaho Airshed Group and obtain special smoke dispersion forecasts in order to burn only on ideal days. Only a handful of days each year meet the conditions that are necessary to conduct this burn with the desire results and not have adverse air quality impacts. This may require that slash remain unburned in the unit for longer than normal until the right conditions are present. With proper smoke management applied, impacts to air quality should be minor and short in duration.

4.3.5.3 Cumulative Effects of Alternative B: Harvest

Smoke resulting from this project would have a cumulative effect with other prescribed burns being conducted in the region as well as with pollutants produced from other sources. Smoke produced in Montana and Idaho is regulated by the smoke monitoring unit, and its cumulative impact is considered in issuing burning restrictions. Industrial, agricultural and vehicular sources of particulate will also be producing pollutants while burning is ongoing. With attention to burning under only ideal conditions, the projects cumulative impact to air quality should be minor and of short duration.

4.3.6 Noxious Weeds (Issue #6)

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

Under Alternative A: Deferred Harvest (No Action), weed seed is expected to spread by vehicle traffic, wind and animal dispersion into the project area, which would result in competition with native species trying to establish in any areas where the vegetation and soil is disturbed. Bio-control efforts by the State of Montana to reduce the presence of knapweed and leafy spurge would continue.

4.3.6.2 Alternative B: Harvest – Direct and Indirect Effects

Ground disturbing activities associated with proposed Alternative B: Harvest have the potential to introduce or spread noxious weeds in susceptible habitat types. Under Alternative B: Harvest, DNRC would follow an integrated weed management approach to help prevent the introduction and establishment of noxious weeds and slow the expansion of existing weeds.

4.3.6.3 Cumulative Effects of Alternative B: Harvest

Disturbance of soils and vegetation from the construction of roads and from skid trails could cause an increase of competition between noxious weeds and native species and decrease soil productivity and stability. A combination of prevention, revegetation and monitoring would be implemented to reduce the possible infestation and spread of weeds associated with this project.

4.3.7 Natural Forest Conditions (Issue #7)

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

Under the Alternative A: Deferred Harvest (No Action) no harvesting would take place at this time. The stand would remain in its current dense condition. Trees would gradually thin out as they die from competition stress and insect attack. The more shade tolerant Douglas-fir would increase at the expense of ponderosa pine. The stand would remain at high risk for high intensity stand replacing wildfire due to the dense stand structure and increasing fuel load from dying trees.

4.3.7.2 Alternative B: Harvest – Direct and Indirect Effects

Under Alternative B: Harvest 675 acres would be commercially thinned. The proposed harvesting would reduce the tree canopy cover in the harvested areas by approximately 40-60%. Harvesting would leave the dominant ponderosa pine and western larch whenever possible. Following harvesting the site would have approximately 50 trees per acre ranging from 8" to 26" dbh with an average of 10" dbh. Species composition after harvest would be roughly 50% ponderosa pine, 30% Douglas-fir, and 20% western larch. These percentages equate to those that would have been present on the site under pre fire suppression conditions. Growth rates should increase dramatically due to the thinning, as competition between trees would be substantially reduced. Other plant species currently on the site such as grass, forb, and shrub species should also experience an increase in growth and vigor as a result of tree thinning. The residual stand dbh would be much smaller than that of the stand present on the site during the pre-settlement era. The remaining trees should grow at a greatly increased rate after thinning, averaging 2 inches of diameter growth per decade for at least the next 20 years, at that time another harvest may be called for. With thinning, the stand will be closer to its pre European-settlement condition than it would be without any harvest. Removal of understory and suppressed trees would give the stand an open nature, similar

to what would have been present with the frequent low intensity fires which historically burned through these dry, low elevation sites. Burning the site after harvesting would provide site prep that would encourage regeneration of ponderosa and western larch in areas where the canopy has been opened up.

4.3.7.3 Cumulative Effects of Alternative B: Harvest

If this alternative were implemented it is predicted that trees would grow at a greatly increased rate after thinning, averaging 2 inches of diameter growth per decade for at least the next 20 years, at that time another harvest may be called for. Thinning would begin a process of management that should promote the diameter growth of the seral ponderosa and western larch species as well as encourage the regeneration of these species. Removal of understory and suppressed trees would give the stand an open nature, similar to what would have been present in pre-settlement times when low intensity fires frequently burned through the site. This thinned stand would be closer to its pre European-settlement condition.

4.3.8 Heavy Truck Traffic and Public Safety (Issue #8)

4.3.8.1 Dust

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

The Deadman Gulch area is growing as a residential area. With the influx of homes and the resultant population increase in the area dust produced by passenger vehicle traffic would become an increasing nuisance. A network of residential roads funnels into Cochise Drive for access to Highway 93. This portion of county road runs adjacent to several private residences. Dust in this section of road would continue to reduce visibility and be a nuisance to local residents.

4.3.8.1.2 Alternative B: Harvest – Direct and Indirect Effects

Commercial trucks can produce a significant amount of dust on dirt roads. Season of use could be used to reduce the amount of dust displaced on a roadway. Wintertime use on a snow covered or frozen road would keep dust to a minimum. If hauling was done in times when the road is dry magnesium chloride or similar dust abatement product could be applied to the section of Cochise Drive adjacent to residences along the haul route. This application of dust abatement would reduce dust produced by truck traffic as well as private vehicle traffic adjacent to residential areas.

4.3.8.2 Cochise Drive

4.3.8.2.1 Alternative A: Deferred Harvest (No Harvest) – Direct and Indirect Effects

Vehicle traffic on Cochise Drive would continue to be a safety problem due to poor visibility and the road's narrow width as the number of private residences and the traffic level increases in the area.

4.3.8.2.2 Alternative B: Harvest – Direct and Indirect Effects

The State has been coordinating efforts with the County Road Department and a private landowner to improve Cochise Drive. If the road plan is implemented, Cochise Drive would be improved or relocated.

The improvements to the road would include the following:

1) A portion of the road would be widened and

2) Visibility would be increased by removing some trees along a portion of the road within the right of way

Or

1) The Cochise Drive would be widened and realignment near the junction of Cochise Drive and Highway 93 to improve visibility.

4.3.8.3 Entering Highway 93 from Cochise Drive

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

Log trucks from state land would not enter Highway 93 and turn north.

4.3.8.3.2 Alternative B: Harvest – Direct and Indirect Effects

Signs would be posted to notify southbound motorists of trucks entering at 500 and 1000 feet prior to the intersection with Cochise Drive and Highway 93. Log trucks from state land would enter Highway 93 and immediately turn right and go south to Lolo. Trucks would then be required to turn around in Lolo at the Town Pump in order to return to the northbound lane. Having trucks enter the highway and proceed in the same direction as the flow of traffic should reduce the risk of collision.

4.3.8.3.3 Cumulative Effect of Alternative B: Harvest

General short and long term passenger vehicle safety would increase on Cochise Drive due to a straightening and widening of this roadway. There would be short term negative effects to the safety of vehicles on Highway 93 and the log trucks entering the southbound lane of Highway 93 at Cochise Drive.

4.3.8 Visual Quality (Issue #9)

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

Under Alternative A: Deferred Harvest (No Action) road building and harvesting would not take place. There would be no immediate change to visual quality. Since the stand would remain in an overstocked condition it would remain at high risk to pine beetle infestation and high intensity stand replacing fire. Either of these events, particularly stand replacing fire could have a very noticeable impact on visual quality at some point in the future.

4.3.9.2 Alternative B: Harvest – Direct and Indirect Effects

Approximately 2.5 miles of new permanent roads would be built with this project. Following harvest, these roads would remain in place but would be closed to all public motorized traffic.

The commercial thinning proposed for the area would maintain a forested appearance with several small openings from a distance. There would be and average of 50 trees per acre across the harvest area. When the ground is snow covered, the portions of harvest units over approximately 35% slope may appear as a mottled white and green as opposed to the solid green look of a forest with a closed tree canopy. From within the harvest units the area would appear much more open than it currently is and sight distances would be increased. Since the stands have been overstocked for a number of years and the smaller trees would be removed the remaining trees would have few if any low live limbs and have a somewhat unnatural appearance immediately after harvest. Because of the variance in stand structure the appearance would vary throughout the harvest area. Overstocked Douglas-fir sites may appear more open because the existing trees have small crowns due to the present overcrowding and competition. In stands where there are larger ponderosa pine and western larch with full crowns the stands would have a clumpier appearance because of the crown size and the availability of large mature trees to leave unharvested on the site. This appearance would slowly change as the tree crowns expand over a period of years.

Skyline corridors from skyline logging would be visible as narrow (10-15 foot wide) clearcut stripes running in perfectly straight lines up and down the slope. These corridors would be most visible if viewed when aligned with the corridor. As the viewpoint moves to either side, trees adjacent to the corridor would screen it from view. If the stand adjacent to the corridor is thinned so that the canopy is not continuous, the corridors would not appear as abrupt as they would if they passed through a dense portion of the stand that has not been thinned, however corridors can be noticeable even in thinned stands for several years. Corridors would be oriented so that they do not align themselves with common viewpoints. This would reduce their visual impact.

There would be some larger openings (up to five acres in size) scattered through the stand where most of the Douglas-fir trees would be removed because they are infected with dwarf mistletoe.

In summary, a harvest system that leaves 40-65 of the largest trees per acre, minimizes the width of skyline corridors and aligns them away from common viewpoints should result in small or no negative visual impact in the short term. Aesthetic quality would improve in the long term as the trees in the stand increase in size and their crowns expand.

4.3.9.3 Cumulative Effects of Alternative B: Harvest

Cumulative effects should be minimal in the short term. Following treatment all stands would have a more open appearance. Some stands would have openings of less than five acre, which would eventually fill in with regeneration. Because skyline corridors would be angled away from populated areas and new roads would be located on gentle slopes and would be screened by trees below the road. It is unlikely that skyline corridors and roads would be visible from the valley floor.

4.3.10 Economics (Issue #10)

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

Under Alternative A: Deferred Harvest (No Action) no harvesting would take place and no new revenue would be generated with the exception of proceeds from 2 grazing licenses.

4.3.10.2 Alternative B: Harvest – Direct and Indirect Effects

Approximately $375,000-$625,000 would be generated for the Common School Trust from the harvest and sale of the estimated 1.5-2.5 MMBF. Stumpage value is estimated at $250/MMBF. From this amount the cost of road construction and improvements must be subtracted. The proposed road construction would cost approximately $40,000.

The amount of forest improvement collection from this sale would be $34.90 per MBF. This would be applied to the sawlog volume harvested. The forest improvement collection would be approximately $52,350-$87,250. This money would be deposited in the forest improvement fund to be used for thinning, prescribed burning, planting, weed management, etc. on Trust Lands.

If this proposed project was implemented, it would provide work for a road building contractor, a logging contractor, their subcontractors, and their employees. The forest products would most likely be processed in local mills providing further job opportunities.

4.3.11 Endangered Species (Issue #11)

4.3.11.1 Bald Eagles

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

If no harvest were to occur in the Project Area, suppressed and co-dominant trees would continue to compete with dominant trees, reducing overall stand vigor, increasing the risk of mortality to large trees. In the short term (10-20 years), this competition may result in the creation of large snags and coarse woody debris, however loss of large trees will increase over time and the increasing risk of insect infestation and resultant stand level fire disturbance would likely result in reduced stand structure. Consequently, habitat attributes important to bald eagles (i.e. large trees, multi-layered stands) would be reduced over time.

4.3.11.1.2 Cumulative Effects of Alternative A: Deferred Harvest (No Action)

From the standpoint of cumulative effects, timber harvesting on adjacent private lands and human development within the Analysis Area has removed structural features important to bald eagle nesting habitat, resulting in an Analysis Area with very limited habitat conditions conducive to use by nesting bald eagles. Some potential nesting habitat does occur on Federal lands to the north and northwest, however these areas are heavily used for motorized recreation and are generally more than 1 mile from the Bitterroot River and hence may be of low value as potential nesting sites. Consequently, the low likelihood of use by nesting bald eagles results in no cumulative effects resulting from selection of Alternative A: Deferred Harvest (No Action) in the short term, with only minor potential negative effects in the long term if fire disturbances resulting from conditions within the Project Area were to affect the limited amount of potential nesting habitat in the Analysis Area.

4.3.11.1.3 Alternative B: Harvest – Direct and Indirect Effects

If the proposed harvest activities are implemented, suppressed and co-dominant trees would be removed, resulting in reduced competition within the stand and increasing the vigor of residual trees. Ponderosa pine would be favored for leave trees and ponderosa pine over 21" dbh would be retained, reducing the potential of directly affecting trees that could be used by bald eagles for nesting and roosting. Decreasing the future risk of stand level disturbances such as catastrophic wildfire, insect and disease infestations resulting from overstocking may benefit bald eagles as stands develop greater structural complexity (i.e. multiple layer stand structure) and a higher proportion of large trees for potential use by bald eagles.

Disturbance resulting from timber harvest activities can affect bald eagles in nesting sites and winter concentration areas (MBEWG 1991). However, known active nest sites are too distant (over 9.5 miles) to be negatively affected by harvest activities on the Project Area and no known winter concentration or communal roosting sites are located within the Analysis Area. Although bald eagles would likely forage and winter within 0.5 miles of the Project Area, any effects from timber harvest disturbance would be minimal and ephemeral, resulting in only minimal potential effects on bald eagles at the population level.

4.3.11.1.4 Cumulative Effects of Alternative B: Harvest

From a cumulative effects standpoint, there are no additional future projects planned within the Analysis Area and harvesting on adjacent private lands is likely to be rare over the short term (10-30 years) due to the existing low merchantable stocking levels that resulted from intensive past harvesting. Harvesting on federal lands to the north and northwest is unlikely due to management restrictions resulting from the land designation in this area (i.e. Blue Mountain Recreation Area). In summary, there would be minimal to no direct, indirect or cumulative effects to bald eagles as a result of implementation of the proposed harvest.

4.3.11.2 Grizzly Bears

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

If no harvest were to occur within the Project Area, no new roads would be constructed resulting in no change in human access to potential grizzly bear habitats. Cover would not be reduced over the short term, however the continued reduction in stand vigor resulting from inter-tree competition could increase the risk of insect and disease infestations, potentially resulting in a stand replacing fire event that would reduce cover values. However, the high road densities (>3 miles/sq. mile) on private lands dominating the northern half of the Analysis Area and surrounding the Project Area, the low quality of seasonal habitats within the Project Area, the close proximity of human development, the lack of grizzly bear occupancy in the Bitterroot Ecosystem, and the relative isolation of the project and Analysis Areas between major highway corridors greatly reduces the likelihood of use by grizzly bears, and consequently there would be no effects to grizzly bears if the Alternative A: Deferred Harvest (No Action) were selected.

4.3.11.2.2 Cumulative Effects of Alternative A: Deferred Harvest (No Action)

From a cumulative effects standpoint, adjacent private lands would likely continue to be managed intensively for timber production, resulting in

continued high road densities and low cover availability. Continued development is also likely on private lands within the Highway 93 corridor that could reduce habitat values for grizzly bears further. Therefore, under the Alternative A: Deferred Harvest (No Action), habitat would continue to be of low quality, with the potential for continued reductions. However, these cumulative effects would be very minimal due to the low quality of existing habitat and the very low existing potential for grizzly bear use.

4.3.11.2.3 Alternative B: Harvest – Direct and Indirect Effects

Implementation of Alternative B: Harvest would result in increased road density and decreased cover. A total of approximately 2.5 miles of new road would be constructed to access the Project Area. All new roads would be closed to public access after completion of the harvest. The effect of these new roads would be very minimal due to the effectiveness of access control in this area as a result of the close proximity of occupied private lands near the only access point (Henderson and Hillis 1998). Cover would be reduced, however the moderate levels of retention would provide some screening cover within the Project Area. The effects of these treatments would be minimal due to the low quality of existing habitat and the consequent low potential for grizzly bear use resulting from the existing high road densities (>3 miles/sq. mile) on private lands dominating the northern half of the Analysis Area, the low quality of seasonal habitats within the Project Area, the close proximity of human development, the lack of grizzly bear occupancy in the Bitterroot Ecosystem, and the relative isolation of the Project Area between major highway corridors.

4.3.11.2.4 Cumulative Effects of Alternative B: Harvest

From a cumulative effects standpoint, continued intensive management of adjacent private lands for timber production, resulting in maintenance of high road densities and low cover availability, coupled with continued human development on private lands within the highway 93 corridor could continue to reduce habitat values for grizzly bears. Therefore, as with Alternative A: Deferred Harvest (No Harvest), implementation of Alternative B: Harvest would have minimal cumulative effects on grizzly bears as habitat would continue to be of low quality, with the potential for continued reductions, and the likelihood of use by grizzly bears would continue to be low.

4.3.11.3 Gray Wolves

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

If no harvest were to occur in the Project Area, there would not be any changes in cover or road density. Although cover and road density have

some affect on direct wolf mortality, the primary concern would be related to affects on big game populations in the Analysis Area. Not implementing the Alternative B: Harvest would have some minor benefit on wolf prey base, however the high road densities within the Analysis Area, the limited concentrations of big game in the Project Area, and the dispersed but extensive human development in the area immediately around the Project Area would greatly reduce the value of this area for wolves. Therefore, there would be no affect on wolves from the Alternative A: Deferred Harvest (No Harvest).

4.3.11.3.2 Cumulative Effects of Alternative A: Deferred Harvest (No Harvest)

From a cumulative effects standpoint, the area around the Project Area is dominated by private commercial forestland that is managed intensively for timber production. This has resulted in high road densities within the Analysis Area and low cover values resulting from dominance of early successional forest types. Quality winter and spring/summer habitats for deer and elk occur on federal lands to the north and northwest, however these areas are generally secure from management due to the existing land designation (Henderson and Hillis 1998). In addition, small private land holdings along the Highway 93 corridor would likely continue to be developed for human use, resulting in the potential for future effects to wolf habitat. However, activities within the Project Area would not likely influence these conditions and hence there is no cumulative effect on wolves from Alternative A: Deferred Harvest (No Action).

4.3.11.3.3 Alternative B: Harvest – Direct and Indirect Effects

Implementation of Alternative B: Harvest would result in reductions in cover and increases in road density. However, winter cover would be retained along Deadman Gulch to maintain important winter habitats for white-tailed deer, cover would also be retained along the ridge to facilitate big game movement, harvesting on the ridge and south-facing slopes would actually increase elk forage availability and thereby improve wintering conditions, and all roads would be effectively closed to public access after harvest. Consequently, any potential effects on wolves would be minimized since big game populations (i.e. wolf prey sources) are not likely to be greatly affected. In addition, the dispersed but intensive human development in the area immediately adjacent to the Project Area would likely reduce the potential for extensive use by wolves. Therefore, there would be little to no effects on wolves as a result of implementing the Harvest.

4.3.11.3.4 Cumulative Effects of Alternative B: Harvest

Cumulative effects resulting from the implementation of Alternative B: Harvest would be minimal to non-existent due to the existence of high road densities and low cover values on private lands dominating the

northern half of the Analysis Area, the lack of key big game winter range in the area, the security of winter range habitats on federal lands to the north and northwest, and the small incremental change in cover and road density. Small private land holdings along the highway corridor would likely continue to be developed for human use, resulting in potential future negative effects to wolf habitat. However, activities on the Project Area would only minimally influence these conditions and hence there is little to no cumulative effect on wolves from implementing the Harvest.

4.3.12 Sensitive Species (Issue #12)

4.3.12.1 Flammulated Owls

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

If Alternative A: Deferred Harvest (No Action) were selected, ponderosa pine would continue to experience competition with encroaching Douglas-fir, leading to continued, and potentially accelerated mortality of the largest size class of ponderosa pine. This would create additional nesting habitat for flammulated owls in the short term (i.e., several decades), but lead to long term deficits in nesting habitat due to the failure of smaller size classes to grow into larger size classes, especially for ponderosa pine. In addition, foraging habitat would continue to decline as tree density remains high.

4.3.12.1.2 Cumulative Effects of Alternative A: Deferred Harvest (No Action)

From a cumulative effects standpoint, intensive harvest on private lands in the western and southern portions of the Analysis Area has generally eliminated potential flammulated owl habitat. Open, ponderosa pine dominated stands on Federal lands in the northern portion of the Analysis Area could provide some habitat. Within the Project Area, deferring harvest would result in a continued, and potentially increasing risk of stand replacing wildfire which, depending on the severity of the fire, could remove available low quality habitat for flammulated owls for an extended period of time (>100 years). However, the close proximity of fire suppression resources and the high priority of fire suppression resulting from the presence of occupied residences in the Analysis Area, reduces the likelihood of extensive fire disturbances. In summary, there is a potential for cumulative effects in the future if Alternative A: Deferred Harvest (No Action) were selected, however these effects would be minimal due to the limited availability of flammulated owl habitat, especially in the area immediately around the Project Area.

4.3.12.1.3 Alternative B: Harvest – Direct and Indirect Effects

The proposed harvest activities are designed to reduce competition from encroaching Douglas-fir on sites that, historically, were dominated by ponderosa pine. Removal of primarily suppressed, and sub-dominant trees would open forest stands, creating better foraging conditions for flammulated owls. Removal of dense, small tree patches in the Project Area could affect roosting habitat, however, retention in the area along Deadman Gulch, patches of advanced regeneration throughout the central and southern portions of the Project Area, and the designated leave area along the main ridge could provide potential roosting habitat. Large ponderosa pine (potential nest cavity trees >21" dbh) are not planned for removal, and snags that are not a safety hazard would be retained. Removal of smaller, suppressed, trees should also result in increased vigor in the retained trees and improving foraging conditions by creating more open forest conditions. In addition, stand scale disturbance risk would be reduced and recruitment potential into the large tree class would increase over time. Small openings would be created in areas with heavy dwarf mistletoe infestations, thereby creating some edge habitats that could be used as foraging areas by flammulated owls.

The proposed harvest activity would reduce the risks of disease, insect, and catastrophic wildfire disturbances, thereby returning these stands to more historically correct conditions. Thinning the smaller trees while retaining the large trees would decrease competitive stress on the remaining large trees, especially ponderosa pine, while encouraging medium-sized trees to grow larger and serve as long term replacements to the largest tree cohort. Although this may reduce tree density and roosting habitat conditions in the short term, by slowing the mortality of large ponderosa pine trees and removing some larger trees in areas of high density, proposed treatments would provide more stable, higher quality (i.e. better foraging habitat with retention of nesting and roosting habitats) conditions within the harvest units over the long term. Consequently, there would be minor positive effects on flammulated owl if the Alternative B: Harvest were implemented.

4.3.12.1.4 Cumulative Effects of Alternative B: Harvest

From a cumulative effects standpoint, suitable flammulated owl habitat is generally limited in the western and southern portion of the Analysis Area due to intensive harvesting on private lands that has created early successional types not suitable for flammulated owl nesting activity. Fire suppression has also reduced the value of flammulated owl habitat by increasing stem densities in historically open ponderosa pine stands, although ponderosa pine dominated stands on the south facing slope in the northern portion of the Analysis Area has been maintained in a relatively open condition and contains considerable grass development in the understory as found in preferred flammulated owl habitats. The proposed

treatment would improve flammulated owl habitat by improving foraging habitat, retaining nesting structure, and retaining patches of denser structure along Deadman Gulch and associated draws and no-harvest areas that can serve as roosting habitat. In addition, reducing the risks of stand replacing disturbances would result in longer-term stability of the suitable flammulated owl habitat. Consequently, there would be minor positive cumulative effects to flammulated owls by implementing proposed Alternative B: Harvest.

4.3.12.2 Pileated Woodpeckers

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

Without the proposed harvest, ponderosa pine would continue to experience competition with encroaching Douglas-fir, leading to, and potentially accelerating, mortality of the largest size class of ponderosa pine. This would create additional nesting habitat for pileated woodpeckers in the short term (several decades) by the creation of large snags, but lead to long term deficits in nesting habitat due to the failure of smaller size classes to grow into larger size classes, especially for ponderosa pine. In addition, foraging and nesting habitat would be created over the short term as ponderosa pine trees continue to succumb, however as this cohort is removed and replaced with smaller size Douglas-fir, foraging and nesting habitat would decline.

Under the Alternative A: Deferred Harvest (No Action), there would be a continued, and potentially increasing, risk of stand replacing wildfire. Hutto (1995) found that pileated woodpeckers did occur in burned forests, but he suggested that they require a mix of forest types and they are generally always detected near intact forest. Therefore, stand replacing fire could result in an increase in foraging substrate, but lower long-term nesting suitability, which would be dependent upon the actual extent and intensity of the particular fire event, should one occur. However, the close proximity of fire suppression resources and the high priority of fire suppression resulting from the presence of occupied residences in the Analysis Area reduces somewhat the likelihood of extensive fire disturbances. In summary, short-term (several decades) nesting and foraging habitat conditions would be maintained or slightly enhanced for pileated woodpeckers under Alternative A: Deferred Harvest (No Action), however, long-term (>50 years) sustainability of nesting habitat could be compromised due to the expected high risk of attrition of preferred large ponderosa pine trees.

4.3.12.2.2 Cumulative Effects of Alternative A: Deferred Harvest (No Action)

From a cumulative effects standpoint, pileated woodpecker habitat within the Analysis Area is relatively limited due to ownership patterns that result in a landscape dominated by private commercial forestland that has undergone intensive harvesting over the past 20 years. Some habitat does occur to the north and northwest on U.S. Forest Service parcels, however these areas would not be affected by selection of Alternative A: Deferred Harvest (No Action). Without harvesting, risks of long-term reductions in the large ponderosa pine component within the Project Area would continue, as would risks of stand replacing wildfire. Although habitat may increase over the short term, there would be a long term cumulative effect to pileated woodpeckers as the remaining suitable habitat were reduced in value or eliminated over time due to competition and potentially stand replacing disturbances. These potential effects may be somewhat mitigated by the likelihood of fire suppression actions mentioned above, and the availability of quality riverine habitats along the Bitterroot River dominated by large cottonwood trees that would provide quality pileated woodpecker habitat and be only minimally affected by an upland fire event.

4.3.12.2.3 Alternative B: Harvest – Direct and Indirect Effects

Removal of large trees within harvest units would affect potential habitat for pileated woodpeckers. However, planned retention of large (over 21" dbh) ponderosa pine and western larch trees would likely result in the retention of the preferred potential nesting trees within the Project Area. In addition, retention of snags, except when a safety hazard, would maintain current levels of foraging, roosting, and nesting habitat. Retention of areas with no or very little removal such as draws and no-harvest areas would provide areas of denser trees, providing recruitment trees into the intermediate and large size classes and protecting snags and coarse woody debris that would function as foraging habitat.

The proposed harvest activity would reduce the risks of disease, insect, and wildfire disturbances, returning these stands to more historical conditions. Thinning the smaller trees while retaining the large trees would decrease competitive stress on the remaining large trees, especially ponderosa pine, while encouraging medium-sized trees to grow larger and serve as long term replacements to the largest tree cohort. Although this may reduce habitat quality in the short term by thinning the dense forest structures preferred by pileated woodpeckers, over the long term it would provide more stable conditions within the harvest units by slowing the mortality of large ponderosa pine trees, and maintaining them in a condition of lowered risk.

4.3.12.2.4 Cumulative Effects of Alternative B: Harvest

From a cumulative effects standpoint, suitable pileated woodpecker habitat is limited in the western and southern portion of the Analysis Area due to intensive harvesting on private lands that has created early successional types not suitable for pileated woodpecker nesting activity. In the northern portion of the Analysis Area, Forest Service lands with mature to old, open, ponderosa pine dominated stands likely provide habitat value for pileated woodpeckers, however these lands would not be affected by Alternative B: Harvest. In addition, quality pileated woodpecker habitats along the Bitterroot River dominated by large cottonwood trees would not be affected. Treatment of the Project Area would reduce habitat values for pileated woodpeckers by removing some intermediate and large trees and reducing within stand mortality that would create foraging substrate in the future, however the effect of these treatments is minimized by the retention of large, preferred nesting trees, retention of snags, live cull, and coarse woody debris that would serve as nesting, roosting, and/or foraging habitat. In addition, reducing the risks of stand replacing disturbances would result in longer term stability of the suitable pileated woodpecker habitat. Consequently, there would be minor short-term negative and minor long-term positive cumulative effects to pileated woodpecker habitat by implementing the proposed Alternative B: Harvest.

4.3.12.3 Black Backed Woodpeckers

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

Without harvesting, the existing stands and forest structure would be retained in their present condition, which is not preferred by black-backed woodpeckers so there would be no effect on black-backed woodpecker habitat. Over the long term, the increasing risk of stand replacing fire under the Alternative A: Deferred Harvest (No Action) could result in increases in black-backed woodpecker habitat. However, the likelihood of fire suppression actions in this area as mentioned above, and the paucity of mature forest types in the northern half of the Analysis Area as a result of timber management activities on private lands would result in post fire stands that would generally not be extensive and not be of high quality as preferred black-backed woodpecker habitat. Consequently, there would be no potential direct, indirect, or cumulative effects in the short term, and a very minor potential for positive indirect effects in the long term on black-backed woodpeckers from selecting the Alternative A: Deferred Harvest (No Action).

4.3.12.3.2 Cumulative Effects of Alternative A: Deferred Harvest (No Action)

There would be no potential cumulative effects in the short term, and a very minor potential for positive indirect effects in the long term on black-backed woodpeckers from selecting Alternative A: Deferred Harvest (No Action).

4.3.12.3.3 Alternative B: Harvest – Direct and Indirect Effects

The proposed harvest units in Alternative B: Harvest are not currently providing preferred black-backed woodpecker habitat, so treatment of these units would not effect black-backed woodpecker populations. Harvest within the Project Area would likely decrease the risk of stand replacing fire, thereby reducing the potential of future black-backed woodpecker habitat. However even if a future fire event were assumed, intensive timber harvesting on private lands in the northern half of the Analysis Area has reduced standing volumes resulting in lower quality post-fire preferred black-backed woodpecker habitat. Consequently, there would be little to no effects on black-backed woodpeckers from implementing the Alternative B: Harvest.

4.3.12.3.4 Cumulative Effects of Alternative B: Harvest

There would be little to no effects on black-backed woodpeckers from implementing the Harvest Alternative.

4.3.13 Big Game (Issue #13)

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

If Alternative A: Deferred Harvest (No Action) were selected, the Project Area would continue to provide winter cover for deer and elk. Canopy cover would be retained and no new roads would be built. However, small openings that are important as winter forage sites would continue to be encroached upon by conifers, thereby reducing winter forage values to some extent. In addition, the continued competitive stress due to high stocking levels would likely increase the risk of insect infestation and resultant fire, thereby potentially removing winter cover values. Therefore, selection of Alternative A: Deferred Harvest (No Action) would have minor to no short term direct or indirect effects on big game, but could result in some long term effects were a stand replacing fire to occur.

Within the Analysis Area, forest management, and the resultant high road densities has reduced security cover and winter range conditions. The area to the north of the Project Area has been designated as the Blue Mountain Recreation Area. This area contains quality winter range and important spring/summer habitat features (Henderson and Hillis 1998). However, it is unlikely that habitats in these areas will be greatly affected in the near future,

other than potential efforts to improve the somewhat limited availability of security cover (Henderson and Hillis 1998). Private land management activities are not likely to change on the majority of the Analysis Area. Selection of Alternative A: Deferred Harvest (No Action) could result in increased potential risk to winter habitat if fire risk were to increase as a result of increasing stand density within the Project Area. However, the close proximity of fire suppression resources and the high priority of fire suppression resulting from the presence of occupied residences in the Analysis Area greatly reduces the likelihood of extensive fire disturbances.

4.3.13.2 Cumulative Effects of Alternative A: Deferred Harvest (No Action)

There would be no cumulative effects in the short term, and only a very minor possibility of increased adverse cumulative effects in the future.

4.3.13.3 Alternative B: Harvest – Direct and Indirect Effects

If Alternative B: Harvest were implemented, canopy cover and stand structure would be reduced within treatment units in the Project Area and approximately 2.5 miles of new roads would be built thereby increasing road densities. However, the no-harvest area along Deadman Gulch and a major side draw would be valuable as white-tailed deer winter cover since it is adjacent to south-facing slopes and would be important in severe winter conditions. In addition, the no-harvest zone along the main ridge would facilitate movement of animals and the untreated areas in the southeastern portion of the harvest parcels would result in the retention of winter cover values there. Also, the retention of large ponderosa pine trees, creation of small open areas where dwarf mistletoe would be removed, and the moderate retention levels in the thinned areas would result in the maintenance of some level of winter cover and an improvement in winter forage values. Over time, crowns would expand within the treatment area and average tree size would increase resulting in improvements in snow intercept and thermal attributes in the Project Area.

Although roads would be built to access this Project Area, all roads would be behind the main access gate shown in Project maps and mentioned in the Effected Environments section above. Therefore, it is unlikely that the new roads would affect the unique security attributes due to restricted vehicular travel in the project area.

The proposed treatments would decrease the competitive stress due to high stocking levels, thereby reducing the risk of insect infestation and resultant fire. This could result in more stable winter cover conditions. Therefore, implementation of the Alternative B: Harvest would have minor short term direct and indirect negative effects on big game, but could result in some long term benefits to deer and elk in the Analysis Area.

Within the Analysis Area, forest management, and the resultant high road densities have reduced security cover and winter range conditions. The quality winter range and important spring/summer habitat features in the Blue Mountain Recreation Area to the north and west of the Project Area would not be greatly affected in the near future, other than potential efforts to improve the somewhat limited availability of security cover (Henderson and Hillis 1998). Private land management activities are not likely to change on the majority of the Analysis Area. Selection of the Alternative B: Harvest would result in reductions in winter cover values and increased road densities. However, the effects of these changes would be relatively minor across the Analysis Area, resulting in minimal short term cumulative negative effects with the possibility of positive long term effects as stand replacing fire risk is reduced through the proposed treatment.

4.3.13.4 Cumulative Effect of Alternative B: Harvest

The effects of these changes would be relatively minor across the Analysis Area, resulting in minimal short term cumulative negative effects with the possibility of positive long term effects as stand replacing fire risk is reduced through the proposed treatment.

4.3.14 Cumulative Effects Associated with other DNRC Projects

Several other DNRC projects are either ongoing or have undergone scoping in the general area around the Deadman Gulch Project Area. The following Table displays the name of the proposed activity, the year when activity is planned, 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 4-1: OTHER DNRC MISSOULA UNIT ACTIVITIES

Project Name	Air miles from Deadman Gulch	Year of Proposed Activity	Description of proposed Activity
Turah Creek	14	2003	Thinning
Cramer	30	2003	Shelterwood
Roman/Six Mile	20	2004	Thinning and PCT
Tyler Creek	34	2004	Shelterwood
Davis Point	10	2005	Overstory removal
Donavan	19	2004	Shelterwood
Land of Lodgepole	30	2002	Thinning
St. Regis Beetle	36	2003	Thinning
St. Regis Cable	36	2003	Thinning
Flat Pardee	36	2003	Thinning
Dry Gulch	30	2006	Shelterwood

5.0 List of Individuals Associated with the Project

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Joe Jedracowski	-County Engineer
Mark Phares	-DNRC lawyer
Will Wood	-DNRC Right of Way Specialist
Tim Wolf	-Territorial Surveyors
Ecology Center	
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Local Citizens

Elaine Anderson and Brady Wood
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Minott & Jan Puryn
Richard Rossignol
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Myra Schults

Other locals notified or in attendance at public meeting available on request.

7.0 References

Literature Cited (Wildlife Portion)

Aubry, K.B., G.M. Koehler, and J.R. Squires. 1999. Pages 373-396 *in* L. F. Ruggiero, K. B. Aubry, S. W. Buskirk, G. M. Koehler, C. J. Krebs, K. S. McKelvey, and J. R. Squires, editors. Ecology and conservation of lynx in the United States. University Press of Colorado, Boulder, Colorado, USA.

Cook, J. G., L. L. Irwin, L. D. Bryant, R. A. Riggs, and J. W. Thomas. 1998. Relations of forest cover and condition of elk: a test of the thermal cover hypothesis in summer and winter. Wildlife Monographs Number 141.

Goggans, R., R.D. Dixon, and L.C. Seminar. 1989. Habitat use by three-toed and black-backed woodpeckers. Deschutes Nat. For. Oregon Dept. of Fish and Wildl. (USDA Deschutes Nat. For. Tech. Rept. No. 87-3-02. pp.1-43.

Hayward, G.D., P.H. Hayward, E.O. Garton, and R. Escano. 1987. Revised breeding distribution of the boreal owl in the northern Rocky Mountains. Condor 89:431-432.

Heijl, S.J., M. McFadzen, and T. Martin. 2000. Maintaining fire-associated bird species across forest landscapes in the northern Rockies. Final Report. INT-99543-RJVA. USDA, USFS RMRS For. Sci. Lab, Missoula, MT.

Henderson, R.E., and J.M. Hillis. 1998. A study of elk habitat use in O'Brien creek, Montana. Unpublished report to the Rocky Mountain Elk Foundation.

Hillis, J.M., and M.J. Thompson, J.E. Canfield, L.J. Lyon, C.L. Marcum, P.M. Dolan, and D.W. McCleerey. 1991. Defining elk security: the Hillis paradigm. pp.38-43 *in* A.G. Christensen, L.J. Lyon, and T.N. Lonner, comps., Proc. Elk Vulnerability Symp., Mont. State Univ., Bozeman, MT. 330pp.

Hitchcox, S.M. 1996. Abundance and nesting success of cavity-nesting birds in unlogged and salvage-logged burned forest in northwestern Montana. M.S. Thesis. University of Montana, Missoula, MT.

Howie, R.R., and R. Ritcey. 1987. Distribution, habitat selection, and densities of flammulated owls in British Columbia. Pages 249-254 *in* R. W. Nero, R. J. Clark, R. J. Knapton, and R. H. Hamre, editors. Biology and conservation of northern forest owls. Proceedings of a symposium. U.S. Forest Service General Technical Report RM-142.

Hutto, R.L. 1995. Composition of bird communities following stand-replacement fires in the Northern Rocky Mountain (U.S.A.) conifer forests. Conservation Biology. 9(5):1041-1058.

Koehler, G. M. 1990. Population and habitat characteristics of lynx and snowshoe hares in north central Washington. Canadian Journal of Zoology 68:845-851.

_____, and J. D. Brittell. 1990. Managing spruce-fir habitat for lynx and snowshoe hares. Journal of Forestry 88:10-14.

MBEWG (Montana Bald Eagle Working Group). 1991. Habitat management guide for bald eagles in Northwestern Montana. USDA Forest Service Northern Region. 29 pp.

McCallum, D.A. 1994. Review of technical knowledge: Flammulated owls. Pages 14-46 *in* G.D. Hayward and J. Verner, editors. Flammulated, boreal, and great gray owls in the United States: a technical conservation assessment. U.S. Forest Service General Technical Report RM-253.

Powell, R.A., and W.J. Zielinski. 1994. Fisher. Pages 38-73 in American Marten, fisher, lynx, and wolverine: The scientific basis for conserving forest carnivores in the western United States. L.F. Ruggiero, K.B. Aubry, S.W. Buskirk, L.J. Lyon, and W.J. Zielinski, eds. USDA Forest Service, Gen. Tech. Rep. RM254, Rocky Mountain Forest and Experiment Station, Fort Collins, Colorado, USA.

Ruggiero, L.F., and K.S. McKelvey. 2000. Toward a defensible lynx conservation strategy: A framework for planning in the face of uncertainty. *in* Ecology and conservation of lynx in the United States. University of Colorado Press and USDA FS Rocky Mountain Research Station. 480 pp.

USFWS. 2000. Final Environmental Impact Statement on the reintroduction of grizzly bears in the Bitterroot Ecosystem in western Montana and central Idaho. Dept. of Interior, Fish and Wildlife Service, Region 6.

Verner, J. 1994. Current management situation: Flammulated owls. Pages 10-13 *in* G.D. Hayward and J. Verner, editors. Flammulated, boreal, and great gray owls in the United States: a technical conservation assessment. U.S. Forest Service General Technical Report RM-253.

Wright, V. 1996. Multi-scale analysis of flammulated owl habitat use: owl distribution, habitat management, and conservation. Masters Thesis, University of Montana, Missoula, Montana, USA.

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