Willows End

Timber Sale

ENVIRONMENTAL ASSESSMENT

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ABBREVIATIONS

ABLA/VACA	Alpine fir/Dwarf Huckleberry
Ac	Acres
ARM	Administrative Rules of Montana
ATV	All Terrain Vehicle
B-D N.F.	Beaverhead Deer Lodge National Forest
BLM	Bureau of Land Management
BMP	Best Management Practices
CFR	Code of Federal Regulations
CFS	Cubic Feet per Second
DBH	Diameter at Breast Height
DEQ	Department of Environmental Quality
DFWP	Department of Fish, Wildlife, and Parks
DNRC	Department of Natural Resources and Conservation
EA	Environmental Analysis
ECA	Equivalent Clear-cut Acres
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ERZ	Equipment Restriction Zone
IWM	Integrated Weed Management
LPP	Lodgepole Pine
LWD	Large Woody Debris
MBF	Thousand Board Feet
MCA	Montana Code Annotated
MEPA	Montana Environmental Policy Act
MMBF	Million Board Feet
MPB	Mountain Pine Beetle
NRCS	Natural Resource Conservation Service
PSME/VACA	Douglas Fir/Dwarf Huckleberry
RMP	Resource Management Plan
RMZ	Riparian Management Zone
SFLMP	State Forest Land Management Plan
SMZ	Streamside Management Zone
SSFI	Sale Specific Forest Improvement
SWLO	Southwest Land Office
TMDL	Total Maximum Daily Load
US	United States
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geographical Survey
WCT	Westslope Cutthroat Trout
WMZ	Wetland Management Zone
WMZ	Wetland Management Zones

WQLS	Water Quality Limiting Segments
WS	Watershed
WYI	Water Yield Increase
WYI	Water Yield Increase

CHAPTER 1 – PURPOSE OF THE PROJECT

PROPOSED ACTION AND OBJECTIVES

Introduction and Description of the Proposed Action

The Department of Natural Resources and Conservation (DNRC), Anaconda Unit, proposes to harvest timber on State lands to generate revenue for the Montana Common School Trusts.

The total gross sale area is approximately 1786 acres (see vicinity map, Figure I-1). Material would be harvested from approximately 1050 acres with various silvicultural treatments.

If a harvest alternative is selected, the sawlog volume would range between 3 and 5 million board feet (MMBF). Even-aged and uneven-aged harvest prescriptions would be applied. To enable harvesting operations, approximately 3.68 miles of new road and up to .9 miles of temporary road would be constructed. In addition to harvesting sawlogs, DNRC proposes to commercially thin up to 40 acres of 80-100 year old lodgepole pine by harvesting posts and rails. Harvesting of sawlog along with post and rail material, could begin in 2010 and would be completed by 2014.

The project area is located approximately 12 miles northwest of Philipsburg, Montana, in the Upper Willow Creek drainage and involves portions of Sections 5, 8, 17, 21, and 28, Township 8 North, Range 15 West. The proposed activity would occur within the Beaver, Bear, Huepeck, Arbuckle and Slusser Creek watersheds. Elevations range from 5,400 to 6,009 feet.

The project area consists of gently to moderately sloping hills containing stands dominated by lodgepole pine with occasional Douglas fir, ponderosa pine, alpine fir and Engelmann spruce. The lodgepole stands in Section 5 of the project area have resulted from stand-replacing fires followed by several lower intensity underburns. The trees are over 140 years old with many having fire scars from frequent low intensity burns. These burns generally occurred prior to modern day fire suppression activities and removed fuel build-up in the forest. Since fires have been suppressed in this area for the last 100 years, fuel build up in this stand has been substantial. This is also prevalent in other older stands within the proposed sale area. Lodgepole stands in Sections 8 and 17 also resulted from a stand-replacing event, but the trees are younger, between 80 and 90 years old. Stands in Sections 21 and 28 resulted from mixtures of hot and cool fires. The sites are warmer and drier than those in Sections 5, 8 and 17. Development of these stands appears to have resulted by encroachment onto what were probably grassland sites. These stands have remnant large-sized Douglas fir and ponderosa pine trees, as well as lodgepole pine.

Typical of many of the lodgepole pine stands in Southwestern Montana, the project area is currently being infested by mountain pine beetle. This has resulted in high mortality of trees and a rapid rate of spread within the project area. DNRC had not planned to enter

these stands for another 10-15 years, but this project is being proposed to salvage the timber value of trees affected by beetles while the trees are still marketable.

In an attempt to reduce the susceptibility of smaller diameter stands from becoming infested, approximately 40 acres of post and rail thinning is proposed for harvesting. This area currently has approximately 1,000 stems per acre, composed of mostly 2 to 6 inch lodgepole pine trees. In these areas trees showing the best timber characteristics would be retained at 12 to 16 foot spacing.

Salvage harvesting in lodgepole pine stands involves the removal of all trees 7 inches in diameter at breast height (DBH). Access to these parcels is via U.S. Forest Service, Road #4325, a BLM Low Standard Road, and privately owned roads controlled by local landowners. These School Trust lands are surrounded by a combination of private, BLM and U.S.F.S. land. Timber proposed for harvesting is a mixture of second growth, (60-80 year old), and mature timber (100-140+ years old).

DNRC intends to manage these parcels for healthy and biologically diverse forests. This would be achieved by managing toward more natural and historic stand structures and by reintroducing fire, where feasible, and as budgets allow, which is a natural process that has been mostly absent for the past 100 years. The proposed harvests are designed, in part, to mimic the role that fire played historically in this cover type. Lodgepole pine seedlings require full sunlight and bare mineral soil to regenerate. These conditions usually resulted from hot, stand replacing fires which killed all the trees over many acres at one time creating new stands of relatively the same age. This gives lodgepole pine stands a uniform appearance.

TABLE 1-1
Acreage Clarification

Item	Legal	Acreage
DNRC Land within the drainage	Sec. 5,8,16,17,21,28, T8N, R15W Sec. 16 T7N, R15W	2,826
DNRC timberland within the drainage	Sec. 5,8,16,17,21,28, T8N, R15W	2,186
DNRC timberland which is involved in the proposed action alternatives	Sec. 5,8,17,21,28, T8N, R15W	1,786

Project Need

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 of February 22, 1889; 1972 Montana Constitution, Article X, Section 11). The Board of Land Commissioners and the Department of Natural Resources and Conservation are required by law to administer these trust lands to produce the largest measure of reasonable and legitimate return

over the long run for these beneficiary institutions (Section 77-1-202, MCA). In 1996, the DNRC adopted and released the Record of Decision on the State Forest Land Management Plan (SFLMP). The State Board of Land Commissioners approved implementation of the SFLMP on June 17, 1996. The SFLMP outlines management philosophy for forested trust lands. In 2003, the Department adopted the resource management standards of the SFLMP into administrative rules (ARM 36.11.401 through 36.11.450).

The Department will manage the lands involved in this project according to the philosophy of the SFLMP and the requirements of the administrative rules. The SFLMP states:

> ***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.***

Southwestern Montana's pine stands, predominantly lodgepole pine, are currently being infested by mountain pine beetle. This has resulted in high mortality of trees and rate of spread within the project area. This sale is being proposed to capture the mortality and timber value prior to its being lost by the School Trusts.

Project Objectives

The Department has developed the following project objectives:

1. Produce the largest measure of reasonable and legitimate return to the trust beneficiaries by harvesting dead and dying timber before there is substantial wood decay and loss of value. (77-5-207 (2))

2. Manage for conditions characterized by the proportion and distribution of forest types and structures historically present on the landscape.

3. Provide 3.0 to 5.0 MMBF of the Southwestern Land Office (SWLO), DNRC, volume contribution to the annual timber harvest on State trust lands that is required by State law (77-5-221 through 223, MCA).

THE MEPA PROCESS

Development of a MEPA Environmental Assessment document

This EA was prepared in compliance with the Montana Environmental Policy Act (MEPA). MEPA requires State government to include consideration of environmental impacts in its decision making process. It also requires agencies to inform the public and other interested parties of the proposed projects, environmental impacts that might result, and alternative actions that could achieve project objectives. An EA helps the agency determine whether further

analysis, such as that contained in an EIS, is necessary.

Public Scoping

The initial stage of developing an EA is the public scoping process, which is used to inform the public that a State agency is proposing an action and to gather comments on the possible impacts of the project. The scope for this EA was developed with input from DNRC resource specialists and comments from the public and other interested parties.

Public participation was originally solicited February 4th, 2010 by distributing a letter and the initial project proposal to individuals, adjacent landowners, organizations, industries, and agencies. The mailing list of parties receiving initial scoping notices for this project is located in the project file at the Anaconda Unit Office. Public scoping comments were summarized and can be found below. The original comments are also located in the project file at the Anaconda Unit Office.

Issues identified

Issues are concerns about a proposal and impacts that implementation may have. The purpose of issue development is to provide a framework for environmental analysis which will be included in the EA. Two types of issues are generally developed (1) those which lead to alternative development and (2) those which can be mitigate through implantation of specialists recommendation, Best Management Practices or standard forestry and engineering practices

Alternative Development

Alternatives are differing methods of accomplishing the agency's identified goals which are developed to address unresolved conflicts concerning alternative uses of available resources. The MEPA rules require that the agency consider only "…alternatives that are realistic, technologically available, and represent a course of action that bears a logical relationship to the proposal being evaluated". The Montana Supreme Court has ruled that a no-action alternative must be evaluated as part of any EA, (Ravalli County Fish & Game Association v. DSL (1995).

Notification of Decision

After completion of the environmental document it will be presented to the decision maker for a final finding. The EA along with his decision document will be posted on DNRC's State wide web site which is available to the general public.

Decision(s) to be Made

The decisions to be made as a result of this EA include:

- Do the alternatives presented meet the purpose and the objectives of the project?
- Which alternative should be selected?

- Does the selected alternative have significant environmental effects?

- Should the recommendation be to select an action alternative and implement the project or prepare an EIS?

Proposed Schedule of Activities

If the action alternative is selected, the EA and decision document would be posted to the DNRC web site, and a Timber Sale Contract package prepared. The package would be sent to the State Board of Land Commissioners for approval. If the Land Board approves the project, the timber sale would be advertised. If the timber is sold, the following schedule would apply:

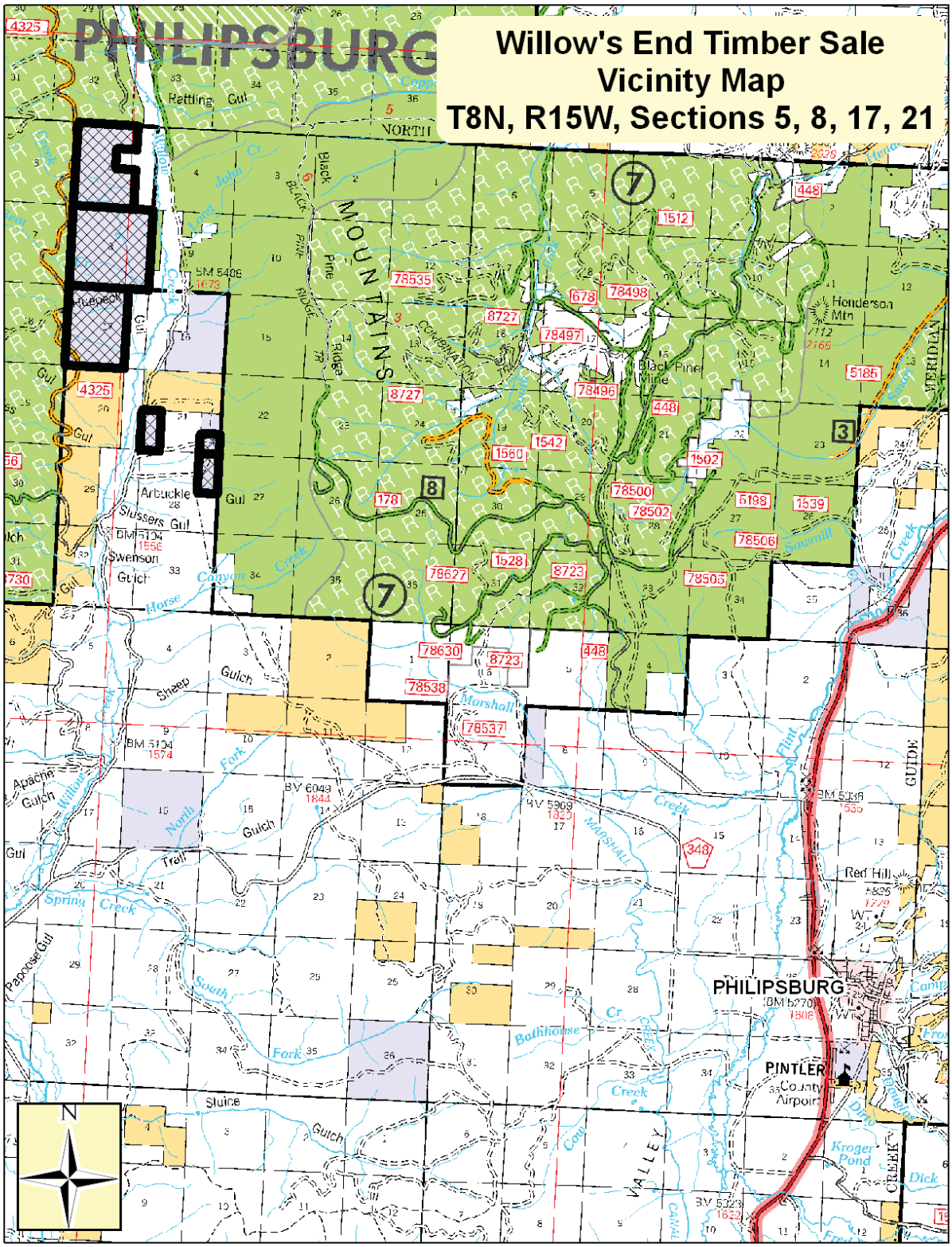
The Anaconda Unit would propose to sell timber from the Willows End project in fiscal year 2011. All harvesting, road construction and improvement work could begin in the fall of 2010 and be completed by March 1, 2014. Hazard reduction work would be completed within 2 years following the completion of harvesting. Some activities would be restricted to certain periods of the year to avoid or reduce impacts (see Chapter 4 for mitigation information).

COOPERATING AGENCIES WITH JURISDICTION AND REQUIRED PERMITS

- A Stream Preservation Act Permit (124 Permit) is required from the Department of Fish, Wildlife, and Parks (DFWP) for activities that could disturb the bed or banks of any perennial stream.

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

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


Willow's End Timber Sale
Vicinity Map
T8N, R15W, Sections 5, 8, 17, 21
PHILIPSBURG
Rattling Gul
NORTH
BLACK PINE RIDGE
MOUNTAINS
Black Pine Mine
Henderson Mtn
Arbuckle
Slussers Gul
Swenson Gulch
Horse Canyon Creek
Sheep Gulch
Marshall Creek
Apache Gulch
Willow Creek
North Fork
Trail Gulch
Spring Creek
Papoose Gul
South Fork
Sluice Gulch
Bathhouse Cr
Flint Creek
Red Hill
PINTLER County Airport
Kroger Pond
Dick Creek
GUIDE MERIDIAN
N

Issues Analyzed in Detail

Through the scoping process, issues were raised by the public, resource specialists from the DNRC, and other agencies about the potential impacts of the proposed action to the environment. These issues are grouped and summarized below.

Comments were received expressing concerns that:

Hydrology

- **Water Quality/Quantity- The proposed forest management activities may cause impacts to water quality as a result of increased erosion and sediment delivery to streams. There is a concern that extensive harvest and high road densities would negatively impact flow and sediment yield, and roads should be minimized, recontoured and stabilized after use.**

- **There is a concern that protection of streams and water quality may be impacted unless 100 foot no-activity buffers are located on perennial and ephemeral streams, with 150 foot buffers on Bear Creek.**

- **There is a concern that new road construction within 200 feet of streams may deliver sediment and impact water quality.**

- **Cumulative Watershed Effects-**
  The proposed timber harvest may cause or contribute to cumulative watershed impacts as a result of increased water yields.

Soils

- **Soil Resources/Geology - The proposed forest management activities may adversely affect geologic or soil resources through excavation, displacement or compaction, depending on the area and degree of impacts, and may cause cumulative effects to soils.**

Wildlife

- **There is concern that the proposed action may negatively affect grizzly bear habitat beyond what is expected to result from the mountain pine beetle infestation.**

- **There is concern that the proposed action may negatively affect Canada lynx habitat beyond what is expected to result from the mountain pine beetle infestation.**

- **There is concern that the proposed action may negatively affect gray wolves beyond**

what is expected to result from the mountain pine beetle infestation.

- **There is concern that the proposed action may negatively affect pileated woodpecker habitat beyond what is expected to result from the mountain pine beetle infestation.**

- **There is concern that the proposed action may negatively affect flammulated owl habitat beyond what is expected to result from the mountain pine beetle infestation.**

- **There is concern that the proposed road building and timber harvesting may negatively affect elk security cover beyond what is expected to result from the mountain pine beetle infestation.**

- **Habitat that is important to moose may be degraded by the proposed action beyond what is expected to result from the mountain pine beetle infestation.**

Fisheries

Issues raised internally include: the proposed actions may adversely affect fisheries habitat features, including channel forms and stream temperature. Eleven issues statements related to fisheries resources were received from the public during project scoping:

- **road construction and logging practices may produce sediment that impacts water quality;**

- **new culverts should provide fish passage;**

- **riparian harvest may impact fisheries resources;**

- **increased flows and sediment yields, especially from increased harvest area and road densities, may impact fisheries resources;**

- **new road construction within 200 feet of streams may impact fisheries resources;**

- **equipment operation near perennial and ephemeral streams may impact fisheries resources;**

- **log skidding through perennial and ephemeral streams may impact fisheries resources;**

- **the location of new road-stream crossing sites may impact fisheries resources;**

- **permanent road-stream crossing structures may impact fisheries resources;**

- **non-obliterated and unnecessary roads within riparian areas may impact fisheries resources;**

- **cumulative effects, especially from riparian harvest, may impact fisheries resources.**

Vegetation

- **There is a general concern about the health of these pine stands, given the current outbreak of mountain pine beetle**

All of the issues identified above are analyzed in Chapters 3 and 4.

Issues Considered but Eliminated from Further Analysis

- **Bald Eagle**—There is concern that timber harvest activities would alter bald eagle habitat or provide unnecessary disturbance. The project area is approximately 8 miles north of the nearest known bald eagle nest. Thus, due to the distance between the nest and project area, there would be low risk of direct, indirect, or cumulative effects to bald eagles as a result of the proposed action.

- **Black-backed Woodpecker -** There is concern that timber harvest activities would alter black-backed woodpecker habitat or provide unnecessary disturbance. The project area contains approximately 95 acres of the 62,861 acre Sawmill Complex fire (2007) in the Sapphire Range, and is located within approximately 25 miles of seven fires occurring since 2000, totaling approximately 137,402 ac. The affected 95 acres were harvested as part of the Phoenix salvage sale. Thus, due to the distance between suitable black-backed woodpecker habitat and the project area, there would be low risk of direct, indirect, or cumulative effects to black-backed woodpeckers as a result of the proposed action.

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

- **Archeology –** The Departments archeologist was contacted for his input concerning the two alternatives being analysed by this environmental document. No impacts are anticipated under either alternative so no further discussion of this concern will occur in Chapters 3 or 4.

- **Increased use of the county road (Upper Willow Creek Road) by logging truck traffic could lead to rutting and damage to surface water drainage reducing its functionality**.

The County road would be treated the same as DNRC's own road system. Hauling would be restricted to dry or frozen road conditions. Drainage on this road is mainly provided by crowning, spot location of inside ditching along with relief culverts. Restriction of use and existing drainage features would reduce the potential for damage to the road due to hauling operations. No further analysis of this concern will be done.

- **Concern was expressed that ground disturbance from timber harvesting operations along with new road construction could facilitate the spread of State listed noxious weeds.**

Under the no-action alternative, noxious weeds may establish on existing roads and dry vegetation sites by unauthorized vehicle or animal use.

The Montana County Noxious Weed Act (MCA 7-22-2102-2153) requires State agencies to submit plans to manage noxious weeds where they occur, through planning and implementation of integrated management measures of prevention, revegetation and control. The action alternative would involve ground-disturbing activities and traffic that have the potential to introduce or spread noxious weeds in susceptible habitat types. For the action alternative, an Integrated Weed Management (IWM) approach was considered by DNRC. A combination of prevention and revegetation measures are considered the most effective weed management treatments for the proposed action alternative. To reduce the possible introduction and spread of weeds associated with this project, the following prevention measures would be implemented for new road construction and areas of disturbance along the existing access road.

- All road construction and harvest equipment would be cleaned of plant parts, mud and weed seed to prevent the introduction of noxious weeds. Equipment would be subject to inspection by the forest officer prior to moving on site.
- All newly disturbed soils on road cuts would be promptly reseeded to site adapted grasses to reduce weed encroachment and stabilize roads from erosion. Within the course of the project, areas that have not revegetated would be reseeded.
- DNRC would monitor the project area for noxious weeds for two years after harvest operations. If noxious weeds are noted DNRC will develop a weed management plan.

- **Concern was expressed by the USFS Pintler Ranger District that they may receive complaints from the hunting public concerning DNRC's harvesting operations during the big game rifle season.**

Sections 5, 8, and 17 are bounded by private land on the east, USFS on the north and west side, and on the south by the Bureau of Land Management (BLM). Road access to these tracts is from one of two directions, walking along Forest Service Road #4325 or crossing private land to the east. Ownership in Sections 21 and 28 has a similar pattern. Forest

Service land adjoins trust lands to the east while the BLM owns 360 acres to the north. Remaining land to the south and west of the School Trust Land is owned by a private individual. The 80 acres located in the W1/2SW1/4 of Section 21 touches the Upper Willow Creek county road for a short distance. The methods of accessing these lands are restricted by road closures on both the USFS ownership and the private land.

Forest Service Road #4325 north of its junction with Road #5156 is closed to motorized vehicles year-around unless specifically permitted by the Philipsburg Ranger District. This road has a locked Powder River gate near its junction with Road #5156. To cross private land, permission must be obtained from the appropriate landowner. Existing roads on BLM land in Section 21 are open year around to motorized public use. Under the no action and action alternatives opportunities to access and use School Trust Lands would remain as they currently are. Individuals who possess a Conservation license and who legally access the trust lands are authorized to use the tracts in compliance with 77-1-101 through 77-1-810, MCA. There are no roads or trails on trust land within the project area that are licensed for recreation or any other specific use.

Neither of the alternatives currently under analysis in this document would impact an individual's access or ability to use trust land for recreational purposes.

There is likely to be some conflict between hunters and loggers during both the archery and regular big game hunting seasons. Potential for this impact can be reduced by limiting timber harvesting operations to Monday through Friday during the big game rifle season. Use would be restricted by prohibiting log hauling during the first and last week of the general big game season (Sunday through Sunday on the first week and Thursday through Sunday on the last week.) While this would not eliminate the potential for conflict, it does mitigate it. This issue will not receive further analysis in Chapters 3 and 4.

FISHERIES ANALYSIS AREAS

Five separate analysis areas were initially identified to evaluate the existing and potential impacts to fisheries and fisheries resources associated with the proposed project. The initially selected analysis areas include: Beaver Creek, Beaver Creek Ditch and Lakes, Bear Creek, Upper Willow Creek and Arbuckle Gulch. However, due to (1) the spatial separation from the project area, (2) the differences in the relative extentof potential effects to fisheries resources, and (3) the consequent infeasibility of generating reasonably accurate qualitative or quantitative effects assessments, the Upper Willow Creek analysis area will not be further considered except as noted in the paragraph below. Arbuckle Gulch does not support any fisheries. The three remaining analysis areas were chosen because they include (1) the watershed of current or historic fish-bearing streams and (2) the proposed harvest units and haul routes that could have foreseeable, measurable or detectable impacts to those fish-bearing streams.

Upper Willow Creek is identified on the 2008 Montana 303(d) list as having impairments to aquatic life and coldwater fisheries, and the probable sources of impairment are riparian grazing and irrigation production. Surface waters in all analysis areas are classified as B-1 in the Montana Surface Water Quality Standards (ARM 17.30.610). For more details on these regulations, water quality standards, and beneficial uses please see the Soils and Hydrology Analysis.

FISHERIES SPECIES

Current and historic fisheries distribution within affected portions of the analysis areas are identified in Table 1-2. Westslope cutthroat trout (WCT) are classified as an S2 Montana Animal Species of Concern. Species classified as S2 are considered to be at risk due to very limited and/or potentially declining population numbers, range and/or habitat, making the species vulnerable to global extinction or extirpation in the state. The Department of Natural Resources and Conservation (DNRC) has also identified WCT as a sensitive species (ARM 36.11.436).

TABLE 1 – 2 Current and historic fish species distribution across analysis areas.

			ANALYSIS AREA		
			Beaver Creek	**Beaver Creek Ditch and Lakes**	**Bear Creek**
SPECIES	**native spp.**	bull trout	X[1]		X[1]
		westslope cutthroat trout	X	X[2]	X
		western pearlshell	X[3]		X[3]
	nonnative spp.	eastern brook trout	X	X[2]	X
		brown trout	X	X[2]	

[1] Species currently not distributed within affected portion of analysis area; affected portion of analysis area is likely within species' historic distribution.
[2] Affected portion of analysis area is not within species' historic distribution.
[3] Species may or may not occur within affected portion of analysis area; affected portion of analysis area may or may not be within species' historic distribution.

FISHERIES ANALYSIS METHODS

The *EXISTING CONDITIONS* of fisheries resources will be described for each analysis area. The *ENVIRONMENTAL EFFECTS* section will compare the existing conditions to the anticipated effects of the proposed No-Action and Action Alternatives to determine the foreseeable impacts to associated fisheries resources.

Analysis methods are a function of the types and quality of data available for analysis, which varies among the different analysis areas. The analyses may either be quantitative or qualitative. The best available data for both populations and habitats will be presented for the analysis area. In order to adequately address the issues raised in Section 1.4 (Fisheries Issues Raised during Scoping) the existing conditions and foreseeable environmental effects to fisheries in the analysis area will be explored using the following outline of issues and sub issues. Sedimentation will be addressed through an analysis of effects to channel forms.

- Fisheries Populations – Presence/Absence
- Fisheries Habitat – Channel Forms
    - Fisheries Habitat – Sediment
    - Fisheries Habitat – Flow Regimes
    - Fisheries Habitat – Woody Debris
- Habitat – Stream Temperature
    - Fisheries Habitat – Stream Shading
- Habitat – Connectivity
- Cumulative Effects

In terms of the risk that an impact may occur, a low risk of an impact means that the impact is unlikely to occur. A moderate risk of an impact means that the impact may or may not (50/50) occur. A high risk of an impact means that the impact is likely to occur.

A very low impact means that the impact is unlikely to be detectable or measurable, and the impact is not likely to be detrimental to the resource. A low impact means that the impact is likely to be detectable or measurable, but the impact is not likely to be detrimental to the resource. A moderate impact means that the impact is likely to be detectable or measurable, and the impact is likely to be moderately detrimental to the resource. A high impact means that the impact is likely to be detectable or measurable, and the impact is likely to be highly detrimental to the resource.

Cumulative impacts are those collective impacts on the human environment of the proposed action when considered in conjunction with other past, present, and future actions related to the proposed action by location or generic type (75-1-220, MCA). The potential cumulative impacts to fisheries in the analysis areas are determined by assessing the collective anticipated direct and indirect impacts, other related existing actions, and future actions affecting the fish-bearing streams.

CHAPTER 2 – ALTERNATIVES

This chapter is intended to describe alternatives developed and considered in this EA. The effects of implementing each alternative, including the No Action Alternative, will be summarized. Environmental consequences of each alternative are listed here for comparative purposes. More detailed information can be found in Chapters 3 and 4, which follow.

INITIAL STAGES OF DEVELOPMENT

The initial proposal and intent of this project is to treat five tracts of school trust lands to achieve the objectives of providing the largest measurable return to the trust over the long run; providing 3.0 to 5.0 MMBF toward the Department harvest target; managing for healthy and biologically diverse forests; harvesting trees already infested with mountain pine beetle and those likely to be infested in the near future; and capturing timber value which would otherwise be lost if harvesting were not to occur. This involves the proposed removal of up to 5.0 MMBF of sawlog-sized timber from 1010 acres. In addition to the sawlog harvesting, up to 40 acres of post and rail material are proposed for removal by thinning. Also included is construction of 3.68 miles of new road, and up to .9 mile of temporary road. The new roads would provide long-term access to these parcels.

DEVELOPMENT OF ALTERNATIVES

Upon analysis of existing conditions in the project area by DNRC specialists, the project leader, and the Decision Maker, an interdisciplinary team was formed to develop alternatives and address issues. Public comments were received and grouped into the concerns listed in Chapter 1. In addition, information on existing conditions was collected and compiled. Using this information, a reasonable range of selectable alternatives was developed.

Many resource concerns can be resolved by interdisciplinary development of site-specific mitigations. Resolution of the remaining unresolved concerns provides the basis for development of alternatives. Because the beetle infestation limits available silvicultural alternatives and due to a lack of issues which cannot be mitigated, this analysis will look at the no action alternative and one action alternative.

Lodgepole pine is the dominant forest cover within both the drainage and the State's Upper Willow Creek ownership. When current age class distribution on state land in the Upper Willow Creek Drainage and throughout the unit is compared to historical distribution research done by Losensky (1993), it becomes obvious that past fire occurrence has skewed stand age toward the 40-100 year old class.

Proposed timber harvesting would remove those trees which meet sawlog specifications, approximately 7" DBH and larger. Tree species other then LPP, predominately Douglas fir,

alpine fir and Engelmann spruce would be retained. In addition those LPP which do not meet the minimum merchantability standards would also be retained. For additional information on land treatments see Table 2-1.

DESCRIPTION OF ALTERNATIVES

Alternative A - No-Action Alternative

Alternative A defers treatment in all sections within the project area, at the present time. No additional revenue, over what is currently being collected, would be generated for the Common School Trust Account. No new roads would be built and no road improvements would be completed. Current management activities such as fire suppression and grazing would continue. Recreational uses such as hiking, and hunting would also continue. Natural events, including plant succession, tree blow down, insect and disease outbreaks, and wildfires would continue to occur. The current beetle infestation would be expected to continue until fires, weather or other natural events stop the infestations progress. Following the appropriate level of MEPA review, timber harvesting or road building could be proposed and undertaken in the future. This no-action alternative will be used as a baseline for comparing environmental consequences of the action alternatives.

Alternative B - Action Alternative

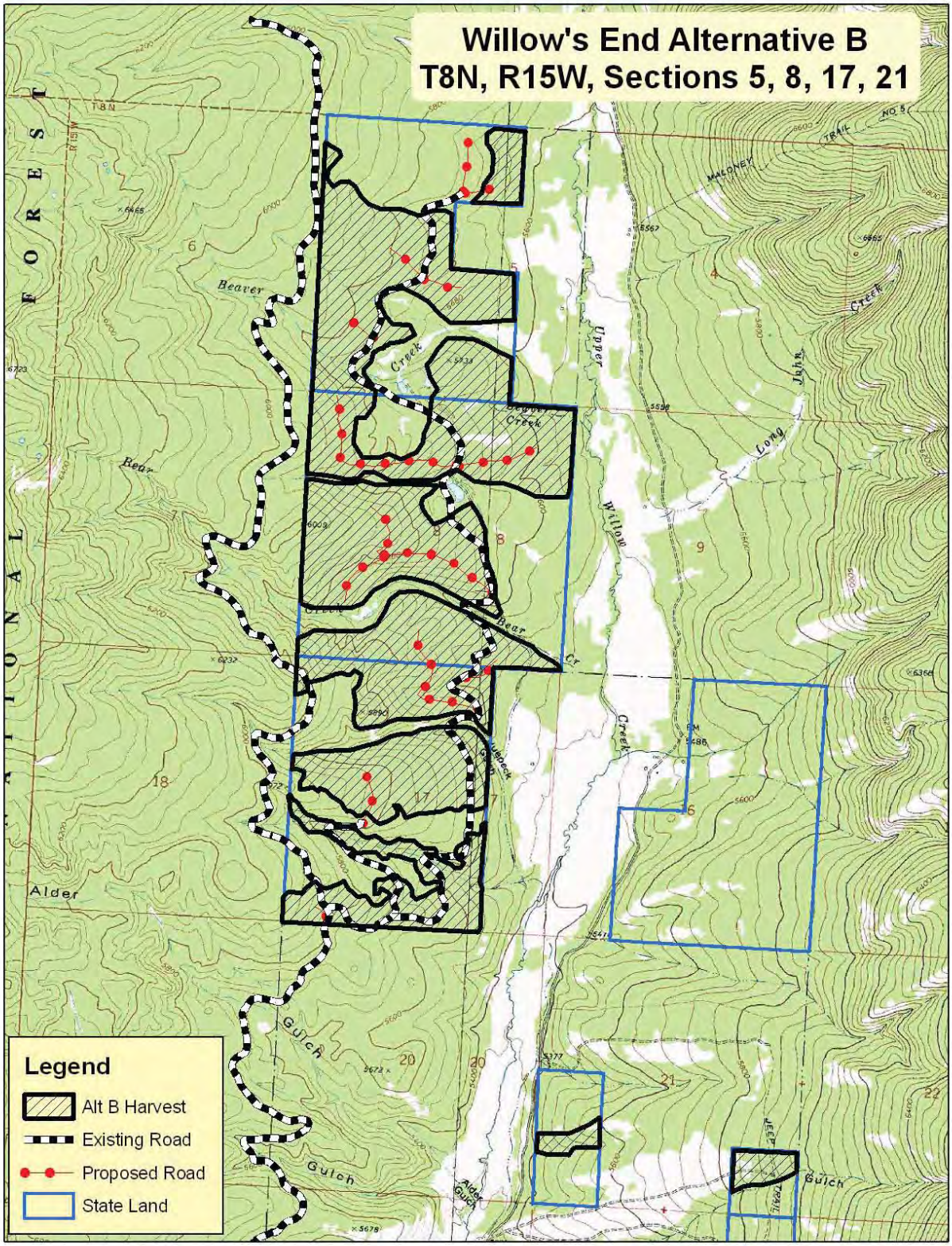
This alternative would harvest most of the sawlog size LPP contained within section 5,8,17,21 and 28, Township 8 North, Range 15 West. Sawlog size material would be retained in most of the streamside management zones and in small patches of timber which are not economical to harvest. In addition, patches of submerchantable LPP would be retained along with isolated Douglas fir, Engelmann spruce and subalpine fir. In portions of the harvest area, where most of the trees are of sawlog size, harvesting would result in a clear cut with irregular boundaries. Throughout the remaining harvest area results would be patchier, with clumps of submerchantable material surrounded by larger openings. The resulting stand would be most closely associated with the results of a mixed severity burn.

The action alternative is being proposed to capture the value of those trees which have already been attacked by mountain pine beetle, and to harvest those which are highly susceptible to attack in the near future. Since completion of the State Wide Forest Management Plan, DNRC has generally managed forested land to an age class distribution which more closely reflects historical conditions, because these conditions are believed to be more sustainable in the long term. As a general guide to what historical conditions were, we have used Losensky's (1993) research as a guideline. More specifically the data which pertained to historical Lodgepole pine age class distribution. When existing age class distribution was compared to inventory data, both on a project and unit wide level, it was apparent that the age class distribution has been skewed toward older stands. The aggressive mountain pine beetle infestation during the last 5 years has dictated DNRC's Anaconda Unit be very aggressive in harvesting those trees which are infected and those which have a high probability of becoming infected. This accelerated harvest program has changed the Units age class distribution from favoring older age classes toward the non-

stocked and 0-39 age classifications. This alternative would move older and middle age lodgepole pine stands located within these 5 tracts into a seedling state while retaining the large old Douglas fir and ponderosa pine. Approximately 1010 acres of lodgepole pine are proposed for harvesting to emulate the occurrence of a mixed severity or stand replacement fire. Within the harvest units those trees which meet merchantability standards would be removed while most of the Douglas fir and ponderosa pine would be retained. In addition to moving these stands toward a seedling condition, we are hoping to increase the ponderosa pine and Douglas fir component in the regenerated stands. In talking with long-time residents in the valley, (personal communication with Hans and John Luthje) they described forests with a larger ponderosa pine and Douglas fir component being present when they first moved into the valley. There is evidence of past low intensity ground fires occurring within the stands. To mimic these occurrences, approximately 40 acres would be thinned using post and rail harvesting. Stand density would be reduced to between 170 and 302 residual trees per acre. Within the thinning block there are 80-100 year old trees, which are so stagnated from overcrowding that their crowns have been reduced to the point, <30% of the total tree height, they are unlikely to respond to thinning. This type of tree would be removed in order to facilitate the growth of more desirable ones.

Access would be provided by the construction of 3.68 miles of new road, and construction of .9 miles of temporary road which would be slashed and water bared after use. Existing access for this proposed sale is by USFS and BLM road systems that join Granite Counties Upper Willow Creek Road.

Up to 1,050 acres of total harvest area is proposed. New road construction would total 3.68 miles. One temporary road-stream crossing would be built on the Beaver Creek Ditch. SMZ harvest would occur adjacent to approximately 6,800’ of Class 1, fish-bearing stream channel and lakes, approximately 6,850’ of Class 3 stream channel, and approximately 5,600’ of Class 3, fish-bearing other body of water.


Willow's End Alternative B
T8N, R15W, Sections 5, 8, 17, 21
Legend
Alt B Harvest
Existing Road
Proposed Road
State Land
Beaver
Creek
Bear
Upper
Willow
Creek
Long
John
Creek
Alder
Gulch
Gulch
Alder
Gulch
Gulch
MALONEY
TRAIL
NO. 5

MITIGATIONS CONTAINED IN THE ACTION ALTERNATIVE

Water Quality

- DNRC would implement all applicable BMP's, Montana Administrative Rules for Forest Management and reasonable mitigation and erosion control practices during timber harvest, road maintenance, and road construction and road use activities

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

- SMZ salvage harvest would occur within 25 feet of streams on designated segments of Class 1 SMZ flanking portions of Beaver and Bear Creeks. Consistent with SMZ and Forest Management Rules (36.11.425), on slopes less than 35%, ground based equipment may operate up to the SMZ boundary of 50 feet and use hydraulic arms or winch line skidding to reach in to the SMZ and selectively remove trees up to about 25 feet from streams. On slopes over 35%, ground based equipment may operate up to the SMZ boundary of 100 feet and use hydraulic arms or winch line skidding to reach in to the SMZ and selectively remove trees up to about 75 feet from streams.

- The Riparian Management Zones (RMZ) will be designated at 80 feet based on site potential tree heights (SPTH) at 100-years as required by ARM 36.11.425. Harvest of dead trees would be allowed in the RMZ, but equipment would be limited to frozen or dry conditions to avoid excessive disturbance.

Roads

- Existing road segments would be improved and maintained in association with the harvest activities to comply with BMP's. Road improvements would include installation of drainage features to prevent surface erosion and sediment delivery to the stream, ditching to improve road surface stability and surface blading.

- Existing road segments would be maintained concurrent with harvest operations to ensure adequate road surface drainage during the period of use. Gravel surfacing would be applied to specific sites to prevent rutting and sedimentation, principally near stream crossings.

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

- New roads would be closed to motor vehicles upon completion of harvest activities. Slash would be placed on main skid trails to protect soils and reduce erosion potential

and potential unauthorized ATV use as needed.

- Newly constructed or reconstructed road cuts, fills and disturbed soils would be grass seeded immediately after excavation.

Wildlife

- If any threatened or endangered species are encountered during project planning or implementation, activity would cease and the situation would be evaluated for protection needs. The SWLO wildlife biologist would be contacted to provide recommendations on appropriate measures to be implemented.

- If owl or other raptor nests were located during planning, the SWLO wildlife biologist would be contacted for recommendations on necessary mitigation. If any nests were located after the sale was sold, activities would cease in the immediate vicinity of the nest until the biologist and sale administrator could visit the site and develop any necessary mitigation measures.

Harvest Units

- Use of designated skid trails and equipment restriction zones to avoid damage to sensitive areas (i.e. wet areas, seeps, bogs, sensitive soils etc.) would be implemented.

- On wet sites and abrupt draws, equipment restriction zones (ERZ's) would be marked and maintained as needed based on site-specific review. Any trees that are removed from the ERZ's would be winch lined out. Any localized moist sites within harvest units would be protected by ERZ's or by limiting operations to winter when frozen ground or adequate snow cover protects the area as determined by site-specific review.

- Harvest units would be regenerated as soon as possible.

- Connectivity of densely forested patches would be maintained where possible.

- The logger and sale administrator would agree to a general skidding plan prior to equipment operations on complex terrain or draw crossings. Ground based skidding would be limited to slopes of 45% or less.

Weeds

- All road construction and off road harvesting equipment would be cleaned of plant parts, seeds, and mud to prevent introduction of noxious weeds. Equipment would be subject to inspection by the forest officer prior to moving on site.

- Disturbed road and landing sites would be promptly revegetated with a site adapted weed-free mixture of grass seed.

Fisheries

- Fisheries related resource mitigations that would be implemented with the proposed Action Alternative include: (1) applying all applicable Forestry BMPs (including the SMZ Law and Rules) and Forest Management Administrative Rules for fisheries, soils, and wetland riparian management zones (ARMs 36.11.425 and 36.11.426), (2) applying the SMZ Law and Rules to all non-fish-bearing streams, and (3) monitoring all road-stream crossings for sedimentation.

Soils

- Equipment and hauling operations would be limited to periods when soils were relatively dry (less than 20%), frozen or snow covered to minimize soil compaction rutting and maintain drainage features. Soil moisture conditions would be checked prior to equipment start-up. Some moister conditions would be accepted on harvest units where tractors remain on designated trails and timber would be winched to trails.

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

- Scarification during slash disposal would be limited to 30-40% of harvest units. No tractor piling would take place on wet areas or slopes over 35%. Broadcast burning with moderate burn intensity would be preferred for slash disposal and site preparation, as budgets and manpower allow. Lopping and scattering of slash or jackpot burning would be used on slopes over 35%.

- On regeneration harvest areas 10-15 tons/acre of large woody debris would be retained as feasible for nutrient cycling and long-term soil productivity. On selective harvest areas 5-10 tons of coarse woody debris would be retained. Where whole tree harvesting is proposed one of the following would be required to assure nutrient cycling: 1) Use in woods processing equipment that leaves slash on site, 2) Return skid slash and evenly distribute within the harvest unit. Slash should be return skidded as part of harvest operations and should not be stockpiled at landings over winter, due to the leaching of nutrients and loss of needles.

- An excavator would be required for installation of culverts (refer to hydro report) and for pioneer road construction on steeper slopes.

- On newly constructed roads, some minor cut-slope sloughing is expected to require continued road maintenance (mainly grading) during the timber sale. Cut-slopes would be sloped at a ratio of ¼ to 1 for rock and 1 to 1 for common material to encourage establishment of revegetation. All newly disturbed road-cuts would be revegetated with site-adapted grasses.

COMPARISON OF ALTERNATIVES

Alternative A - No-Action Alternative

As previously stated, this alternative will be used as the baseline for comparing the environmental consequences of the action alternative, because it defers treatment of all sections at this time. Existing conditions and natural processes would continue unchecked. The second growth lodgepole pine in Sections 5, 8, and 17 that currently provide summer and fall security cover for elk would continue to do so under the No Action Alternative. Without a significant change in the weather patterns or other environmental conditions, it is logical to assume that the MPB infestation would continue in the Upper Willow Creek drainage. Eventually there would be large patches of dead LPP in the drainage.

Soil disturbance would remain at historical levels, with bare mineral soil occurring as a result of moderate to high intensity wildland fires or wind throw. The large amount of dead material which would be expected to occur as a result of the beetle infestation would provide high levels of fuel for these fires. Should they occur it is likely that they would be the high intensity, stand replacing type. Fire acts as a recycling agent for the habitat types which inhabit these tracts. The only other agents which could expose bare mineral soil would be flooding along streams and wind throw which would uproot trees. Neither of these agents would create large patches of bare mineral soil. The risk of noxious weed establishment and spread would be associated with the existing road systems and agents such as vehicles, livestock or wildlife transporting seeds to the site.

Alternatives B – Action Alternative

Under this alternative, timber harvesting, road building, and other associated management activities would occur. Up to 1010 acres of sawlog size lodgepole pine would be available for salvage harvesting along with 40 acres of post and rail thinning. To facilitate the harvest operations up to 3.68 miles of new and .9 miles of temporary road would be constructed. Table 2-1 below summarizes environmental effects of the two alternatives. These alternatives are polar opposites in terms of land management. Alternative A would not salvage any of the infested timber nor would it construct any new roads. Existing natural processes would be allowed to continue unchecked for the near term. The Action alternative would implement an aggressive salvage operation throughout the entire State ownership within the drainage, harvesting most of the timber which meets sawlog specifications. The existing transportation system would be added to and upgraded to reduce the potential for sediment transport. Alternative B makes use of existing roads on U.S. Forest Service and Bureau of Land Management land to access the school trust tracts.

TABLE 2-2
Comparison of Environmental Effects of the Alternatives

Item	Alternative A	Alternative B
Salvage harvest	**0**	**1010 ac.**
Post & Rail harvesting	**0**	**40 ac.**

Estimated sawlog volume removal	**0**	**3 - 5 MMBF**
Total harvested acres	**0**	**1050 ac.**
New Road Construction	**0**	**3.68 mi.**
Road Reconstruction	**0**	**0 mi.**
Temporary Road	**0**	**.9 mi.**
% of Ownership Receiving Treatment	**0**	**56%**
Risk of Insect Attack	**High**	**Low**
Risk of Noxious Weed Spread	**Low**	**Moderate**
Cumulative WYI*	**Same as existing condition**	**Low increase compared to existing condition**
Water quality	**Existing road drainage problems would not be addressed**	**Potential for sediment transport increased, mitigation measures also increased**
Effects to Soil Productivity	**None**	**Minimal with the implementation of recommended mitigation measures**
% of Elk Analysis Area in Security Cover ****	**MPB infestation would reduce Hillis security cover below 30% over time**	**Timber harvesting would reduce Hillis security cover below 30% within the next 2 years**
Effects to recreational hunting	**Reduction in existing hiding and security cover**	**Reduction in existing hiding and security cover**
Estimated Net Revenue to the State ******	**0**	**Between $458,000 and 758,000 dependent upon volume sold**

*ECA - Equivalent Clearcut Acres and WYI - Water Yield Increase are discussed in more detail in Chapters 3 and 4.

***Stumpage was estimated to be $150/MBF for sawlogs under alternative B. $200/acre for post and rail material was assumed as the stumpage.

CHAPTER 3 – AFFECTED ENVIRONMENT

This chapter identifies and describes those resources, which are affected by the proposed action. It is organized by general resource categories and their associated issues. It does not describe any effects of the alternatives, as these will be covered in Chapter 4. The descriptions of existing environments found in this chapter can be used as a baseline for comparison of alternatives and their impacts.

GENERAL DESCRIPTION OF THE AREA

The proposed Willows End Timber Sale is located in the western foothills of the Continental Divide, northwest of Philipsburg, Montana. Elevations in the proposed harvest area range from 5400 to 6009 feet. These parcels drain to tributary creeks of Rock Creek, which in turn are tributary to the Clark Fork River. School trust lands involved in the proposed project are forested mainly with lodgepole pine along with minor amounts of Douglas fir, alpine fir, Englemann spruce and ponderosa pine.

Two habitat types dominate the project area Douglas Fir/ Dwarf Huckleberry (PSME/VACA) and Subalpine Fir/Dwarf Huckleberry (ABLA/VACA). PSME/VACA types occur on dry ridge tops and south facing slopes. ABLA/VACA habitat types are found on the north facing, moister, colder slopes. Understory vegetation on the warm, dry sites are dominated by pine grass, elk sedge, dwarf huckleberry and kinnikinnick. On cool moist sites the ground vegetation is generally composed of dwarf huckleberry, grouse whortleberry, pine grass and twin flower (Pfister et al. 1977). South facing slopes within the project area contain stands, which appear to have been, at one time, a mixture of grassland and timberland. The grasslands (annual and bunchgrass types) in the project area are experiencing encroachment by Douglas fir and lodgepole pine. This is likely due to the lack of frequent wildfires, which historically kept south and west aspects clear of all but scattered individual Douglas fir (Gruell, 1983).

School Trust Lands involved in the gross sale area total approximately 1786 acres. General stand

vigor ranges from poor to fair. Approximately 316 acres of predominately mature timber were harvested in 2006 and 2007. These stands are currently in the process of regenerating with varying degrees of success. An additional 432.6 acres of post and rail thinning have been completed. Mature and old stands of lodgepole pine in Sections 5, 17, 21 and 28 are infected with Dwarf Mistletoe (Arceuthobium americanum). Mountain Pine Beetle (Dendroctonus ponderosae) has been infecting the pine over the last three years. In 2006 & 7 a few small patches of infected trees were noted in the southern ends of sections 17 and 8. Since the first attacks were noted there size has increased rapidly. Outbreaks are now found throughout the States forested ownership within the drainage. Approximately10 to 20% of the LPP is currently infested with the outbreak continuing to expand.

Past Harvesting Activities

Forested School Trust Lands in the Upper Willow Creek Drainage have seen three major timber sales, Upper Willow Creek (1.175 MMBF) harvested in 1985, Phoenix (2.5 MMBF) harvested in 2006-7 and Upper Willow Salvage (1.78 MMBF) currently under contract. In addition there have been 19 permits many of which were issued to cover post and rail harvesting or small sawlog sales. Approximately 432 acres of forested land has been put under management by this means

Most timber harvesting within the drainage occurred prior to 1978 with a majority of the earlier harvest having occurred on private land in the vicinity of Scotchman and Miners Gulch. In the 1980's, harvesting shifted to U.S.F.S. land on the west side of Upper Willow Creek near Alder, Niles, and Standish Creeks.

Current Access

Two groups control access to the School trust lands. U.S.F.S. Road #4325 is a high quality road under jurisdiction of the Beaverhead/Deer Lodge National Forest, that provides access to Sections 5, 8, and 17; and the BLM, which controls access to trust lands in Sections 21 and 28. These tracts can also be accessed from a county road, by crossing private ground east of Upper Willow Creek. These roads are generally closed during the entire year to the public, except for walk-in hunting in the fall. Past and present uses of the proposed project area include grazing, timber production, and mineral exploration.

AFFECTED RESOURCES

Hydrology

Affected Watersheds

The proposed project is located in the Upper Willow Creek portion of the Flint-Rock watershed HUC 1701020211 (see Watershed Map W-1) and more specifically, the Upper-Upper Willow Creek (6th code HUC 170102021102). Upper Willow Creek is a perennial tributary to Rock Creek watershed, which is a tributary to the Upper Clark Fork River basin. The watershed

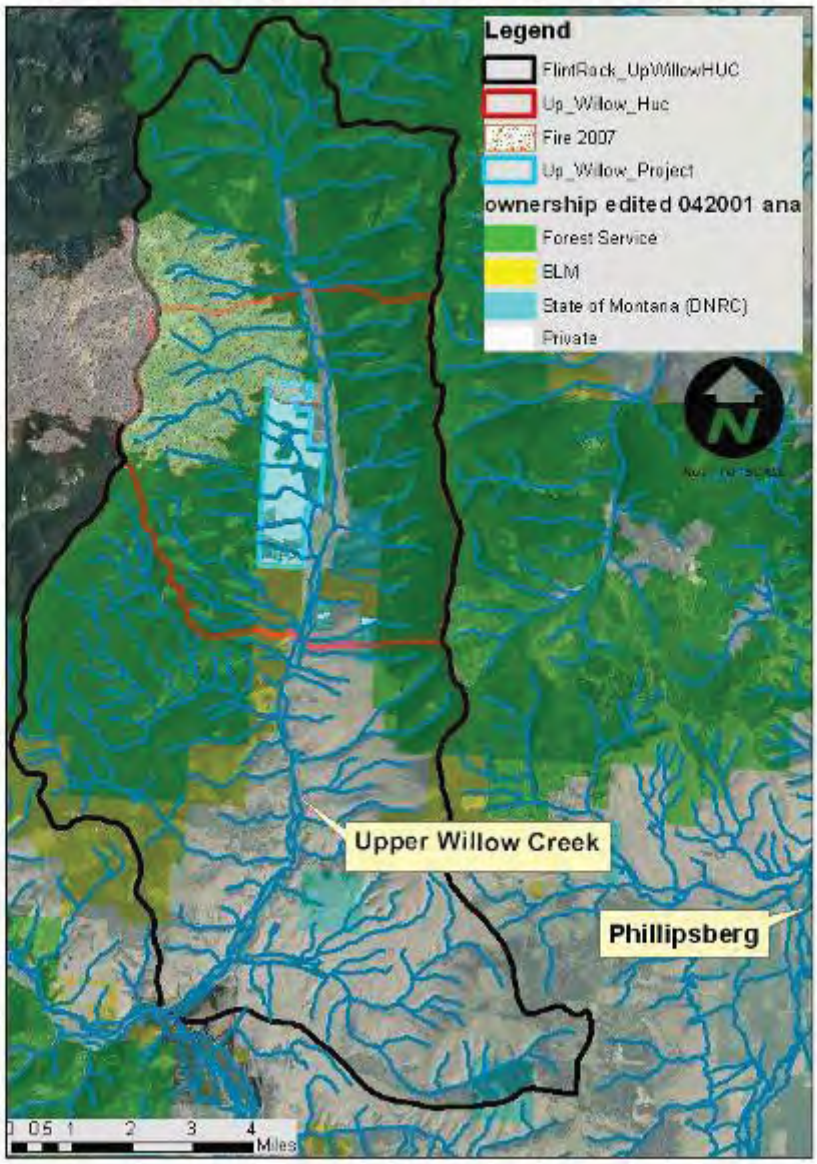
analysis will focus on potentially affected water resources and streams associated with proposed harvest and access roads to; Section 5, 8 and 17 T8N, R15W on the west side of the Upper Willow Creek valley. Four tributary streams flow roughly parallel across DNRC land to Upper Willow Creek. The affected tributary streams include portions of Beaver Creek, Bear Creek and Huepeck Creek and an unnamed tributary. Included in the project is approximately 80 acres in section 21 T8N, R15W on the east side of the valley that is drained by Arbuckle Creek, which flows into an irrigation ditch.

Ownership is a mixture, as noted in table 3-1, and DNRC lands represent (5.4%) in the Flint-Rock watershed and 12.3 % of the Upper Willow Creek watershed.

Table 3-1

Land Ownership within Flint-Rock Watershed, 5th Code HUC 17010203202 and Upper Willow Creek Watershed, 6th Code, HUC 17010203202				
	Flint-Rock HUC		**Upper Willow HUC**	
Land Ownership	**Acres**	**% of Watershed**	**Acres**	**% of Watershed**
DNRC - State trust lands	3279	5.4	2166	12.3
U.S. Forest Service	34160	55.9	12812	73
U.S. Bureau of Land Management	4275	7.0	898	5.1
Undifferentiated Private lands	19359	31.7	1701	9.6
Total Acres	61073		17583	

Watershed Area Map W-1
Willows End Project in Sections 5, 8, 17, T8N, R15W



Analysis ~~a~~ & Methods

The primary concerns relating to water resources within the analysis area are potential impacts to water quality from sediment sources outside the stream channels as well as inside the channels. In order to address these issues the following parameters are analyzed for each alternative:

~Miles of new road construction and road improvements

~Potential for sediment delivery to streams

~Potential for water yield increase impacts to stream channel stability

A watershed analysis and field survey was completed by a DNRC hydrologist for the proposed sale area to determine direct, indirect and cumulative effects to water quality. The water quality

evaluation included a review of existing inventories for soils and water resources (NRIS 2009, DNRC 2008), the proposed BLM Rock Creek Management Project, reference to previous DNRC projects, and comparisons of aerial photos combined with GIS analysis to estimate the area of past timber harvest and vegetative recovery. Several field reviews were completed for the proposed harvest units, access roads and associated streams and the observations, information and data were integrated into the watershed analysis and design of project mitigations.

The analysis of sediment delivery is limited to the proposed harvest units and roads used for hauling and will focus on the streams described in the affected watershed section. This includes in-channel and upland sources of sediment that could result from this project. In-channel areas include stream channels adjacent to and directly downstream of harvest areas. Upland sources include harvest units and roads that may contribute sediment delivery as a result of this project. Past management activities in the proposed project areas that affect sediment delivery include; timber harvest, mining, grazing, irrigation, road construction, fire suppression and recreation. For this project, a DNRC hydrologist evaluated streams, roads and proposed harvest units. The field review compared the current road conditions and repair needs to previous road inventories and planned road maintenance plans for the access roads to this project area.

A DNRC hydrologist initially completed a course filter qualitative assessment of watershed conditions and cumulative effects as outlined in the Forest Management Rules (ARM 36.11.423) concerning watershed management and further developed a detailed assessment. The analysis areas for watershed cumulative effects include the watersheds that wholly surround the DNRC project sections and access roads to those parcels.

Water Quality Regulations and Beneficial uses

All the watershed areas listed in this report are classified as B-1 in the Montana Surface Water Quality Standards. The water quality standards for protecting beneficial uses in B-1 classified watersheds are described in ARM 17.30.623. The B-1 classification is for multiple use waters suitable for; domestic use after conventional treatment, growth and propagation of cold-water fisheries, associated aquatic life and wildlife, agricultural, and industrial uses. Other criteria for B-1 waters include; no increases are allowed above naturally occurring concentrations of sediment, which will prove detrimental to fish or wildlife and a maximum 1 degree Fahrenheit increase above naturally occurring water temperature is allowed within the range of 32 to 66 degrees Fahrenheit. Naturally occurring includes conditions or materials present from runoff or percolation on developed land, where all reasonable land, soil, and water conservation practices have been applied. Reasonable conservation practices include methods, measures, or practices that protect present and reasonably anticipated beneficial uses. The State has adopted Forestry Best Management Practices through its Non-point Source Management Plan as the principle means of controlling non-point source pollution from silvicultural activities. Stream temperatures are discussed in detail in the fisheries section.

Upper Willow Creek is identified on the 2008 Montana 303(d) list as an impaired water body for not fully supporting aquatic life and cold water fisheries (MTDEQ, 2008). Upper Willow Creek is listed as Category 4C with no Total Max Daily Load (TMDL) analysis currently required. Impairments are related to low flow alterations, cover alterations (mainly willow removal) and

habitat alterations associated with livestock grazing and irrigated crop production. Cover is now improving with current management.

The proposed project areas is located in the footslopes above Upper Willow Creek and none of the streams flowing through the harvest areas are listed as water quality limited.

There is a surface water right on the DNRC ownership for the Beaver Creek irrigation diversion in section 5, T8N, R14W, (description in water quality section) but no other water rights or developments are listed within the DNRC project sections. The downslope beneficial uses in the project watersheds described include: recreation, cold-water fisheries, agriculture, irrigation, wildlife and livestock watering.

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

All applicable State Forest Land Management rules and regulations regarding watershed and fisheries management will be followed. This includes but is not limited to water quality (ARM 36.11.422); cumulative effects (36.11.423) Riparian Management Zones (ARM 36.11.425) and Fisheries (ARM 36.11.427).

Existing Water Resource Conditions of Water Quality and Quantity

Upper Willow Creek is a 4th order stream that flows from Sandstone Ridge to Rock Creek and the Clark Fork River. The DNRC project sections are located on the valley footslopes above Upper Willow Creek and the mainstem of Upper Willow Creek does not cross DNRC ownership. The terrain in the project section is gentle to moderately steep slopes. Elevations in the Willow Creek watershed range from 5,000 to 8200 on Sandstone ridge, and from 5400 to 6009 feet within the project area.

Within the Upper Willow Creek watershed, the average precipitation ranges from 17-40 inches/year, and within the project area precipitation is moderate to low with an average of 18-24 inches/year mainly as snow, with surface runoff rare and subsoil moisture low on upland sites. Snow squalls may occur even through the summer months. The lower portion of the drainage is dominated by grassland and sagebrush. Within the project area are also small pothole ponds and areas of sedge dominated somewhat poorly drained soils on concave slopes.

The proposed harvest area is mainly on the west footslopes of the Upper Willow Creek valley and several streams flow roughly parallel from headwaters on forest service lands below Sandstone Ridge, thence across DNRC ownership and onto meadows and hayfields along Upper Willow Creek. The westside tributary streams that cross DNRC project sites are Beaver Creek, Bear Creek, Huepeck Gulch and two unnamed ephemeral streams are described here.

Beaver Creek and Beaver Ditch

Beaver Creek is a class 1 perennial stream with a drainage area of 1775 acres that headwaters in

the B-D N.F. and flows through about 1 mile of DNRC ownership Section 5-8, T8N, R15W and then across private ownership to the confluence with Upper Willow Creek. There is one road culvert crossing located on Forest Service lands, about 1/4 mile upstream and to the west of the DNRC property boundary in section 5, and one steel bridge crossing on the DNRC section. The steel bridge is a high standard crossing for fish passage and does not affect or restrict the stream channel and is has no sediment delivery problems.

Stream channel stability is currently excellent above the bridge and excellent to good below the bridge downstream to an irrigation diversion that flows to Bear Creek. There are high levels of downed large woody debris on and adjacent to the stream channel. There is a historic irrigation ditch diversion on Beaver Creek in section 5, T8N, R15W, that diverts about 3 cfs of summer flows to a ditch. The ditch flows from the headgate to a small pond then continues as a ditch to a steep gradient gully and then joins Bear Creek in section 8, T8N, R15W to the south and then to a irrigated hay field. Stream flows in Bear Creek are relatively consistent after spring runoff, but decline over the summer to estimated 4 or 5 cfs, of which 3 is diverted. With continued tree mortality, water yield may increase slightly and improve the duration of summer flows.

Prior to 2005, the lower Beaver Creek channel to Upper Willow Creek was dewatered below the diversion site and the total stream flow was diverted to the Beaver ditch for irrigation and partial flow to Bear Creek. The Beaver Creek ditch diversion was upgraded to a headgate installation through a joint project with DNRC, MTFWP and the Luthje Ranch. The new headgate provides for the allocated water right and has reconnected flow to lower Beaver Creek and on to Upper Willow Creek. The new headgate has reduced peak flows from Beaver Creek to the ditch and downstream to Bear Creek. The restored flow section of Beaver Creek has good channel stability directly below the headgate, but the lower reach has stream segments with trampled and degraded channel banks from grazing use mainly on open meadow sites of the lower 800 feet of DNRC ownership and extending downstream on private land to the confluence with Upper Willow Creek.

Bear Creek is a class 1 perennial stream of approximately 1009 acres drainage area and is similar to Beaver Creek with headwaters in the B-D N.F and flows through about 1 mile of DNRC ownership in Section 8, T8N, R15W and then across private ownership to the confluence with Upper Willow Creek. Bear Creek is an important fisheries stream and supports bull trout. There are two culvert crossings located on Forest Service lands, about ½ mile upstream and to the west of the DNRC property boundary in section 5, and one steel bridge on the DNRC section. The steel bridge is a high standard crossing for fish passage and does not affect or restrict the stream channel. There is one road drainage feature on the north approach that is rutted and sediment currently delivers to the floodplain, but not into the stream and requires repair. No other sediment sources were identified on this road segment.

The Beaver Creek ditch flows into Bear Creek in the SWSE section 8, T8N, R15W and currently augments stream flow by up to 3 cfs. In 2005, the installation of the Beaver Creek headgate helped reduce ditch flows to lower Bear Creek. Just above the confluence of Bear Creek and the ditch, there is several hundred feet of the irrigation ditch that flows down a steep grade of over 20% slope. Before improvements in 2005, this steep segment of ditch had eroded a large, deep

gully that was a chronic sediment/water quality problem that contributed fine sediment to lower Bear Creek and estimated to have eroded over 600 cubic yards of material over 50 years to Bear Creek and the lower ditch. As part of the DNRC Phoenix Timber project (DNRC 2005), the gully was stabilized with rock control structures and the banks backsloped and revegetated, which has greatly reduced sediment, and improved water quality in lower Bear Creek.

The stream stability of Bear Creek is currently excellent on the Rosgen B above the ditch confluence. Stream channel stability has improved from fair to good downstream of the irrigation diversion in section 8, T8N, R15W although there are still fine sediments from the past gully wash. There are high levels of downed large woody debris on and adjacent to the upper stream channel. Stream flows for Lower Bear Creek and Beaver Creek are relatively consistent after spring runoff, but decline over the summer and the flow on lower Bear Creek is mainly diverted for irrigation use. With continued tree mortality, water yield may increase slightly and extend summer flows. Grazing use on the lower reach has impacted channel banks from grazing use.

Huepeck Creek is a class 2 stream of approximately 397 acres that flows during spring runoff and has short perennial segments. The flow is intermittent and is not fish habitat. The channel is largely grass banks and flow is not consistent through the DNRC section 17. There is one road crossing that is a stable culvert site and does not deliver sediment. The south approach requires gravel surfacing to maintain sediment control. Stream channel stability is excellent above and directly below the road. Moderate grazing use occurs near the lower DNRC property boundary and there are localized segments of impacted meadow.

Unnamed tributary in Section 8, T8N, R15W, is a class 2 stream with a small drainage area that flows during spring runoff to a small pond and is connected to the Beaver Creek ditch. The flow is short term but delivers to another body of water, and is not fish habitat. The channel is largely grass banks and flow is not consistent through the DNRC section 8. There is one road crossing that is a stable culvert site and does not deliver sediment to the pond or affect water quality. The stream segment and associated wetlands are in good to excellent condition across DNRC ownership. Moderate grazing use occurs near on the lower meadow locations where channel is barely discernable.

Unnamed tributary in Section 17, T8N, R15W, south of Huepeck Creek is a class 2 stream with a small drainage area that flows during spring runoff Upper Willow Creek. The flow is short term and most years goes subsurface, and is not fish habitat. The channel is largely grass banks and flow is not consistent through the DNRC section 17. There is one road crossing that does not deliver sediment, but requires rock surfacing on the approach grade to ensure sediment control. Portions of the channel are barely disc3rnable and does not affect Upper Willow Creek

Arbuckle Gulch

Section 21, T8N, R15W includes 120 acres of DNRC ownership and a short, approximately ¼ mile segment of Arbuckle Gulch that has a watershed area of approximately 595 acres. The DNRC ownership is located on the lower elevation footslopes and precipitation is moderate to low, with an average range of 17-24 inches/year mainly as snow, with surface runoff rare and subsoil moisture low. Grassland and sagebrush occur on southerly aspects along the DNRC

ownership boundary, reflecting the dry nature of the area. The relatively small tributary area of Arbuckle Gulch is intercepted by an irrigation ditch at the Upper Willow Creek road and does not have return flow to other waters and is not considered fish habitat. The stream flows across several ownerships and has varied levels of grazing use with bank trampling apparent on stream reaches on the DNRC ownership. Arbuckle Creek channel stability is fair due to grazing effects to channels. There is one existing stream crossing that has adequate road surface drainage at the crossing site, but requires maintenance grading. Less than 30 acres of harvest is proposed and the minor harvest on the Arbuckle parcels would not contribute to water yield. Due to the small scale of harvest and low potential for harvest effects to water quality, the Arbuckle Gulch parcel will be dismissed from further analysis.

Roads Summary

An inventory of the haul route was completed to locate sediment sources and identify maintenance or repair needs. The planned haul route using existing road access follows the Upper Willow Creek County road and the Standish Road that crosses private, BLM and Beaverhead/Deer Lodge Forest Service lands. The Upper Willow Creek county access road is mainly located well away from Willow Creek with the exception of stream crossing sites, and the mainstem crossing is a stable bridge location. Within the DNRC ownership and project area Bear Creek and Beaver Creek have existing bridge crossings that were installed to minimize channel disturbance, protect water quality and protect fish habitat as part of the DNRC, Phoenix Timber Sale project in 2005. Existing sediment sources are few and minor on the haul route.

Existing Cumulative Watershed Effects

Cumulative watershed effects can be characterized as impacts on water quality and quantity that result from the interaction of past, current or foreseeable future disturbances, both natural and human-caused. Past management activities in the area include timber harvest, mining, grazing, road construction, irrigation diversions and fire suppression.

Tree canopy reduction by timber harvest activities, tree mortality or wildfire can affect the timing of runoff, increase peak flows and increase the total annual water yield of a particular drainage. Increased water yield can increase stream channel scour and in-stream sediments that impact water quality, depending on channel stability and increased flow levels. High levels of mountain pine beetle mortality on older lodgepole pine are evident throughout the Upper Willow Creek drainage and the Clark Fork Basin. As trees die and vegetative cover is reduced, stream flows are expected to increase associated with the extensive lodgepole mortality in the Upper Willow Creek watershed. With continued tree mortality, water yield may increase slightly and extend the duration of summer flows. Natural disturbances are loss and changes in vegetative cover from fires and insect mortality. Historically in these lodgepole pine dominated forest 50 to 70% or more of the watershed may be burned over by episodic fire with a resulting increase in water yield.

The Fisher Point Fire in 2007 caused a mosaic burn of low to high fire intensity that killed trees and reduced vegetative cover. The fire covered approximately 3645 acres, or roughly 6% of the 61, 073 flint Rock watershed and approximately 20% of the 17,583 acre Upper Upper Willow watershed that includes the headwaters for Beaver Creek and part of Bear Creek drainage.

Approximately 45% of the Beaver Creek drainage burned with up to 50% mortality. Approximately 19% of the Bear Creek drainage burned with up to 45% mortality. Water yield has likely increased in the headwaters of the portions of Beaver and Bear Creek that were affected by the fire in 2007, but stream channel stability and form has remained good to excellent on forested sites. The typical small Rosgen type "B" channels are resilient to changes in flow, yet we expect the increased flows associated with fire and tree mortality may lead to future changes in stream channel stability as stream segments adjust to these natural effects.

Previous timber management in the Upper Willow drainage include timber harvests on Forest Service lands above the project area in the 1980's that are regenerated, BLM salvage and DNRC harvests. The BLM has a current proposal to harvest approximately 330 acres and thin 120 acres mainly in the Scotchman Creek area, in the lower reaches of the Upper Willow Creek drainage, mainly south and out of the project area. There is a mixture of initial regeneration harvests and post and rail thinnings that were completed in the project area with the DNRC Phoenix timber sale in 2005/2006 and salvage harvest on partial section 16 T8N, R15W (not in proposed project area) in the mid 1980's, and 2009.

The ECA method was used to estimate the average annual water yield for each of the sub drainage areas for the recent Phoenix Timber Sale EIS. The levels of average water yield were determined to be relatively low at 5.15 to 7.7% over a fully forested condition. Historically in these lodgepole pine dominated forest 50 to 70% or more of the watershed may be burned over by episodic fire with a resulting increase in water yield. In the 1920's most of Upper Willow Creek burned over and has lead to many of the dense even age Lodgepole pine stands we see in the drainage today. Cumulative water yield was not found to be a constraint in Upper Willow Creek for recent harvest completed (DNRC Phoenix EIS 2005) and salvage harvest on the east side of Willow Creek in partial section 16 T8N, R15W (DNRC 2009).

On the mid to upper reaches of Beaver and Bear Creek, stream channel stability is good to excellent above and directly below the Beaver ditch and no measurable degradation or change in stream channel stability has occurred since the recent harvest and road operations. On the lower reach of Beaver Creek, mainly on grassland sites, grazing use continues to cause bank trampling of the short sedge dominated riparian areas and hoof traffic has caused a moderate impact on bank stability. An internal BMP and evaluations of DNRC harvest effects from recent harvest operations did not find evidence of increased overland flow or sediment delivery from harvest areas. Surface erosion was limited to short segments of road and only one site had minor sediment delivery.

Wildlife

Issue: There is concern that the proposed action may negatively affect grizzly bear habitat beyond what is expected to result from the mountain pine beetle infestation.
Grizzly bears are listed as federally threatened under the Endangered Species Act, and are the largest terrestrial predators in North America, feasting upon deer, rodents, fish, roots and berries, as well as a wide assortment of vegetation (Hewitt and Robbins 1996). Depending upon climate, abundance of food, and cover distribution, home ranges for male grizzly bears in northwest

Montana can range from 60 - 500 mi^2 (Waller and Mace 1997). The search for food drives grizzly bear movement, with bears moving from low elevations in spring to higher elevations in fall, as fruits ripen throughout the year. However, in their pursuit of food, grizzly bears can be negatively impacted through open roads (Kasworm and Manley 1990). Such impacts are manifested through habitat avoidance, poaching, and vehicle collisions.

Portions of the project area are > 46 miles southwest of the Northern Continental Divide Ecosystem grizzly bear recovery area. The area receives use by grizzlies near the confluence of Upper Willow Creek and Rock Creek (J. Jonkel, MT FWP, pers. comm., 2003). Thus, the proposed project area may be part of one or more grizzly bear home ranges. Therefore, the cumulative effects analysis area for grizzly bears encompasses 436 square miles (279,478 acres). During the period of 2005 through 2009, approximately 57,648 acres of the cumulative effects analysis area had been affected by mountain pine beetles. Approximately 46,958 of those acres were detected in the 2009 Aerial Detection Survey (USFS 2010).

Issue: There is concern that the proposed action may negatively affect Canada lynx habitat beyond what is expected to result from the mountain pine beetle infestation.
Lynx are currently classified as threatened in Montana under the Endangered Species Act. In North America, lynx distribution and abundance is strongly correlated with snowshoe hares, their primary prey. Consequently, lynx foraging habitat follows the predominant snowshoe hare habitat, early- to mid-successional lodgepole pine, subalpine fir, and Engelmann spruce forest. For denning sites, the primary component appears to be large woody debris, in the form of either down logs or root wads (Squires and Laurion 2000, Mowat et al. 2000, Koehler 1990). These den sites may be located in regenerating stands that are >20 years post-disturbance, or in mature conifer stands (Ruediger et al. 2000, Koehler 1990).

Elevation within the project area ranges between 5400 and 6009 feet. There are approximately 59 acres of mature foraging habitat, 337 acres of temporary non-habitat, and approximately 976 acres of “other” lynx habitat (i.e., lands in lynx habitat that do not meet definitions for young or mature foraging, denning, or temporary non-lynx habitat, but serve to provide cover to facilitate movement and acquisition of alternative prey species) on the affected parcels. The cumulative effects analysis area is an approximately 114,028 acre analysis area that is comprised of approximately 92,029 acres of federal lands and 3 lynx observations (Natural Heritage database).

Issue: There is concern that the proposed action may negatively affect gray wolves beyond what is expected to result from the mountain pine beetle infestation.
Cover, road and prey densities likely have some influence on wolves. The Ram Mountain pack is located within 5 miles of the project area. Mule deer, white-tailed deer, elk, and moose are known to use the area. Currently, no known wolf den or rendezvous site is located within 1 mile of the project area. The cumulative effects analysis area for grizzly bears will be utilized for wolves as well. As such, it encompasses 436 square miles (279,478 acres) and what is known of the Ram Mountain pack’s home range. During the period of 2005 through 2009, approximately 57,648 acres of the cumulative effects analysis area had been affected by mountain pine beetles. Approximately 46,958 of those acres were detected in the 2009 Aerial Detection Survey (USFS

2010).

Issue: There is concern that the proposed action may negatively affect pileated woodpecker habitat beyond what is expected to result from the mountain pine beetle infestation.

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

The project area is a mixture of subalpine fir/dwarf huckleberry and subalpine fir/twin flower/bear grass phase, and Douglas-fir/pinegrass/kinnikinnick phase habitat types, with approximately 64 acres having an average stand diameter $\geq$ 15 inches dbh (Stand Level Inventory database). The potentially suitable habitat is split between the parcels in sections 17 and 28. Additionally, the current available habitat has been affected by mountain pine beetles. Within the forested areas of the project area, canopy closure is generally in excess of 60%. The cumulative effects analysis area encompasses a 1-mile radius surrounding each parcel of the project area.

Issue: There is concern that the proposed action may negatively affect flammulated owl habitat beyond what is expected to result from the mountain pine beetle infestation.

The flammulated owl is a tiny forest owl that inhabits warm-dry ponderosa pine and cool-dry Douglas-fir forests in the western United States and is a secondary cavity nester. Nest trees in 2 Oregon studies were 22-28 inches dbh (McCallum 1994). Habitats used have open to moderate canopy closure (30 to 50%) with at least 2 canopy layers, and are often adjacent to small clearings. It subsists primarily on insects and is considered a sensitive species in Montana. Periodic underburns may contribute to increasing habitat suitability for flammulated owls because low intensity fires would reduce understory density of seedlings and saplings, while periodically stimulating shrub growth. Among the project area parcels, there are approximately 190 acres of flammulated owl preferred habitat types. Approximately 179 acres of flammulated owl preferred habitat types have been harvested within the project area during a recent previous entry.

Issue: There is concern that the proposed road building and timber harvesting may negatively affect elk security cover beyond what is expected to result from the mountain

pine beetle infestation.

Dense lodgepole pine stands that dominate the drainage provide both hiding and security cover for elk herds that use the area. The upper third of the Upper Willow Creek drainage is used by elk for summer and fall range. The analysis area required to address security cover was delineated to include the annual home range of the local elk herd. East of Upper Willow Creek, there has been almost no timber harvesting or road construction. Existing roads are mostly two-tracks and used for livestock and ranch management.

Upper Willow Creek flows south for approximately 18 miles through forested land, hay fields, and pasture before joining Rock Creek at Gilles Bridge. The valley formed by Upper Willow Creek is relatively narrow with steep mountains flanking it on the east, and more gentle mountains on the west and north sides. The south end of the drainage is dominated by high energy exposures that are predominately grassland interspersed with Douglas-fir and lodgepole pine on the north aspects. Some smaller patches of grassland are included on the southerly aspects and near the creek bottom. The upper 1/3 of the drainage is composed of dense stands of lodgepole pine with some Douglas-fir on the south aspects. Spruce and subalpine fir dominates the higher elevation creek bottoms and other moist sites.

The analysis area is bounded by Scotchman's Gulch on the south, the Black Pine Ridge on the east, Sandstone Ridge on the west, and a ridge between Harvey Creek and Upper Willow Creek on the north. The analysis area covers approximately 29,119 acres. Of the total acreage within the analysis area, approximately 13,293 acres have been previously harvested, burned by the Sawmill Complex fire (2007), or are grassland. Additionally, approximately 19,363 acres of the analysis area occur within 0.5 miles of open roads during the hunting season. There are approximately 11,290 acres of elk security habitat (or 30.1% of the area) within the analysis area currently, as defined by Hillis et al. (1991).

The project area for this analysis is defined as those 1,786 acres of DNRC-owned parcels in which timber harvesting or road construction are proposed. Of these acres, there are approximately 989 acres (55% of the area) in elk security habitat within the project area.

Issue: Habitat that is important to moose may be degraded by the proposed action beyond what is expected to result from the mountain pine beetle infestation.
Analysis of this moose issue will utilize the project and analysis areas previously described for elk. Moose are the largest ungulate in North America, distributed throughout Alaska, Canada, and many of the border states. In general, moose habitat includes: areas of abundant high-quality winter browse; shelter areas that allow access to food; isolated sites for calving; aquatic feeding areas, young forest stands with deciduous shrubs and forbs for summer feeding; mature forest that provides shelter from snow or heat; and mineral licks (Thompson and Stewart 1998). As such, much of the Upper Willow Creek drainage bottom is considered moose winter range habitat by the Montana Department of Fish, Wildlife & Parks, and the surrounding uplands receive overall use by moose. The project area is immediately adjacent to, and the analysis area contains, the Upper Willow Creek bottom, which contains several shrub species that moose

forage upon. Additionally, along the border between sections 5 and 8, T8N R15W, within the project area, there are 7 potholes ranging in area from 0.43 to 1.7 acres, and totaling 6.28 acres. Within the 1,799 acre project area, there are 200 acres that receive overall use by moose, and 1,599 acres of moose winter range. Currently there are no regenerating clearcuts within the project area , forested habitat. Within the 29,119 acre analysis area, approximately 24,093 acres receive overall use by moose and 13,383 acres are considered to be moose winter range habitat. Currently, there are approximately 6,993 acres of regenerating clearcuts or recently burned areas within the analysis area, for a total of 24% of the total analysis area.

Rempel et al. (1997) evaluated the effects of different landscape management strategies designed to benefit moose populations in Ontario and speculated that the greatest hindrance to increasing moose populations was increases in hunter access resulting from roads required to implement the habitat management strategies. Thus, increasing hunters' road access might degrade moose habitat quality due to increased hunting vulnerability. Currently there are 1.37 miles of open road and 8.47 miles of gated/locked roads within the project area, and 60.5 miles and 37.0 miles, respectively, within the analysis area. Areas behind the locked gates are accessible for walk-in hunting opportunities.

Fisheries

3.1BEAVER CREEK ANALYSIS AREA

The entire Beaver Creek drainage, with the exception of upland areas draining to the Beaver Creek Ditch and Lakes, defines the boundaries of this analysis area. The proposed activities that may affect fisheries resources in this analysis area include harvest and hauling activities within riparian management zone (RMZ) and upland areas. All reaches of Beaver Creek within the project area and downstream to Upper Willow Creek are fish-bearing.

Three distinct geomorphologic reaches of Beaver Creek occur in the project area. The 'Lower' stream reach (~800' within the project area; ~1,800' on private lands) flows through alluvial fan topography exhibiting occasional, historic beaver dam complexes before entering Upper Willow Creek. This reach is characteristic of Rosgen E channel types with grazing impacts causing unstable conditions throughout at least half of the reach. However, grazing impacts in the reach appear to be reducing as fewer cattle may have been turned-out in the area during the past several years. The 'Middle' stream reach (~2,600') extends from the alluvial fan upstream to the Beaver Creek Ditch diversion. This reach is characteristic of Rosgen B and E channel types in a generally stable condition. Occasional, historic beaver dam complexes occur throughout this reach. The 'Upper' stream reach (~1,200' within the project area) extends from the Beaver Creek Ditch diversion upstream to the State/Forest Service property boundary. This reach is characteristic of Rosgen B channel types in a stable and generally undisturbed condition.

The existing conditions of channel forms in fish-bearing reaches are addressed by evaluating the collective characteristics of sediment, flow regime, and woody debris features. Field reviews to assess the condition of Beaver Creek within the project area and downstream on private lands have been conducted annually by a DNRC fisheries, hydrology, or soil specialist since at least

2003. Considering the stream morphologies of the watershed, field reviews have found that relative proportions of surface substrate size classes in the 'Middle' and 'Upper' reaches appear to be generally representative of the expected ranges of substrates that would be found in unmanaged watersheds. The field reviews have found that relative proportions of surface substrate size classes in the 'Lower' reach appear to be smaller than the expected ranges of substrates that would be found in unmanaged watersheds. Many channel form features (e.g. pools, undercut banks, riffles) in the 'Lower' reach are aggraded due nearly exclusively to sedimentation inputs from channel bank erosion. The channel bank erosion throughout the 'Lower' reach is primarily a result of grazing hoof shear and trampling. In addition to filling in pool and other channel scour features, the grazing impacts to streambanks have widened the existing channel in a few places, which reduces hydrologic shear stress and the stream energy needed to flush additional sediment inputs and maintain the channel form features normally expected with associated stream morphologies. [Native fisheries are consequently adversely affected through greatly diminished qualities of wintering, spawning and rearing habitats and habitat displacement.] The Soils and Hydrology Analysis estimates that existing sedimentation from road-stream crossings in the project area are negligible. The Soils and Hydrology Analysis has also determined that an existing departure in the historic range of flow regime in the watershed is unlikely. Field reviews of the watershed did not find any existing impacts to the woody debris component of fisheries habitats. Considering existing sediment conditions, flow regime, and woody debris recruitment rates, a high risk of moderate impacts to channel forms occurs in the 'Lower' reach and a low risk of very low impacts to channel forms occurs in the 'Middle' and 'Upper' reaches. Existing impacts to channel forms are due exclusively too adverse levels of sedimentation.

Many different variables affect the natural fluctuations and ranges of stream temperatures (e.g. groundwater inflows, loss of flow, canopy closure, stream gradient, stream width to depth ratio, volume). Important variables affected by management activities within the Beaver Creek drainage include shading from riparian shrub components, woody debris canopy closure, and sedimentation. No impacts to woody debris canopy closure were observed during field reviews, but mixed levels of grazing of riparian shrub components have been observed within the 'Lower' reach. Based on existing sedimentation impacts, loss of flows to the Beaver Creek Ditch (continuous 0.3 to 1.0 c.f.s.), and mixed grazing of riparian shrubs, a moderate risk of moderate impacts to stream temperatures likely exists in the 'Lower' and 'Middle' reaches. A low risk of very low impacts to stream temperatures likely occurs in the 'Upper' reach.

Connectivity is the measure of fish passage or migration potential throughout a stream system. Two road-stream crossings and one diversion structure occurs on known fish-bearing reaches within the analysis area. One of the structures (on Forest Service Road 4325) may partially limit fisheries connectivity; a moderate risk of moderate impacts to connectivity occurs in the analysis area.

Other related existing direct and indirect effects within the analysis area may include grazing-related trampling of spawning redds, riparian soil compaction, and adverse nutrient effects to water quality. Recent wildfire in several headwater portions of the analysis area likely has neutral short- and long-term impacts to fisheries resources. Displacement of native fisheries by

nonnative fisheries is an existing high adverse impact, however, the restoration of the majority of year-round flows in the 'Lower' and 'Middle' reaches, and consequent restoration of connectivity between the 'Middle' and 'Upper' reaches, during 2006 is a very positive impact. A low risk of low impacts to fisheries resources is expected to have occurred in the analysis area as a result of past timber harvest on Forest Service lands and recent implementation of the Phoenix Timber Sale. All of these other related existing actions are expected to have a general positive impact to fisheries resources in the analysis area.

Considering a high impact to native species presence, moderate impacts to channel forms in the 'Lower' reach, a risk of moderate impacts to stream temperatures in the 'Lower' and 'Middle' reaches, a risk of moderate impacts to connectivity, and a general positive impact from other related actions, an existing moderately positive cumulative impact to fisheries populations and habitat features likely occurs in the analysis area..

3.2BEAVER CREEK DITCH AND LAKES ANALYSIS AREA

The Beaver Creek Ditch and Lakes analysis area is composed of those portions of face drainages to Upper Willow Creek between the Beaver and Bear creek analysis areas, south of Beaver Creek and within the project area, and west (or uphill) of the ditch and lakes. The proposed activities that may affect fisheries resources in this analysis area include harvest and hauling activities within RMZ and upland areas. All perennial reaches and lakes within the project area are fish-bearing.

All reaches of the ditch are manmade and classified as Class 3 other bodies of water. The ditch (~8,500' within the project area) intersects 3 separate natural lakes ranging from 0.5 to 1.8 acres in area. Flows to the ditch are regulated by a headgate on Beaver Creek, and usual inflows range from 1.0 c.f.s. during peak seasonal flows to 0.3 c.f.s. during base flows.. The ditch gains an approximate additional 1.0 c.f.s. (during base flows) before intersecting Bear Creek. At the Bear Creek intersection an earthen diversion is constructed during the summer season to capture all of the Bear Creek flows into the ditch..

Existing impacts to the manmade ditch are negligible, as the variables of channel form, stream temperature, and connectivity appear to be representative of an irrigation diversion. No impacts to these three variables appear to occur to lakes within the analysis area.

The stabilization of sediment point-sources in a gully formed by the Beaver Creek Ditch during 2006 is another related existing action and is a minor positive impact to fisheries resources in the analysis area. A low risk of low impacts to fisheries resources is expected to have occurred in the analysis area as a result of past timber harvest on Forest Service lands and recent implementing the Phoenix Timber Sale.

Considering no impacts to native species presence, no impacts to channel forms, stream temperatures or connectivity, and a minor positive impact from other related actions, an existing minor positive cumulative impact to fisheries populations and habitat features likely occurs in the analysis area.

3.3BEAR CREEK ANALYSIS AREA

The entire Bear Creek drainage, with the exception of upland areas draining to the Beaver Creek Ditch and Lakes, defines the boundaries of this analysis area. The proposed activities that may affect fisheries resources in this analysis area include harvest and hauling activities within RMZ and upland areas. All reaches of Bear Creek within the project area and downstream to Upper Willow Creek are fish-bearing. However, the reach of Bear Creek downstream of the Beaver Creek Ditch intersection (approximately 2,240' or the lowest 13% of the stream channel) is completely dewatered during the summer season to provide a water right for flood irrigation on private lands, and this event is expected to be highly detrimental to any fishery stocks entrained in the dewatered reach.

One distinct geomorphologic reach of Bear Creek occurs in the project area. The reach (~6,200' within the project area) is characteristic of Rosgen B channel types in a generally stable condition.

The existing conditions of channel forms in fish-bearing reaches are addressed by evaluating the collective characteristics of sediment, flow regime, and woody debris features. Field reviews to assess the condition of Bear Creek within the project area have been conducted annually by a DNRC fisheries, hydrology, or soil specialist since at least 2003. Considering the stream morphologies of the watershed, field reviews have found that relative proportions of surface substrate size classes in the project area reach appears to be generally representative of the expected ranges of substrates The Soils and Hydrology Analysis estimates that existing sedimentation from road-stream crossings in the project area are negligible. The Soils and Hydrology Analysis has also determined that an existing departure in the historic range of flow regime in the watershed is unlikely. Field reviews of the watershed did not find any existing impacts to the woody debris component of fisheries habitats. Considering existing sediment conditions, flow regime, and woody debris recruitment rates, a low risk of low impacts to channel forms occurs in the project area reach.

Important variables to stream temperature affected by management activities within the Bear Creek drainage include shading from riparian shrub components, woody debris canopy closure, and sedimentation. No impacts to woody debris canopy closure were observed during field reviews, but minor levels of grazing of riparian shrub components have been observed within the project area reach. Based on existing sedimentation impacts, a major seasonal loss of flows to the Beaver Creek Ditch, and mixed grazing of riparian shrubs, a moderate risk of moderate impacts to stream temperatures likely exists in Bear Creek downstream of the Beaver Creek Ditch diversion. A low risk of very low impacts to stream temperatures likely occurs in Bear Creek upstream of the Beaver Creek Ditch diversion.

Connectivity is the measure of fish passage or migration potential throughout a stream system. Three road-stream crossings and one diversion location occurs on known fish-bearing reaches within the analysis area. Two of the road-stream crossing structures (both on Forest Service Road 4325)completely limit fisheries connectivity; a high risk of moderate impacts to

connectivity occurs in the analysis area. The diversion location where the Beaver Creek Ditch intersects Bear Creek is seasonally constructed as a complete barrier to connectivity for all fish species and life stages. The diversion location represents a moderate risk of high impacts to connectivity in the analysis area.

The displacement of native fisheries by nonnative fisheries is considered an existing high adverse impact. Other related existing direct and indirect effects within the analysis area may include grazing-related trampling of spawning redds, riparian soil compaction, and adverse nutrient effects to water quality. Recent wildfire in several headwater portions of the analysis area likely has neutral short- and long-term impacts to fisheries resources. The stabilization of sediment point-sources in a gully formed by the Beaver Creek Ditch during 2006 and the construction of the riparian grazing enclosure contribute to positive impacts to fisheries resources in the analysis area. A low risk of low impacts to fisheries resources is expected to have occurred in the analysis area as a result of past timber harvest on Forest Service lands and recent implementation of the Phoenix Timber Sale. All of these other related existing actions are expected to have a slightly positive impact to fisheries resources in the analysis area.

Considering a high impact to native species presence, low impacts to channel forms, a risk of moderate impacts to stream temperatures downstream of the diversion location, a risk of high impacts to connectivity, and a slightly positive impact from other related actions, an existing moderate cumulative impact to fisheries populations and habitat features likely occurs in the analysis area.

Soils

Soils Analysis Area & Methods

The analysis area for geology and soil resources includes the DNRC project sections 5, 8, 17 and part of section 21, T 8N, R15W of the Upper Willow Creek drainage and the access roads to those DNRC sections proposed for timber harvest. A soil scientist completed an evaluation of soil survey data, air photos, past harvest units, proposed harvest units design and several on-site field reviews for soil properties and current conditions to assess past and predicted effects compared with DNRC soil monitoring results.

Existing Conditions-Geology and Soils

The sale area is located on moderate slopes with varied soils formed mainly in deep glacial till and alluvial deposits derived from, sedimentary rocks (argillites and quartzites). Tertiary valley deposits of silty clay loam texture occur in the swales, draw bottoms and footslopes. Granitic bedrock occurs on the East side of the valley and south of the DNRC ownership including the proposed harvest areas. Several pothole ponds and wet areas occur on the glacial outwash and tertiary age valley fill deposits in sections 5 and 8.

There are no especially unusual or unique geologic features in the sale area. Slopes are generally stable. One area of marginal slope stability occurs in SW 1/4 section 8 and is a concern for road location and construction, but is not part of any proposed action. This small area did not show signs of recent movement and will be excluded from the proposed harvest and road construction,

and slope stability will be dismissed from further analysis. A steep segment of irrigation ditch in the SE ¼ of section 8 is deeply eroded and was stabilized during the previous DNRC Phoenix timber sale.
On the DNRC project area, rock outcrops are rare and generally fractured bedrock, where encountered at shallow depth, is common excavation or rippable, and should not limit road construction. One area of well fractured argillite occurs adjacent to the road on a ridge in section 8 near Bear Creek. Material from this site is suitable for spot gravel, and a road turnout may be constructed and the material used for road surfacing. The road turnout location is outside of the Bear Creek SMZ on a stable site and is not a source of sediment.

Soils
Soil survey data from the NRCS and previous analysis (DNRC 1996 Phoenix) in the project area were field reviewed to verify soil types and existing soil conditions. Dominate soils on the forested sites in the project area on the west side of the valley are Elve and Loberg gravelly loams on moderate slopes of 15-35%. These soils are mainly well drained on convex slopes and include some somewhat poorly drained areas in swales and draws. Elve soils are very gravelly sandy loams. Loberg soils have shallow gravelly loam topsoils over finer textured gravelly clay loam subsoils. Main soil concerns are potential rutting, compaction and displacement. The moderate slopes are well suited to ground based skidding operations when operated on relatively dry, frozen or snow covered conditions and on slopes less than 45%. These soils have a limited dry season of use and tend to remain moist till July. Erosivity is moderate and can be controlled with standard drainage features. Clay rich soils of low bearing strength which occur at shallow depth along portions of the main access roads can be impassable when wet if not graveled.

Small riparian potholes occur in the area and will be avoided. Swales on the toeslopes include areas of somewhat poorly drained soils that support wet site vegetation, mainly a complex of riparian shrubs, deep sod with bluejoint grass, sedges and some spruce. These sites are subject to rutting and compaction except during winter conditions or exceptionally dry years. These soils support. The deep sod provides a buffer that traps sediment.

In the area on convex ridges with residual soils from the underlying bedrock are mainly Worock, and Winkler series sandy loam topsoils over gravelly sandy loam and cobbly clay loam subsoils, which are well drained and droughty. Main soil concern is potential displacement. These soils have a long season of use and are well suited to tractor operations on slopes up to 45%. Included small areas of steeper slopes over 45% are subject to severe displacement and erosion of surface soils by ground based skidding. This limitation can be overcome by cable skidding or forwarder operations on simple terrain. Erosivity is moderate to low and material quality is good for road construction.

Dominate soils in the project area on the east side of the valley within partial section 21 are Bignell gravelly clay loams with lesser areas of Worock gravelly loams on moderate slopes of 15-35%. These soils are mainly well drained on convex slopes and include some somewhat poorly drained areas in draws. Worock soils have shallow topsoils over deep cobbly clay loams forming in tertiary deposits and volcanics. Bignell soils have deep gravelly clay loam topsoils over finer textured gravelly clay loam subsoils. Main soil concerns are potential rutting, com-

paction and displacement. Erosivity is moderate and can be controlled with standard drainage features. Clay rich soils of low bearing strength which occur at shallow depth along portions of the main access roads can be impassable when wet if not graveled. These soils have a longer dry season of use and tend to dry out earlier in the year than the west side of the valley.

Soil Cumulative Effects

There is a mixture of initial regeneration harvests and post and rail thinnings that were completed in the project area with the DNRC Phoenix timber sale in 2005/2006. Areas of previous harvest were field reviewed for soil effects. The post and rail operations were thinned and brush stacked by hand labor and hauled out with ATV's and pickups resulted in minor effects to soils and few trails are evident. Areas of recent harvests were completed on frozen or dry conditions.

An evaluation of harvest impacts from recent harvest operations did not find excessive soil disturbance and soil rutting, compaction and temporary road construction impacted less than 10% of the harvest units, consistent with past effects assessments and lower than average harvest disturbances, based on previous monitoring. Erosion was minimal and recent trails and temporary roads where stabilized. On all sites reviewed, there are moderate to high levels of existing downed, course woody debris across the proposed harvest areas, similar to historic conditions established by Graham et al. (1994). The tree mortality from insects has resulted in many trees shedding their needles, which helps return nutrients to the soil and maintains organic matter for nutrient and moisture retention.

Vegetation

Issue; There is a general concern about the health of these pine stands, given the current outbreak of mountain pine beetle.

Stands of timber in the project area are dominated by lodgepole pine. Large-scale stand-replacing fires and low intensity ground fires have historically played a major role in the ecology of Lodgepole Pine forests (Fischer and Bradley, 1987). When stands of lodgepole pine become older than 60-80 years, natural thinning processes such as low intensity ground fires, insects and disease, cause mortality and fuel buildup. Over time fuel loading becomes heavy enough that any fire ignition will lead to a stand replacement fire that may cover large expanses of land. Increment bore sampling and conversations with long-time local residents indicate that a large, stand replacement fire occurred in this drainage between 1920 and 1930. Mature lodgepole pine, which are present on site show signs of fire scaring from frequent low intensity ground fires. Most dominant trees have these scars on the up-hill side indicating that at some point they have been exposed to light ground fires. When these fires occurred the trees were large enough and fuels light enough to prevent the ground fire from killing them.

The project area is dominated by two distinctly different habitat types: Douglas Fir/Dwarf Huckleberry and Alpine Fire/Dwarf Huckleberry. Fisher and Bradley (1987) place both of these in fire group seven. This group includes those habitat types which are cool and usually dominated by lodgepole pine. In describing the role fire plays in this group they estimated that severe, stand replacing, fire occurs on a 100 to 500 year basis below 7500 ft. in elevation. Above

this elevation the time period between stand replacing fires is longer. Low intensity fires occur approximately every 50 years (Fischer and Bradley (1987).

Work on the Beaverhead Forest by USFS personnel Diane Hutton and Brian Quinn, indicates that on average, high elevation lodgepole pine timber types will receive 4-5 low intensity ground fires during their life if there is no fire suppression (Diane Hutton pers. comm.). Lack of fire in these stands, due to fire suppression, appears to be having significant effects on stocking levels, fuel buildup, plant succession, historic age class distribution and nutrient cycling. This is especially evident in Section 5 where a large portion of the section has a much higher downed woody component than the remainder of the stands within the State's ownership. Within this same stand an understory of subalpine fir has become well established indicating that climax tree species will soon be co-dominate. Present mature lodgepole pines are decadent and are dying rapidly. These stands have a buildup of downed woody material and a substantial amount of ladder fuels present, indicating that they are at risk for a stand replacement fire.

In Upper Willow Creek, forests appear to fall into two general types: Douglas fir generally grows in stands that produce multiple aged classes. Small patches of trees are killed by insects or diseases, which create openings and then, over time, regenerate creating a multistoried forest. Fire has historically played an important role in the development of the Douglas fir type in this area. Over a 150-300 year period, stands may end up consisting of 3 or 4 different age classes of trees.

Tree species such as lodgepole pine regenerate under conditions where there is abundant sunlight and bare mineral soil. Natural disturbances in lodgepole pine tend to follow patterns, which leave large areas of timber, roughly the same age that became established after a major fire. Between 30 and 100 years of age, trees will often be subjected to frequent, low intensity ground fires, which act as a thinning agent. As stands become older, forest pathogens play a more active role, killing larger portions of the forest and increasing fuel loading. Forest succession also progresses creating an understory of more shade tolerant trees such as subalpine fir or Douglas fir. Eventually a large stand replacement fire will occur and a new stand will again become established. Many stands in the project area have higher stocking rates and greater canopy closure than occurred historically. The following table provides a visualization of the impacts that 90 years of fire suppression have created. Information in the historic levels column was calculated by multiplying the historic age class percentage times the total number of Lodgepole pine acres within the project area.

Table 3-1
Historic and Current Age Class Distribution of LPP within Upper Willow Creek within the project area, expressed in acres

Age Class	Historical Levels Ac.	Existing Condition Ac.
Non-stocked	196.9	59.6
1-40	743.7	507.1
41-100	940.6	1434.4
101-Old Stand	218.7	81.01

Old Stand	87.5	105.3
TOTAL	2187.4	2187.4

CHAPTER 4 - ENVIRONMENTAL IMPACTS

This chapter describes environmental effects of each alternative on the resources described in Chapter 3 and contains the scientific and analytic basis for alternative comparison summarized in Chapter 2. It is organized in the same manner as Chapter 3, by general resource categories and their associated issues.

AFFECTED RESOURCES

Hydrology

Direct and Indirect Effects of the No- Action Alternative on Water Quality and Quantity

Under the no-action alternative, direct, indirect or cumulative effects to water quality or quantity would be similar to the Water Resource Existing Conditions section. Sedimentation on existing roads with inadequate surface drainage would continue to impact water quality unless mitigations or remedial actions are taken. A trend towards more extensive insect infestations and mortality, or possibly wildfire could considerably reduce tree canopy and may increase water yield in the future relative to increasing canopy loss. The effects of increased insect mortality, and or fire would be considered to be similar to historic conditions.

On all streams trees are currently falling onto the bed and banks and there are above average levels of large woody debris (refer to fisheries analysis). We expect a continued short term increase in large woody debris as dead and dying trees continue to fall and jackstraw across stream channels. Increased woody debris helps maintain channel stability, moderate potential increased flows and restrict cattle grazing near streams. Mixed conifer species of Douglas- fir, and spruce are expected to increase growth with less competition for light and moisture through the growing season. Grazing management would continue and should gradually improve over time as inspections and management modifications are made.

Direct and Indirect Effects of the Action Alternative on Water Quality and Quantity

The primary risks to water quality associated with the proposed timber management activities is sediment delivery from roads. The potential direct and indirect effects of the Action Alternative on water quality and quantity will consider the miles of new road construction and road improvements, potential for sediment delivery to streams and potential for water yield increase impacts to stream channel stability.

Under the action alternative, up to 3.7 miles of new road construction is planned on DNRC Sections 5, 8 and 17, T8 N, R15W. Within the 6th code Upper Willow Creek HUC, the proposed new road construction would result in a road density of only 1.5 miles of road/sq. mile compared to the no-action alternative with 1.38 miles of road/sq. mile of the drainage. The new road construction results in a very minor increase in roads on the watershed scale and a low sediment risk due to design, location and planned stabilization. The area has restricted access to avoid

damage to roads and there would be no increase in open road density.

DNRC's sale design focused on avoiding new stream crossings and limiting the extent of new roads to locations away from streams. No new stream crossings on Beaver, Bear, Huepeck Creeks or Arbuckle Gulch are proposed. One temporary crossing of Beaver ditch is proposed. New roads would be located away from streams to avoid sedimentation and mainly temporary design with minimal excavation to limit the area and degree of disturbance. Temporary roads could result in some rutting and compaction but impacts would be largely restored by ripping the soils surface and installing adequate drainage. Temporary roads with minor excavation were previously used in the sale area and are stable and revegetated, with no BMP departures. To limit the area of potential cumulative effects, reclaimed roads may be reused and again reclaimed after use.

All existing roads and stream crossings would be maintained and drainage features improved to meet BMPs. Gravel surfacing would be used on segments of system roads that are subject to rutting and near crossing sites to reduce sediment potential. All roads would be stabilized and grass seeded with site adapted grass to control erosion and prevent sedimentation.

The proposed harvest is to salvage lodgepole pine which has been infested by mountain pine beetles and to remove those trees which are at high risk of mortality. Incidental trees of other species, predominately Douglas fir, may be removed to facilitate harvesting of pine but are not the targeted species. There are portions of 4 DNRC sections and land parcels totaling 1640 acres and harvest would occur on approximately 1,050 acres of forest land. In addition up to 30 acres of post and rail thinning are also proposed. All harvest operations and mitigations are designed to minimize surface disturbance and potential for erosion and sediment delivery.

Selective SMZ salvage harvest would occur within 25 feet of streams on approximately 6,800 feet of Class 1 SMZ flanking portions of Beaver and Bear Creeks. Consistent with SMZ and Forest Management Rules (36.11.425), on slopes less than 35%, ground based equipment may operate up to the SMZ boundary of 50 feet and use hydraulic arms or winch line skidding to reach in to the SMZ and selectively remove trees up to about 25 feet from streams. On slopes over 35%, ground based equipment may operate up to the SMZ boundary of 100 feet and use hydraulic arms or winch line skidding to reach in to the SMZ and selectively remove trees up to about 75 feet from streams. Ground disturbance is unlikely in the SMZ's if ground based boundaries are adhered too and dead and dying trees are lifted out of the SMZ. Skid trail planning will be used adjacent to SMZ's to minimize disturbance of surface vegetation and avoid concentrating flow near the boundaries.

Avoiding disturbance in the SMZ has proved to provide adequate vegetative buffer for erosion and sediment control based on BMP audits of forest practices and soil monitoring. In addition, the recent tree mortality is returning fine litter and tree needles to the forest floor that helps slow surface runoff and traps sediments in combination with the thick surface vegetation in the riparian areas. Sub-merchantable trees and mixed species other than lodgepole pine would be retained in the SMZ. On all harvest sites ground based operations would be limited to slopes less than 45% to minimize disturbance and potential erosion. Bear and Beaver Creeks are fish bearing

streams and to provide for additional protection, Riparian Management Zones (RMZ's) would be located at 80 foot based on stand potential tree height, and ground based skidding operations in the RMZ would be limited to minimize ground disturbance to dry and frozen conditions.

Proposed SMZ harvest adjacent to Class 3 steams would occur along Huepeck Creek, Arbuckle Creek and minor unnamed tributary streams previously listed that includes up to 6850 feet of intermittent and discontinuous drainage. All Class 3 segments would be protected by equipment restriction zones, BMP's, site specific mitigations and require skid trail planning and avoiding excessive disturbance through on-going administration.

Beaver Creek and Beaver Creek Ditch

Sediment delivery from roads: The proposed project would construct up to 2 miles of road in the Beaver Creek analysis area that would be minor excavation and located away from streams with very low potential for sediment delivery to streams. The combined existing road and new road construction would result in a low relative road density of about 1.5 mi./sq. mi. in the Beaver creek drainage compared to no action conditions of 1 mi./ sq. mi. of existing roads. One temporary ditch crossing would be constructed on the Beaver Creek ditch at a stable location and removed after use. There is a moderate risk of low sediment delivery potential to the ditch during construction and removal of the crossing, but any sediment would be likely trapped in the rock armored section of the stabilized gully that is downstream of the proposed crossing and any effects would be low and short term. A temporary crossing was previously used on the ditch and removed, followed by mulching the road surface with slash, and no sediment delivery was noted and we would expect similar results with the proposed action. The existing steel bridge across Beaver Creek and roads would be maintained as needed to meet BMP's for adequate road surface drainage and presents low risk of sediment delivery to surface waters.

Sediment delivery from harvest operations: Timber harvest would occur on up to 35% of the upland sites in this analysis area. There is low potential for sediment delivery from the moderate sloping foothills sites based on mitigations, soil monitoring and field review of previous harvest. In the project area, Beaver Creek flows through moderate sloping alluvial deposits where minimum 50 foot Streamside Management Zones are required. The proposed harvest within the SMZ of Beaver Creek would remove dead, dying and high risk trees in the 25 to 50 foot zone on both flanks of the Beaver Creek SMZ for approximately 1200 feet and on one side of the creek for up to 2200 feet. Ground based equipment would not enter the SMZ and trees would be harvested by clipping and lifting the trees out of the SMZ to avoid ground disturbance and maintain vegetative cover to provide a sediment buffer. Skid trail planning would locate trails to avoid concentrating surface runoff and reduce the risk of sediment delivery from skid trails.

Bear Creek

Sediment delivery from roads: The proposed project would construct up to 1.5 miles of road in the Beaver Creek analysis area that would be minor excavation and located away from streams with low potential for sediment delivery to streams. The combined existing road and new road construction would result in a low relative road density of about 1.8 mi./sq. mi. in the Beaver creek drainage compared to no action conditions of 1.1 mi./ sq. mi. of existing roads. No new stream or ditch crossings would be constructed. Near the existing Bear Creek bridge crossing, the

one road drainage feature with potential for delivery would be improved, gravel surfaced and sediment control installed. The existing steel bridge across Bear Creek and roads would be maintained as needed to meet BMP's for adequate road surface drainage. The combination of road improvements and new road construction located well away from surface waters presents a low risk of low sediment delivery potential.

Sediment delivery from harvest operations: Approximately 16% of this area would be harvested. There is low potential for sediment delivery from the moderate sloping upland sites based on soil monitoring and field review of previous harvest. In the project area, Bear Creek flows through moderate sloping alluvial deposits where minimum 50 foot Streamside Management Zones are required. The proposed harvest within the SMZ of Beaver Creek would remove dead, dying and high risk trees in the 25 to 50 foot zone from up to 3100 feet of adjacent to Beaver Creek. Ground based equipment would not enter the SMZ and trees would be harvested by clipping and lifting the trees out of the SMZ to avoid ground disturbance and maintain vegetative cover to provide a sediment buffer. Skid trail planning would locate trails to avoid concentrating surface runoff and reduce the risk of sediment delivery form skid trails.

In summary, A short- and long-term, low risk of low impacts to sedimentation from one road-ditch crossing site on Beaver ditch that would be used for hauling. There is low potential for sediment delivery on upland sites and a moderate risk of low sediment delivery from SMZ harvest based on; 1) SMZ harvest sites are on gentle to moderate slopes, 2) no equipment operations in the SMZ, 3) minimizing disturbance by harvest during relatively dry or frozen ground conditions, and lifting trees from the outside perimeter of the SMZ and 4) maintaining an undisturbed vegetative buffer in the SMZ, and 5) above average levels of dead needles and woody debris on the forest floor that helps trap sediment and slow surface and 6) on-going administrative inspections of harvest and road use to maintain BMP's and mitigations concurrent with operations. No harvest or road activities are planned along Upper Willow Creek or within its streamside management zone or floodplain, and there would be no direct and low risk of in-direct impacts to Upper Willow Creek.

Water Yield and Stream Channel Stability

Timber harvest, fire or vegetation removal reduces net evapotranspiration and can result in increased stream flow depending largely on precipitation. Research on a snowmelt dominated watershed of higher precipitation than this project site, in Wyoming found that suspended sediment transport was similar from paired watersheds with a control drainage and a drainage where 23.7% of the drainage was harvested. Increased duration of higher flows may lead to bank scour and changes in channel form when mean daily flows are in excess of bankful depending on channel conditions.

Most stream channels on the forested DNRC project sections are in good to excellent condition based on channel evaluations. There are the exceptions of limited segments with grazing impacts on meadows in the lower reaches that have shown some improvements as noted in the water quality section. It is possible that increases in stream flow in Beaver and Bear Creeks could be observed through the implementation of the Action Alternative B. Potential change in channel stability due to harvest effects are unlikely given the good to excellent channel stabilities in and

directly below the DNRC project sites. Stream channel stability and form will likely remain relatively stable which is in part due to the resilient "B" channel streams and rocky nature of the stream headwaters below Sandstone Ridge to the west.

The additive effect of the proposed tree harvest of dead, dying and high risk trees has low potential for measurable or detectable change in effects on stream flow regime, especially considering the amounts of lodgepole forest cover in the analysis area that is expected to perish as a result of insect and disease infestations. The duration of near bankfull conditions may lead to changes in channel form, but would likely occur regardless of project implementation. An increase in large woody debris in streams and riparian areas from dead trees will help maintain channel stability and should limit grazing traffic. Grazing effects would be similar to existing conditions, but should trend lower over time as inspections and management modifications are made and hydrologic recovery occurs.

Effects are expected to be similar to no- action with a moderate risk of low impact to stream channel stability associated with potential water yield increases for the proposed project based on 1) the proposed harvest is targeted at removal of dead, dying or high risk lodgepole pine trees and retention of other conifers, 2) precipitation is low near the open forest sagebrush valley floor to moderate at upper edge of harvest with a range of 18 to 24 inches average/year harvest 3) harvest are located in the lower foothills slopes of the drainage,4) relatively low total road densities of less than 1.8 mi/sq. mi would not measurably contribute to water yield increases or route sediment that could influence channel stability, 5) recent irrigation diversion improvements on Beaver Creek have redistributed flows to lower Beaver Creek and reduced the above natural levels of water that were previously diverted to Bear Creek, 6) Huepeck and the small unnamed class 3 tributary drainages have intermittent flow and are unlikely to have noticeable increase in water yield or surface runoff that would affect channel stability.

In summary, there is a moderate risk of low level and short term adverse impacts to water quality and quantity that would not substantially increase sediment or impact channel form and function compared to existing conditions due to the following reasons; 1) the proposed SMZ salvage harvest is proposed on gentle to moderate slopes and SMZ's would be designated at 50 ft for slopes less than 35% and 100 feet for slopes over 35%, 2) no ground based equipment would operate in the SMZ in order to protect surface vegetation and soils and maintain an effective sediment buffer to streams, 3) no ground based equipment harvest would occur on slopes over 35% in the RMZ's adjacent to Bear or Beaver Creeks, 4) selective harvest would occur in the SMZ as far as the mechanical harvest arm could safely reach into the SMZ (up to 25 feet), 5) to avoid disturbance and sediment impacts to streams, road systems are planned with no new roads proposed next to streams and only one temporary water crossing of a ditch is proposed that has low potential for impacts to water quality, 6) use of existing roads has low risk of off-site erosion, 7) all roads will have adequate drainage installed and seeded to stabilize soils from erosion.

Cumulative Watershed Effects of No-Action Alternative:
Under the no-action alternative, cumulative effects would remain the same as described in existing conditions including existing roads, agricultural and grazing effects. The effects would

be most likely to decline over time as hydrologic recovery occurs and TMDL measures are implemented.

Cumulative Watershed Effects of the Action Alternative:
Past, current, and future planned activities within each analysis area have been taken into account for the cumulative effects analysis. There is at most a moderate risk of low cumulative watershed impacts to water yield or beneficial uses occurring from this harvest proposal due to the following reasons. 1) The low to moderate precipitation zone (18-24”/yr) provides low runoff and soil infiltration exceeds runoff on upland sites, 2) The timber harvest is well distributed across DNRC land parcels and separate drainages and represents less than 3% in the Upper Willow Creek watershed. 3) harvest is mainly on gentle to moderate slopes, 4) Beaver and Bear Creeks are the sites of highest concern and both streams have good to excellent stream channel stability on the forested sites (with the exception of segments with grazing impacts on meadows). 5) SMZ harvest would not allow equipment operation in the SMZ and resource protection will be implemented by the combination of site specific mitigation measures, and on-going sale administration. 6) Removal of dead and dying trees is unlikely to measurably affect water yield compared to the no-action of leaving dead and suppressed trees with lost canopy interception and evapotranspiration. 7) An increase in large woody debris in streams and riparian areas from dead trees will help maintain channel stability and reduce traffic by grazing animals.8) To avoid stream crossings and potential sediment impacts, only one temporary crossing of a ditch is proposed. 9) Most road construction is minor excavation and disturbance that is located well away from streams and adequate drainage will be installed to control erosion.

Studies on similar watersheds when the total annual precipitation is less than 18-20 inches and less than 20% of the drainage is harvested or dead, have found no increase in stream flow (MacDonald & Stednick. 2003, Romme et.al.2006). Tree mortality from base level fire and insect damage have increased the potential for water yield, yet the additive effect of harvest is unlikely to be measurable compared to no action.

Wildlife

Issue: There is concern that the proposed action may negatively affect grizzly bear habitat beyond what is expected to result from the mountain pine beetle infestation.

No Action Alternative

Direct and Indirect Effects
The 2009 aerial detection survey indicated that approximately 181 acres of the project area showed signs (e.g., red needles) of having been affected by mountain pine beetles. A review of the stand level inventory database for the project area indicates that there are approximately 938 acres susceptible to infestation due to the presence of mature lodgepole. Lodgepole pine snags are likely to fall within 10 years of dying, but would continue to provide some screening cover until the snags fall. Additionally, while the approximately 938 acres are susceptible to insect infestation, subalpine fir, Douglas-fir, and Engelmann spruce are generally < 40% of the standing volume in these stands. As a result, while there would be a loss of cover in these stands,

subalpine fir, Douglas-fir, and Engelmann spruce would continue to provide some screening cover. Habitat loss would likely be temporary (15 to 25 years), until the forest has regenerated and replaced screening cover that would otherwise be provided by lodgepole pine poles and sawlogs. Under this alternative, security cover would not change, but there would likely be temporary reductions in hiding cover due to affected lodgepole pine. Additionally, there would not be increases in open or total road densities. However, seasonal habitats for grizzly bears may temporarily be increased through resultant open forests which would likely provide food sources in autumn (McLellan and Hovey 2001). As a result, there would likely be low to moderate risk of direct and indirect effects to grizzly bear habitat within the project area from the no action alternative.

Cumulative Effects

Approximately 20.6% of the analysis area has been affected by the mountain pine beetle since 2005. Examination of the aerial detection surveys indicates that the infestation has been working its way west over the past several years. The heaviest infestation levels occur between the towns of Maxville and Quigley, and immediately surrounding Upper Willow Creek. Between 2008 and 2009 an additional 31,154 acres became affected by mountain pine beetles, largely in the area of Sandstone Ridge, Ranch Creek, and Butte Cabin Creek to the west of the project area, and Black Pine Ridge just east of the project area. As the infestation grows, it would likely occupy a larger portion of the analysis area, and would likely temporarily reduce hiding cover while increasing seasonal foods for grizzly bears. With the exception of reductions in visual screening cover surrounding riparian areas and wetlands within the analysis area, these seasonal habitats would likely experience little impact from the no action alternative. However, due to the level of infestation, and the likelihood that the infestation would continue to increase, with likely subsequent temporary reductions in hiding cover when the affected lodgepole pine fall to the ground, there would likely be low to moderate risk of cumulative effects to grizzly bear habitat under the no action alternative.

Action Alternative

Direct and Indirect Effects

The proposed action would harvest approximately 1,050 acres of lodgepole pine, construct approximately 3.68 miles of road, and conduct an approximately 40 acre post and pole harvest of lodgepole pine. Harvest on the approximately 1,050 acres would be species-designated for lodgepole pine and remove only sawlogs (i.e., $\geq$ 7 inch dbh); sub-merchantable trees (i.e., <5 inches dbh) and non-lodgepole pine species would be retained, and broadcast burning on grounds with perched water tables would also be conducted for site preparation following harvest. Open road density would not increase as a result of the proposed action. Similar to the no action activity, there would be a temporary loss of vegetative screening cover until the forest has regenerated. However, associated with the proposed harvest, timber-felling machinery would provide soil scarification, and broadcast burning would be conducted in areas with perched water tables for site preparation, thereby establishing good growing sites for future trees. As such, forest regeneration may be established sooner than under the no action alternative. During this time, the insect infestation is likely to continue to run its course. The proposed action would not stop mountain pine beetle activity.

Under this alternative, the following measures would be implemented for grizzly bear mitigations:
1. Visual screening cover adjacent to open roads would be retained to the extent practicable;
2. If the contractor chooses to camp on the sale area, they would be required to keep a clean camp. Food should be stored by hanging, or placement in bear resistant containers. Cleaning of the campsite and landings should be done every day.
3. If the Purchaser/ contractor does not choose to camp onsite, lunches and other food would be stored within vehicle or equipment cabs.
4. Contractors and purchasers conducting contract operations would be prohibited from carrying firearms while operating (ARM 36.11.433 (1)(d)) and bear spray would be recommended for protection of personnel.

Given that approximately 181 acres showed signs (e.g., red needles) that they were affected by mountain pine beetles within the project area, and approximately 938 acres are susceptible to infestation due to the presence of mature lodgepole pine, the proposed action's planned removal of lodgepole pine would likely not be additive to baseline conditions. Implementation of the proposed grizzly bear mitigations would promote quicker recovery of visual screening cover, reduce the potential for human-bear conflicts during the proposed operation, and ensure no net increase in open road densities. Thus, there would likely be low risk of the proposed action increasing the direct and indirect effects above baseline conditions.

Cumulative Effects

Given the increasing level of mountain pine beetle infestation in the analysis area (an increase of 31,154 acres exhibiting red needles in lodgepole pine from 2008 to 2009), and the expected subsequent increase in the infestation, a level of hiding cover loss due to affected lodgepole pine falling to the ground within 15 years of death, would be expected for grizzly bear habitat within the analysis area under baseline conditions. The proposed action would harvest affected lodgepole pine and prepare the site for natural regeneration on approximately 1,050 acres within the project area, and construct approximately 3.68 miles of new road, while not increasing open road density. As such, the proposed action would likely reduce the time visual screening cover is reduced. However, past and proposed actions (including the currently proposed action) on school trust and BLM lands would treat approximately 3,365 acres within the analysis area (Table 1), and fires in 2007 burned approximately 50,174 acres. As a result, approximately 19% of the analysis area would have experienced reductions in visual screening cover within a five year time frame. Because the proposed action would likely reduce the time required for reforestation and restoration of visual screening cover, there would be a low likelihood the proposed action would increase the cumulative effects to grizzly bear habitat beyond baseline conditions.

Table 4-1.
Recent and proposed harvests within the grizzly bear cumulative effects analysis area.

	Project			
	Phoenix	BLM Rock Creek RMP	Upper Willow Salvage	Proposed Action
Harvest Acres	314	925	216	1,050
Thinning Acres	432	350	0	40
Total Treated (Ac.)	**746**	**1,275**	**216**	**1,090**

Issue: There is concern that the proposed action may negatively affect Canada lynx habitat beyond what is expected to result from the mountain pine beetle infestation.

No Action Alternative

Direct and Indirect Effects

Under this alternative, no new road would be constructed or timber harvested by the DNRC on School Trust land. The mountain pine beetle infestation would likely continue to grow, infest, and likely, eventually kill additional lodgepole pine stands. Where advanced regeneration is present, current mature foraging habitat would likely be converted to young foraging habitat due to mountain pine beetle-induced tree deaths, and "other" lynx habitat would likely be converted to temporary non-foraging habitat due to lodgepole pine comprising >70% of the mature timber. As a result, there would likely be a conversion of approximately all 59 acres of mature foraging habitat to young foraging habitat within the project area, and the 976 acres of "other" lynx habitat would likely become temporary non-lynx habitat until the time that the forest has regenerated sufficiently to provide either young foraging habitat or returned to "other" status. Thus, there would likely be direct and indirect reductions in the quantity of suitable Canada lynx habitat within the project area under the no action alternative.

Cumulative Effects

Through 2008, approximately 10,679 acres in the analysis area had been affected by mountain pine beetles. In 2009, an additional 31,466 acres were affected by the mountain pine beetle in areas west and north of previous infestations centered near the town of Maxville. The larger of the new infestations in 2009 occur along Sandstone Ridge, Black Pine Ridge, and the North Fork Willow Creek areas.

Within the analysis area, lynx habitat is largely intact, but has been compromised along the east facing slopes of Upper Willow Creek due to past harvests on federal and school trust lands, and more recently by the mountain pine beetle infestation. Lodgepole pine comprises a significant proportion of the tree species within the analysis area. As such, the mountain pine beetle infestation has spread throughout much of the analysis area. However, under current conditions, lynx habitat is largely intact. Thus, there would likely be low to moderate risk of cumulative effects to Canada lynx habitat in the analysis area with the no action alternative, providing the mountain pine beetle infestation remains stable. Should the infestation continue to grow, there could be moderate risk of cumulative effects to lynx habitat under the no action alternative, particularly if advanced regeneration is lacking to provide for young foraging habitat post-infestation.

Action Alternative

Direct and Indirect Effects

The proposed action would directly affect approximately 784 acres of currently suitable lynx habitat (733 acres of "other", and 51 acres of mature foraging habitat). Of the affected lynx habitat, the proposed treatment would likely accelerate natural forest regeneration due to ground scarification and increased sunlight, which would promote lodgepole pine regeneration. The site preparation associated with this treatment would likely shorten the time affected habitat would be unsuitable for lynx, in comparison to the no action alternative. Within the affected mature foraging habitat, damage to existing advanced regeneration could be reduced through skid trail planning. As a result, young foraging habitat characteristics could be retained within these patches. Thus, through likely accelerated forest regeneration from site preparation, and conversion of affected mature foraging habitat to young foraging habitat, the proposed action would likely produce shorter duration direct and indirect loss of Canada lynx habitat than the no action alternative. Therefore, there would likely be minimal to low risk of increasing the direct and indirect effects to lynx habitat beyond baseline conditions.

Cumulative Effects

Within the analysis area, lynx habitat is largely intact, but has been compromised along the east facing slopes of Upper Willow Creek due to past harvests on federal and school trust lands (Table 1). Lodgepole pine comprises a significant proportion of the tree species within the analysis area, and approximately 42,145 acres have been affected by mountain pine beetle from 2005 through 2009. As such, the mountain pine beetle infestation may spread throughout the analysis area. However, under current conditions, lynx habitat is largely intact. With the potential for an increasing level of lynx habitat that could be affected by mountain pine beetles, there could be conversion of currently suitable habitat, which does not contain advanced regeneration, to unsuitable habitat. Where advanced regeneration is present in spruce/subalpine fir habitat types, there would likely be conversion from mature foraging to young foraging habitat, with potential den sites once lodgepole pine fall, and the creation of temporarily unsuitable habitat where advanced regeneration is currently absent. The proposed action would likely accelerate forest regeneration from site preparation and convert the affected 733 acres of "other" habitat to temporary non habitat. Thus, the proposed action would not likely reduce suitable Canada lynx habitat within the analysis area beyond what is expected under the no action alternative.

Issue: There is concern that the proposed action may negatively affect gray wolves beyond what is expected to result from the mountain pine beetle infestation.

No Action Alternative

Direct and Indirect Effects

Douglas-fir is generally < 30% of the standing volume in the stands affected by the mountain pine beetle infestation. As a result, while there would be a loss of cover in these stands, Douglas-fir would continue to provide some screening cover. Habitat loss would likely be temporary (15 to 25 years), until the forest has regenerated and replaced screening cover that would otherwise be provided by lodgepole pine poles and sawlogs. Additionally, there would not be increases in open road densities. As a result, there would likely be low risk of direct and indirect effects to wolf habitat within the project area from the no action alternative.

Cumulative Effects

Examination of the aerial detection surveys indicates that the infestation has been working its way west over the past several years. The level of infestation is currently approximately 20.6% of the analysis area, with the heaviest concentration occurring between the towns of Maxville and Quigley, and immediately surrounding Upper Willow Creek. Between 2008 and 2009 an additional 31,154 acres became affected by mountain pine beetles, largely in the area of Sandstone Ridge, Ranch Creek, and Butte Cabin Creek to the west of the project area, and Black Pine Ridge just east of the project area. As the infestation grows, it would likely occupy a larger portion of the analysis area, and would likely temporarily reduce screening cover for wolves. However, due to the level of infestation, and the likelihood that the infestation would continue to increase, with likely subsequent temporary reductions in visual screening when the affected lodgepole pine fall to the ground, there would likely be low to moderate risk of cumulative effects to wolf habitat under the no action alternative.

Action Alternative

Direct and Indirect Effects

The proposed action would harvest lodgepole pine on approximately 1,050 acres within the project area, while continuing to maintain cover within 50 feet of class 2 streams, 100 feet of class 1 streams, as per the SMZ law, and retaining cover surrounding ponds in sections 5 and 8. Similar to the no action activity, there would be a temporary loss of vegetative screening cover until the forest has regenerated. However, associated with the proposed harvest, timber-felling machinery would provide soil scarification, thus establishing good growing sites for future trees, and broadcast burning would be implemented in areas with perched water tables. As such, forest regeneration may be established sooner than under the no action alternative. The proposed action would not stop mountain pine beetle activity.

Under this alternative, visual screening cover adjacent to open roads would be retained to the extent practicable, as a partial mitigation for wolves. Given that approximately 181 acres of the project area showed signs of having been affected by mountain pine beetles between 2005 and 2009, and approximately 938 acres are susceptible to infestation due to the presence of mature lodgepole pine, the proposed action's planned removal of lodgepole pine would likely not be additive to baseline conditions. Implementation of the proposed wolf mitigation would promote quicker recovery of visual screening cover and ensure no net increase in open road densities. Thus, there would likely be low risk of the proposed action increasing the direct and indirect effects above baseline conditions.

Cumulative Effects

Given the increasing level of mountain pine beetle infestation in the analysis area (an increase of 31,154 acres exhibiting red needles in lodgepole pine from 2008 to 2009), and an expected increase in the infestation, a level of visual screening cover loss due to affected lodgepole pine falling to the ground within 15 years of death, would be expected for gray wolf habitat within the analysis area under baseline conditions. The proposed action would harvest affected lodgepole pine and prepare the site for natural regeneration on approximately 1,050 acres within the project area, and construct approximately 3.68 miles of new road, while not increasing open road

density. As such, the proposed action would likely reduce the time visual screening cover is reduced. However, past and proposed actions (including the currently proposed action) on school trust and BLM lands would treat approximately 3,365 acres within the analysis area (Table 1), and fires in 2007 burned approximately 50,174 acres. As a result, approximately 19% of the analysis area would have experienced reductions in visual screening cover within a five year time frame. Because the proposed action would likely reduce the time required for reforestation and restoration of visual screening cover, there would be a low likelihood the proposed action would increase the cumulative effects to gray wolves beyond baseline conditions.

Issue: There is concern that the proposed action may negatively affect pileated woodpecker habitat beyond what is expected to result from the mountain pine beetle infestation.

No Action Alternative

Direct and Indirect Effects

As previously discussed, the affected parcels are being impacted by a mountain pine beetle infestation that has been killing, mature lodgepole pine on the project area and the surrounding area. As of the 2009 Aerial Detection Survey, the infestation had impacted approximately 22 of the approximately 64 acres of pileated woodpecker habitat in the project area. However, given that approximately 172 acres of the project area had shown evidence of infestation by mountain pine beetles in only 2009, and approximately 938 acres are susceptible to infestation due to the presence of mature lodgepole or ponderosa pine within the project area, increased infestation would be highly likely. Due to the prevalence of lodgepole pine in the potential pileated woodpecker habitat, virtually all of it would be susceptible to infestation by mountain pine beetles. As a result, canopy closure < 40% would be expected, which would reduce the suitability of the stands for nesting by pileated woodpeckers. However, there would be a large pulse of lodgepole pine snags, and eventually coarse woody debris, which could be used for foraging sites. The resulting stands may be of reduced value to pileated woodpeckers and increase their vulnerability to predation by avian predators. Thus, this alternative would likely have low to moderate risk of direct and indirect effects to pileated woodpeckers.

Cumulative Effects

Approximately 39% (4,702 acres) of the analysis area is grassland or has been impacted by past timber harvest, or fire, and approximately 19% has been affected by the current mountain pine beetle infestation from 2005 through 2009. With the mountain pine beetle infestation, there has been a reduction in canopy closure due to infestations in mature lodgepole pine within the analysis area, and possibly mortality in a portion of these stands. Under this alternative, within potential pileated woodpecker habitat there would likely be a mosaic of new snags, and possibly entire stands that have succumbed to the infestation. As such, the effects of the infestation would increase the habitat potential of some stands, while reducing the potential of others. Therefore, the no action alternative may have minimal to moderate risk of cumulative effects to pileated woodpecker habitat within the analysis area.

Action Alternative

Direct and Indirect Effects

The proposed action would harvest approximately 52 acres of the approximately 64 acres of pileated woodpecker habitat within the project area. As such, recruitment of snags and coarse woody debris that could be used for potential nest and foraging sites, would be greatly reduced compared to the no action alternative, as ARMs 36.11.411 and 414 would be implemented. Although the habitat suitability for the affected stands would be greatly reduced, due to reduced canopy closure, under the no action alternative, it would still retain valuable habitat features (i.e., more snags and downed wood) that could eventually be used by this species. However, reduction in snag and downed wood retention under the proposed action may reduce pileated woodpecker vulnerability to avian predators because this species may not utilize the post-harvest stands. As a result, the proposed action may have low to moderate risk of direct and indirect effects to pileated woodpeckers.

Cumulative Effects
Given the effects of the mountain pine beetle infestation, and past timber harvest within the rest of the analysis area (see No Action Alternative Cumulative Effects discussion), and that the proposed action would treat approximately 81% of the remaining pileated woodpecker habitat within the project area, the commensurate reduction in potential pileated woodpecker habitat, due to the proposed treatment, would likely result in moderate risk of cumulative effects to pileated woodpecker habitat within the analysis area.

Issue: There is concern that the proposed action may negatively affect flammulated owl habitat beyond what is expected to result from the mountain pine beetle infestation.
No Action Alternative
Direct, Indirect, and Cumulative Effects
The mountain pine beetle infestation would reduce canopy closure, create legacy snags, and likely spur forest regeneration through the openings in the overstory that they create. Depending on the extent of the overstory mortality, the effects for flammulated owls could be variable under this alternative. In stands with limited to moderate overstory mortality, flammulated owl habitat could be improved within 15 to 20 years, provided forest regeneration occurs in the new openings. Stands that might experience more extensive mortality would likely suffer reductions in habitat suitability for this species, or may serve more as foraging areas. Thus, there may be minimal to low risk of direct, indirect, or cumulative effects for flammulated owls as a result of this alternative.

Action Alternative
Direct, Indirect, and Cumulative Effects
The proposed action would harvest lodgepole pine on approximately 123 acres of approximately 190 acres of flammulated owl preferred habitat types within the project area, while post-and-pole harvesting on approximately 40 acres that are also flammulated owl preferred habitat types. As such, recruitment of snags that could be used for potential nest sites would be greatly reduced compared to the no action alternative, as ARM 36.11.411 would be implemented. Post-harvest, most treatment areas would resemble clearcuts with reserves, while still others may resemble seed tree harvests with reserves. The resulting stands would likely have limited value for flammulated owls for 40 to 60 years post-harvest. As a result, there would likely be low to moderate risk of direct, indirect, or cumulative effects for flammulated owls as a result of the

proposed action.

Issue: There is concern that the proposed road building and timber harvesting may negatively affect elk security cover beyond what is expected to result from the mountain pine beetle infestation.

No Action Alternative

Direct and Indirect Effects

Between 2005 and 2008, the project area experienced small pockets of infestation by mountain pine beetles. However, in 2009 >150 acres of the project area began to show that they had been affected by the mountain pine beetle. This species has heavily impacted much of the area surrounding Butte, Anaconda, and the Garnet Mtn. range by killing mature lodgepole pine. The results of these infestations have been the death of trees that contribute to hiding cover. A review of the stand level inventory database for the project area indicates that there are approximately 938 acres susceptible to infestation due to the presence of mature lodgepole pine. Lodgepole pine snags are likely to fall within 10 years of dying, but would continue to provide some screening cover until the snags fall. Additionally, while the approximately 938 acres are susceptible to insect infestation, subalpine fir, Douglas-fir, and Engelmann spruce are generally < 40% of the standing volume in these stands. As a result, while there would be a loss of cover in these stands, subalpine fir, Douglas-fir, and Engelmann spruce would continue to provide some screening cover. As a result, reductions, or changes, in hiding cover would likely result under this alternative given the progression of mountain pine beetles in recent years. Thus, this alternative would likely result in moderate direct and indirect effects to elk security cover until the forest would regenerate.

Cumulative Effects

During the period of 2005-2008, 887 acres (2.4%) of the 37,475 acre analysis area had been affected by mountain pine beetle, which has affected lodgepole pine in the area. In 2009, 9,645 acres (25.7% of the analysis area) showed signs that they had been affected by mountain pine beetle. Unfortunately, these signs (e.g., red needles) only manifest the year after the trees have been infested by mountain pine beetles. As such, additional acres within the analysis area were likely affected by mountain pine beetles in 2009 than were aerially detected. Under this alternative, in the short term (0 – 10 years), the mortality caused by the mountain pine beetle infestation would result in reductions in elk security cover because lodgepole pine snags in the overstory would fall to the ground and reduce hiding cover. Over a longer period (10 – 40 years), the forest would regenerate, with seedlings and saplings providing hiding cover through increased leaf area and more dense timber stands. Thus, there would likely be moderate risk of cumulative effects to elk security cover in the short term under the no action alternative.

Action Alternative

Direct and Indirect Effects

The proposed action would harvest approximately 1,050 acres of lodgepole pine, construct approximately 3.68 miles of road, and conduct an approximately 40 acre post and pole harvest of lodgepole pine. Harvest on the approximately 1,050 acres would be species-designated for lodgepole pine and remove only sawlogs (i.e., $\geq$ 8 inch dbh); sub-merchantable trees (i.e., <5 inches dbh) and non-lodgepole pine species would be retained, and broadcast burning on grounds

with perched water tables would also be conducted for site preparation following harvest. Open roads would not increase as a result of the proposed action. Similar to the no action activity, there would be a temporary loss of hiding cover until the forest has regenerated. However, associated with the proposed harvest, timber-felling machinery would provide soil scarification, and broadcast burning would be conducted in areas with perched water tables for site preparation, thereby establishing good growing sites for future trees. As such, forest regeneration may be established sooner than under the no action alternative. During this time, the insect infestation is likely to continue to run its course. The proposed action would not stop mountain pine beetle activity.

Given that approximately 181 acres showed signs (e.g., red needles) that they were affected by mountain pine beetles within the project area, and approximately 938 acres are susceptible to infestation due to the presence of mature lodgepole pine, the proposed action's planned removal of lodgepole pine would likely not be additive to baseline conditions. Thus, there would likely be low risk of the proposed action increasing the direct and indirect effects above baseline conditions.

Cumulative Effects

In addition to the insect infestation discussed in the No Action Alternative's Cumulative Effects section, the current proposed treatment of harvesting approximately 1,050 acres of lodgepole pine, approximately 40 acres of post and pole thinning, construction of approximately 3.68 miles of new closed road, and potentially broadcast burning on lands with perched water tables, would be in addition to the following past and current actions within the analysis area:

1. Approximately 784 acres treated within the proposed project area during the DNRC Phoenix Timber Sale;
2. Approximately 216 acres treated in section 16, T 8 N R 15 W, during the DNRC Upper Willow Salvage timber sale; and
3. Approximately 625 acres to be treated within the analysis area during the BLM's Rock Creek RMP.

Additionally, approximately 4,852 acres of the analysis area burned in 2007 during the Sawmill Complex fires. Combined, the proposed action and the BLM's Rock Creek RMP would likely drop elk security cover within the analysis area below 30%. However, given the progression and recent rapid infestation of mountain pine beetles within the analysis area, the proposed action would likely not negatively affect elk security cover beyond what is expected to result from the mountain pine beetle infestation.

Issue: Habitat that is important to moose may be degraded by the proposed action beyond what is expected to result from the mountain pine beetle infestation.

No Action Alternative

Direct, Indirect, and Cumulative Effects

Under this alternative, both the project and analysis areas may experience change due to mountain pine beetle-induced mortality in mature lodgepole pine. Given the rapid increase in acres affected by mountain pine beetles in the project and analysis areas, as described in the No Action Alternative for Elk Security, the insect infestation would likely increase, barring mitigating circumstances (e.g., prolonged climatic conditions that would negatively impact

mountain pine beetle populations). Thus, depending on scale, insect-induced tree mortality could have positive or negative effects on moose habitat. Insect-killed areas <300 acres in size would serve to create short-term (<20 years) foraging habitat for moose through overstory removal that would stimulate shrub growth due to increased sunlight. Such conditions could produce positive effects for moose. However, insect-killed areas >300 acres or which would remove overstory cover within winter range habitats could remove large amounts of canopy cover that moose require for winter shelter or summer thermal protection ((Thompson and Stewart 1998)). This would be a negative effect for moose habitat.

Action Alternative
Direct, Indirect, and Cumulative Effects
The proposed action, in conjunction with other actions (described in the Action Alternative for Elk Security, cumulative effects), past fire, and likely mountain pine beetle-induced mortality, would likely affect >40% of the existing moose winter range within the analysis area and affect areas >300 acres in size, which could negatively affect habitat needed for winter shelter of summer thermal protection. However, given the rapid increase in acres affected by mountain pine beetles in the project and analysis areas, the insect infestation would likely increase, barring mitigating circumstances. The proposed action would likely: 1). remove the overstory earlier than mountain pine beetle-induced mortality; 2). reduce the likelihood of jackstrawed timber that would likely occur under the No Action alternative, thereby improving moose mobility; and 3). prepare the affected acres earlier for reforestation than would normally occur under the No Action alternative, thereby reducing the time period moose winter range and summer thermal cover would be affected. Additionally, important moose habitat around several vernal ponds located in sections 5 and 8 would remain untreated. As a result, the proposed action would likely not degrade important moose habitat beyond what is expected to result from the mountain pine beetle infestation.

Fisheries
NO-ACTION ALTERNATIVE

BEAVER CREEK, BEAVER CREEK DITCH AND LAKES, AND BEAR CREEK ANALYSIS AREAS

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

Future related actions considered part of cumulative impacts include continued, various, widespread grazing impacts, flow diversions, and displacement of native fisheries by nonnative fisheries. Short- and long-term impacts from insect and disease impacts to RMZ vegetation, and consequently stream shading and LWD, are expected to be notable in all three analysis areas; related minor impacts to flow regime are not expected to be measureable or detectable (see Soils and Hydrology Analysis). Although impacts from anticipated insect and disease outbreaks in the analysis areas are expected to occur, these naturally occurring impact events are not considered adverse.

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

ACTION ALTERNATIVE

BEAVER CREEK ANALYSIS AREA

Effects to channel forms in the analysis area will be addressed by evaluating the collective potential impacts to sediment, flow regime, and woody debris. An increase in the proportion of fine substrates is an impact that would be expected to adversely affect channel forms. Approximately 0.4 miles of new road would be built in upland zones of the analysis area, and approximately 10% of the acreage in the analysis area would be harvested. A short- and long-term, low risk of low impacts to sedimentation from one road-stream crossing site used for hauling would occur (see Soils and Hydrology Analysis.) Short-term and long-term impacts to substrates comprising stream channel forms are not expected to occur as a result of adjacent upland harvest or road construction activities (see Soils and Hydrology analysis.) Minor changes in flow regime associated with canopy removal are not expected to be measureable or detectable, especially considering notable amounts of functional forest vegetation in the analysis area are expected to perish as a result of insect and disease infestations (see Soils and Hydrology analysis). SMZ harvest would occur along one bank of Beaver Creek for approximately 2,200' and along both banks of the creek for approximately 1,200', which includes approximately 16% of all fish-bearing stream length in the analysis area. Although a portion of recruitable LWD would be removed from the RMZ, short-term increases in LWD are also expected to occur due to increased blowdown in this zone. Considering potential effects of these variables, a moderate risk of low direct and indirect impacts to channel forms is expected beyond those described in the Existing Conditions.

Due to the expected levels of canopy closure retention from implementing the SMZ Law and Rules, the RMZ harvest is not expected to have more than a moderate risk of low impacts to stream temperatures.

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

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

BEAVER CREEK DITCH AND LAKES ANALYSIS AREA

Effects to channel forms in the analysis area will be addressed by evaluating the collective

potential impacts to sediment, flow regime, and woody debris. An increase in the proportion of fine substrates is an impact that would be expected to adversely affect channel forms. Approximately 2.0 miles of new road would be built in upland zones of the analysis area, and approximately 35% of the acreage in the analysis area would be harvested. One temporary road-stream crossing would be built across the ditch. A short-term, moderate risk of low impacts to sedimentation from the temporary crossing used for hauling would occur; however, no long-term risks to sedimentation would be expected to occur (see Soils and Hydrology Analysis.) Short-term and long-term impacts to substrates comprising stream channel forms are not expected to occur as a result of adjacent upland harvest or road construction activities (see Soils and Hydrology analysis.) Minor changes in flow regime associated with canopy removal may be measureable or detectable; however this departure would likely occur regardless of project implementation, considering the notable amounts of functional forest vegetation in the analysis area expected to perish as a result of insect and disease infestations (see Soils and Hydrology analysis). SMZ harvest would occur along one of the lakes for approximately 300', along one bank of the ditch for approximately 4,600' and along both banks of the ditch for approximately 1,000'. Although a portion of recruitable LWD would be removed from the RMZ of the affected lake, short-term increases in LWD are also expected to occur due to increased blowdown in this zone. Impacts to LWD recruitment in the irrigation ditch are negligible since the water right holder normally clears LWD from the ditch to prevent flow blockages. Considering potential effects of these variables, a low risk of low direct and indirect impacts to channel forms is expected beyond those described in the Existing Conditions.

Due to the expected levels of canopy closure retention from implementing the SMZ Law and Rules and the very limited extent of the proposed RMZ harvest, the RMZ harvest is not expected to have more than a low risk of low impacts to stream temperatures.

Including the installation of one temporary road-stream crossing site, no changes to fisheries connectivity would occur in this analysis area from the Action Alternative.

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

BEAR CREEK ANALYSIS AREA

Effects to channel forms in the analysis area will be addressed by evaluating the collective potential impacts to sediment, flow regime, and woody debris. An increase in the proportion of fine substrates is an impact that would be expected to adversely affect channel forms. Approximately 0.6 miles of new road would be built in upland zones of the analysis area, and approximately 16% of the acreage in the analysis area would be harvested. A short- and long-term, low risk of low impacts to sedimentation from one road-stream crossing site used for

hauling would occur (see Soils and Hydrology Analysis.) Short-term and long-term impacts to substrates comprising stream channel forms are not expected to occur as a result of adjacent upland harvest or road construction activities (see Soils and Hydrology analysis.) Minor changes in flow regime associated with canopy removal are not expected to be measureable or detectable, especially considering notable amounts of functional forest vegetation in the analysis area is expected to perish as a result of insect and disease infestations (see Soils and Hydrology analysis). SMZ harvest would occur along one bank of Bear Creek for approximately 3,100', which includes approximately 18% of all fish-bearing stream length in the analysis area. Although a portion of recruitable LWD would be removed from the RMZ, short-term increases in LWD are also expected to occur due to increased blowdown in this zone. Considering potential effects of these variables, a low risk of low direct and indirect impacts to channel forms is expected beyond those described in the Existing Conditions.

Due to the expected levels of canopy closure retention from implementing the SMZ Law and Rules and the location of the proposed RMZ harvest being entirely on the north side of the stream, the RMZ harvest is not expected to have more than a low risk of low impacts to stream temperatures.

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

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

SUMMARY

Three analysis areas are considered in the fisheries assessment for the Willows End Timber Sale: Beaver Creek, Beaver Creek Ditch and Lakes, and Bear Creek. Existing cumulative impacts to fisheries resources range from positive in the Beaver Creek and Beaver Creek Ditch and Lakes analysis areas to moderately adverse in the Bear Creek analysis area. The primary mechanisms for the existing positive impacts include the restoration of historic stream flows, expansions of native fisheries habitats, and sedimentation mitigations, while existing adverse impacts are primarily a result of grazing-related effects and displacement of native fisheries. The proposed actions include SMZ harvest along a portion of fish-bearing streams or lakes in all three analysis areas. Proposed harvest areas range from 10% to 35% of the total analysis area acreages; however many of the areas are expected to contribute to canopy reductions in the future due to insect and disease infestations, regardless of project implementation. As a result of implementing the proposed actions a risk of low direct and indirect impacts would occur to fisheries resources in all of the analysis areas, and these risk assessments contribute to a low risk

of additional low cumulative effects to fisheries resources [compared to the existing conditions] in all of the analysis areas.

Soils

Direct, Indirect, and Cumulative Effects of the No- Action Alternative on Soils
The No-action alternative would have little effect on soil resources. Existing roads completed with the Phoenix Timber sale had drainage features installed to control erosion and there are only a few locations that require maintenance repairs. Effects are consistent with the description of existing conditions.

Direct, and Indirect, Effects of the Action Alternative on Soils
The primary risks to long term soil productivity and hydrologic function are excessive impacts to soil properties caused by rutting, compaction and displacement of surface soils by equipment operation and road construction. Potential effects are a reduction in long-term soil productivity, and regeneration potential as well as impacts to course woody debris distribution and nutrient cycling. Most sensitive soils to operation effects are small areas of steep slopes, erosive soils and wet sites which will be avoided or protected with mitigation measures.

For the proposed harvest, BMP's and mitigations would be implemented to minimize the area and degree of detrimental soil impacts (displacement, erosion, and compaction). Mitigations include general skid trail planning, limit tractors to moderate slopes, avoiding wetlands and controlling soil disturbance to meet silvicultural goals to promote conifer regeneration. Ground based harvest operations would be limited to slopes less than 45%. Steeper slopes would be harvested by cable/line skidding where needed. The proposed harvest areas do include some somewhat poorly drained sites and will be designated as Equipment Restriction Zones (ERZ's) or Wetland Management Zones (WMZ's) and include mitigation measures for skid trail planning and limiting operations to relatively dry or frozen conditions when excessive displace can be minimized. Scarification of 20-35% of the regeneration harvest is desirable to promote prompt regeneration considering the extensive grass in the area that can be competitive with tree seedlings. A portion of old and new course woody debris (>3" dia.) at ~10-15 tons/acre and fine litter would be retained or return skidded on harvest units for conservation of soil nutrients.

Based on DNRC soil monitoring on comparable sites (DNRC 2004), implementation of BMP's and the recommended mitigation measures, harvest operations present low risk of detrimental impacts to soils if impacts are restricted to ~15% of the proposed harvest areas. We expect that by protecting ~85% of a harvest area in non-detrimental soil impacts, soil properties important to soil productivity will be maintained.

Sale administrators will monitor on-going harvest and road construction activities to meet contract requirements, BMP'S for soil and water protection and silvicultural objectives. For all of these reasons the proposed harvest operations and mitigation measures are expected to maintain soil properties important to plant growth and hydrologic function and present low risk of direct and indirect impacts to soils.

Cumulative effects to soils
Cumulative effects to soils can occur from repeated ground skidding entries into the harvest area and additional road construction, depending on area and degree of detrimental impacts. There is a mixture of regeneration harvests and post and rail thinnings that were completed in the project area with the DNRC Phoenix timber sale. Most proposed harvest areas have not been previous entered and present low risk of cumulative effects to soils. Portions of recently thinned harvest units that will be reentered to remove dead, dying and high risk trees and use previous skid trails and landing sites to reduce the area impacted. The use of previous main skid trails, and skid trail planning represents a low risk of cumulative effects to soils with the planned harvest activities, based on implementation of BMP's, and skidding and slash disposal mitigation measures to limit the area of detrimental soil impacts to less than 15% of harvest units.. This level of effects is consistent with DNRC soil monitoring (DNRC 2004).

Considering nutrient cycling, the high level of tree mortality has already caused many needles and fine litter to fall to the forest floor. Most needles and fine foliage that have not already fallen would be expected to break off during logging operations. Coarse woody debris would be maintained on the site with a goal of 5-15 tons/acre (Graham 1994). Coarse wood and litter will be distributed throughout the units and trampled to help promote decay processes, maintain organic matter for nutrient and moisture retention important for long term soil productivity and to encourage micro growing sites for reforestation.

Vegetation

Effects of Alternatives
No Action - The mountain pine beetle infestation would be expected to run its natural progression including rapid population expansion which would lead to a high mortality rate. The infestation would continue to expand at a rapid rate, killing the majority of pine trees greater than 7 inches in diameter at breast height. The dead trees would remain standing for several years until a combination of wind, wet soils and snow load caused a majority to fall. As the downed material accumulate, potential for stand replacing fires to occur would also escalate. Following a stand replacement fire, LPP would be expected to again dominate the regeneration. This is the normal progression of mountain pine beetle infestations. They are generally either stopped by a loss of viable food or a significant change in weather. Generally the MPB are most susceptible to weather by late spring or early fall severe cold periods. Prolonged severe cold periods during the winter can also impact the overwintering populations.

Age class distribution would also change as the infestation progressed. It is reasonable to assume that without an environmental change the current infestation would kill the vast majority of LPP greater then 6 inches DBH. This is unlikely to change the dominate species in these stands but would eventually move the majority of this timber into the non-stocked and 1-40 age class group.
Action - The action alternative would salvage a majority of the sawlog (7" DBH and larger) lodgepole pine on Trust Land in the Upper Willow Cr. Drainage. This would result in a mottled residual stand composed of varying sizes of sub-merchantable lodgepole on predominately North and East facing slopes. The higher energy slopes located in sections 5, 8, 17, 21 and 28 would be dominated by larger, older Douglas fir and ponderosa pine with smaller patches of lodgepole

pine. Riparian area's would have more of the larger diameter lodgepole pine retained in order to protect the water quality. Mechanical operations would be allowed to park their equipment outside the SMZ and reach in, to harvest merchantable timber while keeping equipment out of the management zone. The resulting stands would be far less susceptible to insect damage, but would be composed of small patches of sub-merchantable pine with interspersed Douglas fir, alpine fir, Engelmann spruce and ponderosa pine. With the disturbance caused by mechanical harvesting along with prescribed burning in areas with high soil moisture content, it is expected that the site would be successfully regenerated. This would virtually eliminate the potential for further mountain pine beetle infestation in the lodgepole pine for 30-40 years.

The age class distribution would be very similar to that described in the no action alternative. Non-stocked and 1-40 year old trees would dominate within the first 5 years after harvest. This is not the same age class distribution identified for these timber stands by Losensky's research. Table 4-2 provides information on what historic levels are believed to have been, what existing conditions are and what the expected future condition would be under the two alternatives being evaluated.

Table 4-2
Historic and current Age Class Distribution of LPP in Upper Willow Creek and within the project area

Age Class	**Historical Levels Ac. (Losensky 1977)**	**Current Distribution Trust Land ac.**	**Current Distribution %**	**Anticipated Distribution Under Both Proposed Alternatives**	**Anticipated Distribution Under either alternative %**
Non-stocked	9%	59.57	2.7 %	1395.86	63.8 %
1-40	34%	507.14	23.2 %	507.14	23.2 %
41-100	43%	1434.42	65.6 %	246.26	11.3 %
101-Old Stand	10%	81.01	3.7 %	5.8	.2 %
Old Stand	4%	105.32	4.8 %	32.4	1.5 %
Total	100.00%	2187.46	100.00%	2187.46	100.00%

APPENDIX A-List of persons and organizations contacted

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STATEMENT OF FINDING

Willow's End Salvage Analysis
October 6, 2010

An interdisciplinary team (ID team) has completed the Environmental Analysis (EA) for the proposed Department of Natural Resource and Conservation (DNRC) Willow's End Timber Sale. Two alternatives have been analyzed for:

No Action Alternative

Alternative A defers treatment in all sections within the project area, at the present time. No additional revenue, over what is currently being collected would be generated for the Common School Trust Account. No new roads would be built and no road improvements would be completed. Current management activities such as fire suppression and grazing would continue. Recreational uses such as hiking, and hunting would also continue. Natural events, including plant succession, tree blow down, insect and disease outbreaks, and wildfires would continue to occur. The current beetle infestation would be expected to continue until fires, weather or other natural events stop the infestations progress. Following the appropriate level of MEPA review, timber harvesting or road building could be proposed and undertaken in the future. This no-action alternative will be used as a baseline for comparing environmental consequences of the action alternatives.

Action Alternative

The proposed action alternative would be to salvage harvest approximately 3-5 MMBF of Mountain Pine Beetle killed timber, and trees with high risk of infection, from 969 acres of State owned School Trust Lands in parts of 4 sections, northwest of Philipsburg, Montana. The proposed project area encompasses 1,786 acres of State School Trust Lands within T8N, R15W, Sections 5,8,17 and 21. To remove the timber approximately 4.6 miles of new and temporary road would be constructed. All Douglas-fir, Ponderosa pine, Engleman Spruce, and Subalpine fir would be retained. Some SMZ harvest would be done in accordance with all applicable rules and laws.

Objectives:

The Department has developed the following specific project objectives:

1. Produce the largest measure of reasonable and legitimate return to the trust accounts.
2. Provide 3.0 – 5.0 MMBF of the Southwestern Land Office's volume contribution to the annual timber harvest on State trust lands which is required by State law (77-5-221 through 223, MCA).
3. Manage for conditions characterized by the proportion and distribution of forest types and structures historically present on the landscape.
4. Harvest dead and dying timber, consistent with MCA 77-5-207 before there is substantial wood decay and value loss.

Decisions to be made:

The following decisions are to be made as a result of this Environmental Assessment:

1. Do the analyzed alternatives meet the stated project objectives?

2. Which alternative should be selected?
3. Does the selected alternative have significant impacts on the environment?
4. Is there need for further analysis (preparation of an EIS)?

For the following reasons, I have selected the Action Alternative as presented:

1. The Action Alternative meets the project objectives.
2. The analysis of identified issues did not reveal information compelling the DNRC not to implement the sale.
3. The Action Alternative identifies mitigation measures to address issues raised by the public, which include effects on vegetation, soil productivity, air and water quality and wildlife habitat.

<u>Issues raised and Significance of Impacts</u>

Water Quality – There is a concern that the proposed forest management activities may cause impacts to water quality as a result of increased erosion and sediment delivery to streams. There is a concern that extensive harvest and high road densities would negatively impact flow and sediment yield.

In summary, there is a moderate risk of low level and short term adverse impacts to water quality and quantity that would not substantially increase sediment or impact channel form and function compared to existing conditions due to the following reasons; 1) the proposed SMZ salvage harvest is proposed on gentle to moderate slopes and SMZ's would be designated at 50 ft for slopes less than 35% and 100 feet for slopes over 35%, 2) no ground based equipment would operate in the SMZ in order to protect surface vegetation and soils and maintain an effective sediment buffer to streams, 3) no ground based equipment harvest would occur on slopes over 35% in the RMZ's adjacent to Bear or Beaver Creeks, 4) selective harvest would occur in the SMZ as far as the mechanical harvest arm could safely reach into the SMZ (up to 25 feet), 5) to avoid disturbance and sediment impacts to streams, road systems are planned with no new roads proposed next to streams and only one temporary water crossing of a ditch is proposed that has low potential for impacts to water quality, 6) use of existing roads has low risk of off-site erosion, 7) new roads would be located away from streams, mainly temporary and minimal excavation, and 8) all roads will have adequate drainage installed and seeded to stabilize soils from erosion.

This level of harvest and potential change in water yield would not likely be measurable compared to the no-action alternative and ranges associated with natural disturbances of insect mortality and fire (MacDonald & Stednick. 2003, Romme et.al.2006). With minimal if any increases in water yield or in-stream sediments, and channel form and function would be similar to no-action.

Wildlife – There is a concern that the proposed harvest would negatively impact threatened, endangered and sensitive species such as: Grizzly bears, Canada Lynx, Gray Wolves, Pileated woodpeckers and Flammulated Owls. There is concern the proposed action would also negatively affect elk security and moose populations.

Grizzly Bear

Implementation of the proposed grizzly bear mitigations would promote quicker recovery of visual screening cover, reduce the potential for human-bear conflicts during the proposed operation, and ensure no net increase in open road densities. Thus, there would likely be low risk of the proposed action increasing the direct and indirect effects above baseline conditions.

Canada Lynx

The proposed action would directly affect approximately 784 acres of currently suitable lynx habitat (733 acres of "other", and 51 acres of mature foraging habitat). Of the affected lynx habitat, the proposed treatment would likely accelerate natural forest regeneration due to ground scarification and increased sunlight, which would promote lodgepole pine regeneration. The site preparation associated with this treatment would likely shorten the time affected habitat would be unsuitable for lynx, in comparison to the no action alternative. Within the affected mature foraging habitat, damage to existing advanced regeneration could be reduced through skid trail planning. As a result, young foraging habitat characteristics could be retained within these patches. Thus, through likely accelerated forest regeneration from site preparation, and conversion of affected mature foraging habitat to young foraging habitat, the proposed action would likely produce shorter duration direct and indirect loss of Canada lynx habitat than the no action alternative. Therefore, there would likely be minimal to low risk of increasing the direct and indirect effects to lynx habitat beyond baseline conditions.

Gray Wolf

Under the action alternative, visual screening cover adjacent to open roads would be retained to the extent practicable, as a partial mitigation for wolves. Given that approximately 181 acres of the project area showed signs of having been affected by mountain pine beetles between 2005 and 2009, and approximately 938 acres are susceptible to infestation due to the presence of mature lodgepole pine, the proposed action's planned removal of lodgepole pine would likely not be additive to baseline conditions. Implementation of the proposed wolf mitigation would promote quicker recovery of visual screening cover and ensure no net increase in open road densities. Thus, there would likely be low risk of the proposed action increasing the direct and indirect effects above baseline conditions.

Pileated Woodpecker

The proposed action would harvest approximately 52 acres of the approximately 64 acres of pileated woodpecker habitat within the project area. As such, recruitment of snags and coarse woody debris that could be used for potential nest and foraging sites, would be greatly reduced compared to the no action alternative, as ARMs 36.11.411 and 414 would be implemented. Although the habitat suitability for the affected stands would be greatly reduced, due to reduced canopy closure, under the no action alternative, it would still retain valuable habitat features (i.e., more snags and downed wood) that could eventually be used by this species. However, reduction in snag and downed wood retention under the proposed action may reduce pileated woodpecker vulnerability to avian predators because this species may not utilize the post-harvest stands. As a result, the proposed action may have low to moderate risk of direct and indirect effects to pileated woodpeckers.

Flammulated Owl

The proposed action would harvest lodgepole pine on approximately 123 acres of approximately 190 acres of flammulated owl preferred habitat types within the project area, while post-and-pole harvesting on approximately 40 acres that are also flammulated owl preferred habitat types. As such, recruitment of snags that could be used for potential nest sites would be greatly reduced compared to the no action alternative, as ARM 36.11.411 would be implemented. Post-harvest, most treatment areas would resemble clearcuts with reserves, while still others may resemble seed tree harvests with reserves. The resulting stands would likely have limited value for flammulated owls for 40 to 60 years post-harvest. As a result, there would likely be low to moderate risk of direct, indirect, or cumulative effects for flammulated owls as a result of the proposed action.

Elk Security

Given that approximately 181 acres showed signs (e.g., red needles) that they were affected by mountain pine beetles within the project area, and approximately 938 acres are susceptible to infestation due to the

presence of mature lodgepole pine, the proposed action's planned removal of lodgepole pine would likely not be additive to baseline conditions. Thus, there would likely be low risk of the proposed action increasing the direct and indirect effects above baseline conditions. Additionally, mechanical harvesting would likely provide scarification and lead to faster regeneration above what would be expected under the no action alternative.

Moose

The proposed action, in conjunction with other actions (described in the Action Alternative for Elk Security, cumulative effects), past fire, and likely mountain pine beetle-induced mortality, would likely affect >40% of the existing moose winter range within the analysis area and affect areas >300 acres in size, which could negatively affect habitat needed for winter shelter of summer thermal protection. However, given the rapid increase in acres affected by mountain pine beetles in the project and analysis areas, the insect infestation would likely increase, barring mitigating circumstances. The proposed action would likely: 1). remove the overstory earlier than mountain pine beetle-induced mortality; 2). reduce the likelihood of jackstrawed timber that would likely occur under the No Action alternative, thereby improving moose mobility; and 3). prepare the affected acres earlier for reforestation than would normally occur under the No Action alternative, thereby reducing the time period moose winter range and summer thermal cover would be affected. Additionally, important moose habitat around several vernal ponds located in sections 5 and 8 would remain untreated. As a result, the proposed action would likely not degrade important moose habitat beyond what is expected to result from the mountain pine beetle infestation.

Fisheries – There is a concern that cumulative effects to fisheries may occur from the past, present and proposed harvesting and road building operations.

Three analysis areas are considered in the fisheries assessment for the Willows End Timber Sale: Beaver Creek, Beaver Creek Ditch and Lakes, and Bear Creek. Existing cumulative impacts to fisheries resources range from positive in the Beaver Creek and Beaver Creek Ditch and Lakes analysis areas to moderately adverse in the Bear Creek analysis area. The primary mechanisms for the existing positive impacts include the restoration of historic stream flows, expansions of native fisheries habitats, and sedimentation mitigations, while existing adverse impacts are primarily a result of grazing-related effects and displacement of native fisheries. The proposed actions include SMZ harvest along a portion of fish-bearing streams or lakes in all three analysis areas. Proposed harvest areas range from 10% to 35% of the total analysis area acreages; however many of the areas are expected to contribute to canopy reductions in the future due to insect and disease infestations, regardless of project implementation. As a result of implementing the proposed actions, a risk of low direct and indirect impacts would occur to fisheries resources in all of the analysis areas, and these risk assessments contribute to a low risk of additional low cumulative effects to fisheries resources [compared to the existing conditions] in all of the analysis areas.

Soils - The proposed forest management activities may adversely affect geologic or soil resources through excavation, displacement or compaction, depending on the area and degree of impacts, and may cause cumulative effects to soils.

Most sensitive soils to operation effects are small areas of steep slopes, erosive soils and wet sites which will be avoided or protected with mitigation measures. For the proposed harvest, BMP's and mitigations would be implemented to minimize the area and degree of detrimental soil impacts (displacement, erosion, and compaction). Mitigations include general skid trail planning, limit tractors to moderate slopes, avoiding wetlands and controlling soil disturbance to meet silvicultural goals to promote conifer regeneration. Ground based harvest operations would be limited to slopes less than 45%. Steeper slopes would be harvested by cable/line skidding where needed. The proposed harvest areas do include some somewhat poorly drained sites and will be designated as Equipment Restriction Zones (ERZ's) or Wetland Management Zones (WMZ's) and include mitigation measures for skid trail planning and

limiting operations to relatively dry or frozen conditions when excessive displace can be minimized. Scarification of 20-35% of the regeneration harvest is desirable to promote prompt regeneration considering the extensive grass in the area that can be competitive with tree seedlings. A portion of old and new course woody debris (>3" dia.) at ~10-15 tons/acre and fine litter would be retained or return skidded on harvest units for conservation of soil nutrients.
Sale administrators will monitor on-going harvest and road construction activities to meet contract requirements, BMP'S for soil and water protection and silvicultural objectives. For all of these reasons the proposed harvest operations and mitigation measures are expected to maintain soil properties important to plant growth and hydrologic function and present low risk of direct and indirect impacts to soils.

Summary

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 timber sale is similar to past projects that have occurred on State trust lands in the area. Since the EA does not identify future actions that are new or unusual, the proposed timber sale is not setting a precedence for a future action with significant impacts.

Taken individually and cumulatively, the identified impacts of the proposed timber sale are within threshold limits. Proposed timber sale activities are common practices and none of the project activities are being conducted on important fragile or unique sites. The proposed timber sale conforms with management philosophy adopted by the DNRC in the State Forest Land Management Plan and Administrative Rules of Montana and is in compliance with existing laws, policies, guidelines and standards applicable to this type of proposed action.

Upon review of the primary issues considered as part of this EA, I find that none of the project impacts are regarded as severe or enduring. Further, I find that the quantity and quality of various resources will not be adversely affected to a significant degree. I find no precedent for future actions that would cause significant impacts, nor do I find conflict with local, State, or Federal laws, requirements, or formal plans. In summary, I find that the identified adverse impacts will be avoided, controlled or mitigated by the design of the project to an extent that they are not significant.

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

1. The EA adequately addressed the issues identified during project development and displayed the information needed to make the decisions.
2. Evaluation of the potential impacts of the proposed timber sale indicates that no significant impacts would occur.
3. The ID Team provided sufficient opportunities for public review and comment during project development and analysis. Public concerns were incorporated into project design and analysis of impacts.

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