CHAPTER I. PURPOSE OF AND NEED FOR THE PROJECT

I. INTRODUCTION

This Revised Environmental Assessment (REA) expands the analysis that was completed for the ***Collins Creek Timber Sale and Road Decommissioning Projects Environmental Assessment (EA)*** and ***Decision Notice*** (signed June 8, 2000). The Collins Creek decision was appealed on July 31, 2000 and later remanded back to the Medicine Bow-Routt National Forests for additional analysis by the Rocky Mountain Regional Forester on September 25, 2000. Remand points included the need to: 1) Determine whether a Section 402 Storm Water permit was required for this project. The hydrology section contains information relating to the need for a Section 402 Storm Water permit (EA page 57); and 2) Provide a reliable, scientifically defensible assessment of habitat fragmentation on wildlife species. Specifically, the Forest Service was asked to determine why three Baker and Reed[1] studies are or are not pertinent to this analysis. The studies examined the effects of forest fragmentation and road density on wildlife species and their habitat. The Forest Service responded to this issue by developing a new alternative (Alternative 4) which reduces timber harvest to provide larger and more continuous blocks of habitat for specific wildlife species. The environmental effects of implementing Alternative 4 are described in Chapter III of this REA.

This REA is tiered to the Medicine Bow National Forest Land and Resource Management Plan (Forest Plan) and the Final Environmental Impact Statement (Forest Plan EIS) for the Forest Plan, which were approved in October 1985. Tiering means that Forest Plan and Forest Plan EIS information is incorporated by reference in this document rather than repeated. Tiering is used to reduce paper work, as stated in 40 CFR 1500.4 and 40 CFR 1502.20.

This REA describes the potential environmental effects of implementing the proposed Collins Creek Timber Sale and Road Decommissioning Projects. The REA also analyzes alternatives to a Proposed Action and the potential effects they could have on the environment. The alternatives were designed to address issues raised during the scoping process and to help achieve the goals and objectives of the Forest Plan. As part of each alternative, mitigation measures are prescribed to protect other resource uses and values, and monitoring requirements are prescribed to ensure that mitigation measures are successful. The Proposed Action and all of the alternatives are consistent with the overall management direction set forth in the Forest Plan. The Forest Plan is being implemented as required by the Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA, P.L. 93-378) and the National Forest Management Act of 1976 (NFMA, P.L. 94-588). The Forest Plan provides the direction for the actions proposed here, and is part of the process of implementing the Forest Plan.

A REA is not a decision document. It is a document disclosing the environmental consequences of implementing a Proposed Action and alternatives to that action. The REA will be available for a 30-day public review period. Following the review, a new decision will be documented in a Decision Notice signed by Laramie District Ranger, Clinton D. Kyhl.

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[1] The three studies are 1) Baker, W.L. 1994. Landscape structure measurements for watersheds in the Medicine Bow National Forest using GIS analysis; 2) Reed, R.A., J. Johnson-Barnard, and W>l. Baker. 1996 Fragmentation of a forested Rocky Mountain landscape; and 3) Reed, R.A., J. Johnson-Barnard, and W.L. Baker. 1996. Contributions of roads to forest fragmentation in the Rocky Mountains.

Other Federal, state, and local jurisdictions have assisted in the analysis and disclosure of these environmental consequences and in the development of alternatives to the Proposed Action. Environmental consequences on lands and activities administered by other agencies resulting from the Proposed Action are also disclosed in this REA. Subsequent decisions by other agencies that could relate to this proposal may be aided by the disclosure of effects in this document.

II. PURPOSE OF AND NEED FOR THE PROPOSAL

A. Collins Creek Analysis Area Description

The Collins Creek analysis area is located on the Laramie Ranger District of the Medicine Bow-Routt National Forest, northwest of Foxpark, Wyoming at the juncture of Townships 13 and 14 North, and Ranges 78 and 79 West (see Map 1-1). The area lies within the Medicine Bow Mountains, an extension of the Colorado Front Range of the Rocky Mountains. The analysis area includes a total of 11,585 acres. Of this, 11,449 acres are National Forest System (NFS) lands and 136 acres are privately owned. The NFS ownership includes 9,525 acres of forested and 1,924 acres of non-forested land. The forested land is mainly lodgepole pine and spruce-fir forest types. The area boundary coincides with the Lake Creek sixth-level watershed boundary. The highest point is near the northeast corner of the analysis area at the summit of Lake Mountain (9,753 feet). The lowest point is at the western corner where Lake Creek joins Douglas Creek (8,517 feet). Private land within the analysis area is identified and discussed in this document for information purposes only. The Forest Service has no jurisdiction over private lands and no management is proposed on these tracts.

The Collins Creek area has provided timber products for development and the local economy since the turn of the century. More recently, the area has provided sawlogs to local mills. There have been approximately 1,170 acres clearcut (10 percent of the area) and 2,000 acres (17 percent) partially harvested since 1960. This past timber harvest activity has created a mosaic of relatively small blocks with several age classes represented. Although there are some large clearcuts in the area, the average size of existing clearcuts is 22 acres, and the average partial harvest unit is 30 acres. Laramie District records identify portions of six timber sales that have treated stands within the Collins Creek watershed during the past 25 years. The records show that sites harvested more than five years ago are adequately restocked with seedlings and saplings. Many stands harvested more than 15 years ago have been pre-commercially thinned to recommended stocking levels or are currently scheduled for thinning. The arterial and collector road system is in place, as are most of the local roads needed for the proposed sale. There are no inventoried roadless areas or wilderness within or adjacent to the analysis area.

The Medicine Bow Five-Year Action Plan has listed the proposed Collins Creek timber sale for several years. It originally scheduled this project for advertisement and sale of an estimated 4.6 million board feet of sawtimber during 1999. Also included was a preliminary estimate of 1.5 miles of road reconstruction and 1.0 miles of new road construction. However, as a result of the information obtained during field surveys, reviews, and evaluation by the various resource specialists, the proposed treatments were adjusted in order to fully address project objectives and to mitigate some of the issues and concerns that were identified during the environmental analysis process for this project.

Map 1. Vicinity Map

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B. The Proposed Action

The Forest Service is proposing to harvest approximately 4.2 million board feet (MMBF) on about 485 acres in the Collins Creek watershed. Treated acres would include 267 acres of clearcutting, 66 acres of Overstory Removal, 40 acres of Shelterwood-prep., 94 acres of Group Selection, and 18 acres of Commercial Thinning.

Approximately 1.4 miles of road reconstruction, 0.7 miles of new specified road, and 3.5 miles of temporary road would be needed to implement this alternative. Concurrently, about 7.4 miles of existing road would be decommissioned, resulting in a net reduction in miles of open road at sale termination.

The proposal includes roadside clearing along 3.1 miles of National Forest System Road (NFSR) 509, where tree regeneration has been encroaching on the road right-of-way and impairing line-of-sight visibility for traffic on the road. Roadside clearing would involve removing trees within five feet of each road shoulder and ten feet on the inside of curves to restore a longer sight distance. The analysis also considered pre-commercial thinning on 537 acres of 15 to 30-year old regeneration over the next 5 years. Thinning removes a portion of the trees in overly dense stands to stimulate growth on the remaining trees. A decision for treating site-specific stands over the next five years would be analyzed and recorded in a future NEPA document after additional public involvement. If approved, this project would be implemented in 2004.

C. Management Area Direction

The management areas represented in the Collins Creek Analysis Area are identified in Table 1 below, and are described in Chapter III of the Forest Plan. Management requirements for individual Management Areas (MA) specify the constraints under which activities would be implemented to achieve Forest Plan goals and objectives.

As displayed in Table 1, the majority of acreage within the Collins Creek watershed is allocated to a 7E Management Prescription. The other MA with a significant percentage of land within the analysis area is 9A.

Table 1 - National Forest System Lands[1] by Management Area and Cover Type

Management Area	NFS Land within Analysis Area		Forested Lands (9,525 acres, 83 %)[2]					Nonforested Lands (1,924 acres, 17 %)	
			Lodgepole pine		Spruce and fir		Aspen[3]		
	Acres	%	Acres	%	Acres	%	Acres	Acres	%
7E - Wood-fiber Production	9,357	82	8,537	91	424	5	0	396	3
9A - Riparian Area Management	2,004	17	413	21	63	3	0	1,528	13
10C - Special Interest Areas (i.e., Dry Park)	53	<1	53	100	0	0	0	0	0
4B - Management Indicator Species Habitat	35	<1	35	100	0	0	0	0	0

1 Does not include 136 acres of private land within the analysis area.

2 Within the 9,525 acres of forested land, 7,842 acres are classified as suitable and 1,683 acres are classified as unsuitable for timber production.

3 Aspen is present as a minor component (individual trees) in stands dominated by other species.

D. Purpose of and Need for the Action

The Collins Creek Interdisciplinary Team analyzed existing conditions in the Collins Creek area and compared them to the desired future conditions described in the Forest Plan EIS (pages IV-14 to IV-18). The differences are discussed below. Conditions in the analysis area need to be consistent with those in the Forest Plan.

1) Increase vegetative diversity in Management Area 7E.

The Collins Creek watershed does not meet Forest Plan desired conditions for early and late structural stages in either the lodgepole pine or the spruce-fir timber types. There are too many acres in the mature and overmature successional stages and too few acres in grass/forb and sapling stages (see Table 3, EA page 21).

The current pattern of stands in the analysis area is the result of historic management practices which converted continuous, even-aged forests to a mosaic of smaller sizes of various ages. The goal was to maximize diversity by developing a large amount of "edge" forest. While these transition zones are optimal habitat for species that use both openings and forested lands, research indicates that this pattern of small, uniform patches does not provide optimal interior forest habitat for some species. Rather, a range of stand sizes is considered optimal. Current management direction requires a greater variety in patch size ranging from small to large to improve habitat for a greater number of species.

Applicable Forest Plan direction.

- Maintain structural diversity of vegetation (Forest Plan, general direction, page III-14).
- Manage fish and wildlife habitats, including plant diversity, to maintain viable populations (forest direction, goals, page III-4).
- Maintain stands in Management Area 7E in a variety of age classes and sizes [Forest Plan, MA 7E, page III-193 (2)].

2) Improve existing scenic integrity in areas where old strip cuts do not meet Forest Plan Visual Quality Objectives.

As a result of historic harvest activities (i.e., strip clearcuts created in the 1960ís), approximately 230 acres of the Collins Creek watershed do not meet Forest Plan Visual Quality Objectives (VQOs). The visual quality of these stands can be improved by removing some patches of trees and by feathering the edges of existing stands. Modifying the edges of the old strip clearcuts would provide a more pleasing visual transition between the strip cuts and the residual stands.

Applicable Forest Plan direction.

- Provide characteristic landscapes that satisfy the adopted Visual Quality Objectives (forest direction, goals, page III-3).
- In Management Area 7E, rehabilitate areas where Visual Quality Objectives are not being met [Forest Plan, MA 7E, page III-190 (1b)].

3) Reduce the incidence of dwarf mistletoe in the analysis area.

During the early 1980ís, the Laramie District avoided the use of the clearcutting to address the controversy surrounding the practice. At that time, the objective was to leave a "forested appearance" after the harvest. Research has demonstrated that thinning or partial-cutting in stands with dwarf mistletoe (*Arceuthobium americanum*) infection tends to intensify the infection (Hawksworth and Graham 1963; Hawksworth and Johnson 1989; Hawksworth, Johnson, and Geils 1987). Stands with dwarf mistletoe ratings of 3 or greater should not be thinned since the intensity of infection will likely affect growth and yield of the remaining stems (Hawksworth and Johnson, 1989). Several stands in the analysis area were partially harvested during the 1980ís. These stands are now heavily infected with dwarf mistletoe. Both the residual trees and the regeneration are infected to such a degree that options are severely limited (Johnson, 1997). Some existing stands could be harvested and regenerated, resulting in reduced disease levels. However, for several other stands in the area, there are no viable commercial options for reducing the level of dwarf mistletoe or commercially replacing the stand with new, disease-free regeneration. Sanitizing these stands would require substantial, direct capital investment of Federal funds.

Applicable Forest Plan direction.

- Monitor effects of insect and disease and treat vegetation to reduce the risk of epidemic outbreaks (Forest direction, goals, page III-5).
- Prevent or suppress epidemic insect and disease populations that threaten forest tree stands (Forest Plan, general direction, page III-84).

4) Reduce tree density in Management Area 7E to Forest Plan recommended levels.

Tree densities in younger, forested stands exceed Forest Plan recommended levels on about 537 acres of the Collins Creek watershed. Competition for nutrients and water is reducing tree growth and increasing stress in these stands. The health and vigor in these areas could be improved by thinning. Rapidly growing trees are more resistant to invasion by a variety of insect and disease species.

Applicable Forest Plan direction.

- Thin 20 to 30-year old stands in Management Area 7E (Forest Plan, p. III-193).

5) Address resource effects associated with poorly located roads.

The soil, water, and vegetation resources are being impacted by roads that do not meet current standards. There are also roads that provide duplicate access to some areas. The aggregate effects from the road system could be reduced by either closing or obliterating site-specific road sections.

Applicable Forest Plan direction.

- Improve or maintain water quality to meet or exceed State of Wyoming water quality standards (Forest Plan, goals, page III-4).
- Manage motorized travel to protect land and resource values (Forest Plan, goals, page III-5).

Differences between existing conditions in the analysis area and the Desired Future Conditions described in the Forest Plan were not the only reason for developing the Proposed Action. Multiple-use (timber harvest, wildlife, livestock grazing, wilderness, etc.) of National Forest system lands is mandated under the National Forest Management Act. The method in which these multiple-use objectives would be met helped to define the alternatives for the Collins Creek area. With most of the area (82 percent) in Management Area 7E - Wood Fiber Production, timber harvest is an important management consideration.

E. Scoping

Scoping is an important part of the environmental analysis process because it helps determine the environmental issues to be addressed in relation to a Proposed Action. On May 29, 1997, a scoping letter describing the analysis, analysis goals, and anticipated opportunities designed to improve watershed conditions was sent to 231 individuals, organizations, and agencies who expressed an interest in this type of project. The scoping letter requested that comments or concerns be submitted to the Laramie District office by July 7, 1997. The letter was accompanied by a news release, which was sent to newspapers, radio, and television stations.

From this scoping effort, 27 responses were received. An Interdisciplinary Team of Forest specialists reviewed the responses and identified issues relevant to the proposed project. These issues were combined with the management concerns (also identified by the Interdisciplinary Team) and presented to the Responsible Official for consideration. The Responsible Official provided a list of issues for the Interdisciplinary Team to consider in the analysis. The only issue significant enough to drive the development of an additional alternative was the use of clearcutting as a silvicultural technique.

Comments regarding the use of clearcutting were mixed. Some people commented that clearcutting could be used to improve biological diversity and to make old clearcuts more visually acceptable. Others commented that clearcutting should not be used as a management tool because it adversely affects scenery and wildlife species requiring mature tree habitats. The Lake Creek Cabin Owner's Association expressed concern that clearcutting would depreciate adjacent private property values. The clearcutting issue was analyzed using several indicators including the following:

- Attainment of the adopted visual quality objectives,
- The number of acres to be clearcut, and
- The effect of clearcutting on attainment of Forest Plan goals.

On April 29, 1999, the Forest Service released the Collins Creek Timber Sale and Road Decommissioning Projects EA for a 30-day public review period. After the comment period ended, 26 comments had been received. Public comments and Forest Service response to comments were included as Appendix E to the June 8, 2000 Collins Creek Timber Sale and Road Decommissioning Projects EA.

As previously mentioned, the Collins Creek Timber Sale and Road Decommissioning Projects Decision Notice was issued on June 8, 2000. The decision was appealed on July 31, 2000 and later remanded back to the Medicine Bow-Routt National Forests for additional analysis by the Rocky Mountain Regional Forester on September 25, 2000. Remand points included the need to: 1) Determine whether a Section 402 Storm Water permit was required for this project; and 2)

Provide a reliable, scientifically defensible assessment of habitat fragmentation on wildlife species. These remand points are addressed in this REA.

F. Decisions to Be Made

Laramie District Ranger, Clinton D. Kyhl will decide whether management action is appropriate at this time, in order to transition the Collins Creek analysis area towards the desired future conditions described in the Forest Plan. If he decides to implement a series of management activities, he will also approve the design of the activities and the mitigation and monitoring required to implement the projects.

- The specific decisions that the District Ranger must make are:
- Which alternative to select among the alternatives considered in detail.
- Which of the identified activities to implement.
- Which site-specific areas to treat.
- Which vegetative treatments to select.
- Which specific mitigation measures to select and implement.
- Which specific monitoring activities to select and implement.

These decisions will be made based on the site-specific environmental effects and analysis documented in this Environmental Assessment (EA).

CHAPTER II. ALTERNATIVES, INCLUDING THE PROPOSED ACTION

I. INTRODUCTION

This Chapter describes and compares the alternatives considered for the Collins Creek Timber Sale and Road Decommissioning Projects. It includes a description and map of each alternative considered. This section also presents the alternatives in comparative form, sharply defining the differences between each alternative and providing a clear basis for choice among options by the decision maker. Some of the information used to compare the alternatives is based upon the design of the alternative (i.e., location of timber harvest units) and some of the information is based upon the environmental, social, and economic effects of implementing each alternative (i.e., the amount of erosion caused by harvest activities).

II. ALTERNATIVES CONSIDERED IN DETAIL

The Forest Service developed four alternatives, including the No Action and Proposed Action alternatives, in response to issues raised by the public and the Rocky Mountain Regional Office.

Alternative 1 - No Action:

Under this alternative, the Forest Service would not schedule timber harvest and road decommissioning activities in the Collins Creek area. Forest vegetation would continue to change by natural succession. Individual tree mortality would increase as a result of dwarf mistletoe, Western gall rust, and comandra blister rust infections. Increased insect activity and susceptibility to pathogens would also occur in trees stressed by disease, drought, or other conditions. Individual tree growth would decline as dense pole stands become increasingly stagnated, with little change in tree diameter or height. Mature and overmature stands would increase in age, and stand health would continue to decline. Entire stands or portions of stands could be replaced over time by fires, disease, or insect activity. Taking No Action at this time would forego the opportunities to regenerate unhealthy stands; to thin stagnated stands; to release young, healthy stands; and to create greater age class and size diversity to improve the visual character of a portion of the analysis area. This alternative would not help to achieve the Desired Future conditions described in the Forest Plan.

Alternative 2 - Proposed Action:

Under the Proposed Action (Map 2-1) the Forest Service would harvest approximately 4.2 million board feet (net) on about 485 acres in the Collins Creek watershed. Approximately 267 acres would be clearcut, and 218 acres would receive partial-cut treatments. Partial-cut treatments would include 66 acres of Overstory Removal, 40 acres of Shelterwood Preparation, 94 acres of Group Selection, and 18 acres of Commercial Thinning.

Approximately 1.4 miles of road reconstruction, 0.7 miles of new specified road, and 3.5 miles of temporary road would be needed to implement this alternative. Concurrently, about 7.4 miles of existing road would be decommissioned, resulting in a net reduction in miles of open road at sale termination. The proposal includes roadside clearing along 3.1 miles of NFSR 509 where tree regeneration is encroaching on the road right-of-way and impairing the line-of-sight

visibility for traffic. Roadside clearing would remove trees within five feet of each road shoulder and ten feet on the inside of curves to restore a longer sight distance.

The analysis also considered pre-commercial thinning on 537 acres of 15 to 30-year old lodgepole pine regeneration during the next 5 years. Field data would be collected, and stands meeting tree density and age requirements for thinning would be scheduled for treated. Thinning is designed to remove individual trees in overly dense stands to stimulate growth on the remaining stems. Trees designated for removal are those that exhibit poor form and size characteristics. Thinning would be done pre-commercially, since the trees are not large enough to produce a commercial product. The decision for which site-specific stands will be treated will be analyzed and recorded in future NEPA documents following additional public involvement..

Apply the clearcut method to stands that have generally reached culmination of mean annual increment (CMAI). The clearcut prescription will also be applied to some stands that are heavily infected with dwarf mistletoe and are in decadent condition, but have not reached CMAI. Clearcutting these stands is the optimum harvest method to meet the objectives and requirements of the Forest Plan. The stands scheduled for clearcut treatment are mature and overmature lodgepole pine where on-the-ground reconnaissance has verified that the intensity of disease warrants stand regeneration. These stands are characterized by high levels of insects or disease, with numerous dead trees and trees with sparse, dying crowns.

Apply overstory removal to two-storied stands that have scattered large trees and a relatively disease-free understory. Remove the majority of the large diameter trees. Retain scattered spruce or fir trees for species diversity. Remove lodgepole pine infected with dwarf mistletoe. Several of the harvest units proposed for overstory removal in the two action alternatives are adjacent to regenerated clearcuts with trees of a similar age class. The removal of the overstory would result in a residual stand of approximately the same age as the existing, adjacent openings where the combined stand age would approximate 10 percent of the rotation age. This would allow the combined stands to be managed as a single unit as the stands mature, thus increasing the patch size and interior forest.

Use the group selection method (an uneven-aged regeneration method) to treat stands where merchantable trees are arranged in groups. These stands consist of a mosaic of trees in two structural conditions, including an overstory of scattered groups of lodgepole pine sawtimber and understory groups of advanced regeneration. In these stands, the mature and overmature sawtimber is heavily infected with dwarf mistletoe, while the regeneration is mostly free of mistletoe. The scattered groups of overstory range in size from one-half acre to two acres, and the groups of diseased mature and overmature trees will be harvested. This action will reduce the spread of dwarf mistletoe from the overstory to the understory and release the advanced regeneration from competition. Apply subsequent sanitation treatment(s) to remove regeneration infected with dwarf mistletoe. This treatment is not as effective in reducing the level of dwarf mistletoe in lodgepole pine stands as either the clearcutting or shelterwood method, but is selected when other objectives (i.e., visual quality) need to be met.

Map 2. Proposed Action

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Alternative 3 - Partial Cut Emphasis:

The Partial Cut Alternative (Map 2-2) would harvest approximately 3.4 million board feet (net), with an emphasis on harvest methods other than clearcutting. About 184 acres of sanitation/salvage, 81 acres of overstory removal, 154 acres of group selection, 90 acres of clearcut, and 73 acres of shelterwood preparation are included in this alternative. In addition, about 137 acres would be commercially thinned.

No new roads would be constructed, but approximately 1.6 miles of road reconstruction and 4.9 miles of temporary road would be needed to implement this alternative. However, about 7.4 miles of existing road would be decommissioned, resulting in a net reduction of open road at sale termination. The proposal includes roadside clearing along 3.1 miles of NFSR 509 where tree regeneration is encroaching on the road right-of-way and impairing line-of-sight visibility for traffic. Roadside clearing would involve removing trees within five feet of each road shoulder and ten feet on the inside of curves to improve sight distance.

The analysis also considered pre-commercial thinning on 537 acres of 15 to 30-year old lodgepole pine regeneration during the next 5 years. Field data would be collected, and stands meeting thinning requirements (tree density and age) would be treated. Thinning is designed to remove trees in overly dense stands to stimulate growth on the remaining stems. Trees designated for removal are those that exhibit poor form and size characteristics. Thinning would be done pre-commercially, since the stands are not yet large enough to produce a commercial product. The decision for which site-specific stands will be treated will be analyzed and recorded in future NEPA documents following additional public involvement.

The sanitation and salvage treatment would involve removing an average of 35 percent of the basal area in mature and overmature lodgepole pine stands. The stands selected for this treatment consist of large diameter trees with scattered pockets of lodgepole pine regeneration Dwarf mistletoe is prevalent in the overstory trees of these stands, but mostly absent in the young regeneration. Trees selected for removal would include those with dwarf mistletoe, sparse and fading crowns, comandra blister rust, Western gall rust, and those with poor form.

The shelterwood preparation harvest would be applied to single-story stands of large diameter lodgepole pine with little or no regeneration. This initial entry is a preparatory cut that will remove approximately 35 percent of the basal area. The trees to be removed will include stems from each crown class in the overstory so that the stand is not susceptible to windthrow. Trees selected for removal will include those with sparse and dying crowns, poor quality, and individuals affected by insects or disease. The second and third entries would occur 20 and 40 years after completion of this project.

Alternative 4 - Wildlife Mitigation:

Alternative 4 was developed to provide additional protection to wildlife species; pine marten and goshawk, in particular. Under Alternative 4, approximately 3.3 million board feet (net) of timber would be harvested on roughly 420 acres in the Collins Creek watershed. Approximately 222 acres would be clearcut; 66 acres would be harvested using an overstory removal prescription; 94 acres would be harvested using group selection; 18 acres would be commercially thinned; and 20 acres would be harvested using a shelterwood prescription (Map 2-3.).

Map 3. Alternative 3. Partial Cut Emphasis.

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Alternative 4 includes the following changes from the Proposed Action which were designed to benefit wildlife:

- The western half of ITM unit 1 was dropped to provide a 30-acre buffer around an existing and active goshawk nest (nest 1);
- Clearcut units 9 and 9a were dropped to provide for alternate nesting areas within nest 1 goshawk territory and to maintain one of the larger blocks of pine marten habitat in the analysis area; and
- The northern half of clearcut unit 24 was dropped to avoid a known goshawk nest (nest 2) and to provide a portion of the 30-acre buffer around the know nest site.

Mitigation measures designed to protect wildlife, in addition to those described for the other action alternatives, are as follows:

- Nest disturbing activities related to the project proposal would not occur between April 15 and August 15 within º mile of the active goshawk nest (nest 1). Seasonal restrictions would be implemented to limit harvest activity on ITM unit 1 and log haul on NFSR 527;
- Temporary road construction to access units 24 and 25 would be located at least 300 feet away from current nest site (nest 2); and
- Seasonal restrictions would be applied to harvest units 24 and 25 so activities would not occur between April 15 and August 15 within º mile of the active goshawk nest (nest 2). Nest disturbing activities which should be restricted include heavy maintenance on the abandoned road used to access units 24 and 25, construction of the temporary road used to access unit 24, and harvest on northern portions of units 24 and 25 where biologists have determined it is likely to disturb the active goshawk nest.

Similar to the Proposed Action, approximately 1.4 miles of road reconstruction, 0.7 miles of new specified road, and 3.5 miles of temporary road would be needed to implement this alternative. Concurrently, about 10.1 miles of existing road would be decommissioned, resulting in a net reduction in miles of open road at sale termination. Alternative 4 would decommission 3.1 more miles of road than the Proposed Action. The proposal includes roadside clearing along 3.1 miles of NFSR 509 where tree regeneration is encroaching on the road right-of-way and impairing the line-of-sight visibility for traffic. Roadside clearing would remove trees within five feet of each road shoulder and ten feet on the inside of curves to restore a longer sight distance.

The analysis also considered pre-commercial thinning on 537 acres of 15 to 30-year old lodgepole pine regeneration during the next 5 years. Field data would be collected, and stands meeting tree density and age requirements for thinning would be scheduled for treated. Thinning is designed to remove individual trees in overly dense stands to stimulate growth on the remaining stems. Trees designated for removal are those that exhibit poor form and size characteristics. Thinning would be done pre-commercially, since the trees are not large enough to produce a commercial product. The decision for which site-specific stands will be treated will be analyzed and recorded in future NEPA documents following additional public involvement.

Map. 4. Wildlife Emphasis.

Timber harvest prescriptions described under the Proposed Action and Alternative 3 would be the same.

A. Features Common to all Action Alternatives

The following features are incorporated into the action alternatives and would occur during implementation as funding is available. The environmental effects to most resources from implementing these projects have been included within the direct, indirect, and cumulative effects analyses in this Environmental Assessment. The projects listed below have been included in the effects analysis for all resources.

Included as an integral part of both action alternatives are several small projects designed to mitigate current problems. They include the following:

- Improve drainage and design of NFSR 509, and remove unused, damaged culverts.
- Relocate the ATV trail in Section 6, T.13N., R.78W. away from Lake Creek.
- Improve or eliminate the ATV crossings in the SW 1/4 of Section 32, T.14N., R.78W. of Hay Creek.
- Improve or eliminate the ATV crossing (NFSR 512N) of Collins Creek in the N 1/2 of Section 16, T.13N., R.78W.
- Construct waterbars on the spur road in the NE 1/4 of Section 11, T.13N., R.79W.
- Construct waterbars and improve drainage on NFSR 517D.
- Decommission and rehabilitate NFSRs 575.AB and 527.DA, and non-system routes 3432, 3434, 3435, 3440, 5127, 3441, and 3433.
- Erect 1/2 mile of pasture division fence southwest of Lake Mountain at NFSR 541.C.

B. Alternative Design Features

The alternatives were designed to avoid effects requiring mitigation. All potential harvest units have been examined on the ground using perimeter and interior walk-through surveys. Areas to be protected include raptor nesting sites, streamside protection zones, riparian areas, wetlands, cultural resources, small inclusions of rocky and steep ground, and other sensitive areas. These areas are effectively protected by marking them as exclusions from the harvest units. Final sale unit layout provides the opportunity to improve the original design by utilizing increased knowledge obtained during intensive on-the-ground work.

The following design features would be applied where ground and timber conditions warrant:

- During unit layout, seek opportunities to increase average patch size by combining with adjacent stands of approximately the same age class. An example is clearcutting in stands which are adjacent to existing openings and which are infected with dwarf mistletoe. The objective will be to design the new opening to combine with existing, adjacent openings where the average stand age would approximate 10 percent of the rotation age. This would allow the combined stands to be managed as a single unit as the stands mature, thus increasing the patch size and interior forest.
- In clearcut units, mimic the size and shape of natural openings found in or adjacent to the timber sale area.

- Design unit boundaries to follow natural contour lines and avoid straight edges.
- Minimize edge contrast by feathering or inter-mixing the edges of harvest units.
- Require slash disposal in harvest units located in the immediate foreground of NFSRs 509, 512, and 517 and for the roadside clearing on NFSR 509. Cut stumps as close to the ground as feasible when they are within 25 to 50 feet of the road edge. Retain groups of healthy young trees, shrubs, and rock outcrops to mitigate visual impacts and to meet the Visual Quality Objective of partial retention.
- Locate temporary roads that are to be obliterated so they can be readily shaped and blended with the landscape upon termination of use. Upon closure, scarify and seed the roadbed and install barriers. If rocks and boulders are used as barriers, bury the lower third in the ground to improve their appearance.
- Individually mark trees to be removed on the Resort Road safety/widening project. Determine the amount of volume for sale with a 100 percent cruise, or perform this activity with Forest Service crews.
- Avoid straight edges on roadside clearing - provide irregular edges.
- Decommission roads that are not part of the permanent system during the same season that the sale ends. Restore effective ground cover by ripping to minimize compaction, and seeding and/or scattering woody debris.
- Avoid perennial, intermittent, and ephemeral channels with road drainage features to minimize disturbed areas.
- Due to the nature of the soils, maintain as much slash as feasible on the site while still meeting the site preparation requirement for the area. This will help maintain the plant nutrients on the site and minimize off-site erosion.
- To keep major ground disturbance within regional standards, designate landings so the main skid trails are about 100 feet apart.
- Seed disturbed areas with a native mixture of grasses, forbs, and shrubs.
- Include contract provision CT6.312# - Sale Operation Restrictions (11/98) in the sale contract to prevent disturbance of active goshawk nests in the proposed harvest units.
- Include contract provision CT6.25# - to provide for the protection of any Proposed, Endangered, Threatened, or Sensitive Species located after the sale has been sold.
- Identify range improvements on the Sale Area Map to protect fences located within or immediately adjacent to cutting unit boundaries.
- Locate roads and timber harvest units at least 200 feet from all amphibian breeding sites to reduce siltation and woody debris from entering the pond.
- Snowplowing will be allowed on either NFSR 517 or NFSR 512, but not on both roads at the same time. Signs will be posted on the plowed road to warn other users.
- Include provisions in the KV plan to treat approximately 5-10 acres of noxious weeds each year for the 3 years following completion of harvest activities.

- Include provisions in the cutting contracts to clean logging equipment entering the treatment area if it is known that equipment has been recently used in an area where noxious weed infestations occurred.
- Seed highly disturbed areas (roadsides, landings, skid trails, etc.) with a native and/or desirable non-native species mixture of grasses, forbs, and shrubs as soon as possible after completion of harvest activities.
- Establish landings in forested/cut sites. Avoid permitting them in open meadows/ parks, upland range sites or riparian areas.
- Aspen rangeland sites in or adjacent to commercial and pre-commercial cut areas should be treated to promote or increase aspen regeneration.
- Livestock use of cut areas will be curtailed if grazing is significantly affecting tree regeneration in an adverse manner.
- **TES Plant Survey:** Conduct a TES plant survey within all proposed harvest units and proposed roads during the 2003 field season. Search at a time of year and at an intensity that would allow us to locate populations of all the plant species listed above, if they are present in the project area. Provide the following mitigation measures if these or any other sensitive plant species are found.
    1. Identify on the ground and buffer all known populations of sensitive plants from management activities that would directly or indirectly impact plant habitat or populations. The protection buffers would be a minimum of 100 foot in radius from population center.

    2. If *Cypripedium fasciculatum* is found, the protection buffer will maintain shading and micro-site conditions at managed sites by retaining sufficient shrub and/or canopy cover so that plants are not exposed to more than intermittent direct solar radiation.

    3. Fell trees away from population buffer.

    4. Exclude mechanized equipment from managed sites.

    5. Do not build roads through or near populations in a way that would directly or indirectly impact plant habitat or populations.

The Ω mile of new fence identified for construction in the original EA for this project is not necessary. Field investigations in the summer of 2000 revealed adequate fencing was in place and new fencing would not be needed as a result of implementing any of the action alternatives.

C. Mitigation Features

In addition to the Forest Plan Standards and Guidelines, the Interdisciplinary Team identified mitigation measures to be incorporated into each alternative from the *Watershed Conservation Practices Handbook*, the *Packer's Guide*, and the *Wyoming Forestry Best Management Practices*. A list of specific practices that would be used to minimize the effects of project activities is displayed in Appendix A. These mitigation measures have been proven effective by reEArch and project monitoring. The practices identified in these publications are incorporated

by reference and would be followed as an integral part of implementing the Proposed Action or one of the other action alternatives. Periodic monitoring inspections would occur during project layout and implementation to ensure that all activities are limited to culturally cleared areas and to determine any effects to immediate and nearby sites from increased human activity. Heritage sites discovered during ground-disturbing activities would be identified, recorded, and protected.

D. Summary of Effects of the Alternatives Analyzed

Table 2 - Summary of Estimated Effects of Implementing the Alternatives

Criteria	Alt. 1 - No Action	Alt. 2 - Proposed Action	Alt. 3 - Partial Cut Emphasis	Alt. 4 - Wildlife Mitigation
Specified road reconstruction	0	1.4 miles	1.6 miles	1.4 miles
Specified road construction	0	0.7 miles	0	0.7
Temporary roads	0	3.5 miles	4.9 miles	3.5 miles
Road decommissioning	0	7.4 miles	7.4 miles	10.1 miles
Open road density (miles/sq mi)	1.88	1.86	1.86	1.80
Roadside Clearing maintenance	0	3.1 miles (3.8 ac)	3.1 miles (3.8 ac)	3.1 miles (3.8 ac)
Clearcut (acres)	0	267	90	222
Group Selection (acres)	0	94	154	66
Overstory Removal (acres)	0	66	81	94
Shelterwood-preparation cut (acres)	0	40	73	20
Sanitation and Salvage (acres)	0	0	184	0
Thinning - commercial (acres)	0	18	137	18
TOTAL (acres)	0	485	719	420
Thinning - noncommercial (acres)	0	537 *	537 *	537 *
Net Volume (MMBF)	0	4.2	3.4	3.3
(CCF)	0	9,495	7,672	7,272
Acres of Old Growth	1,788	1,788	1,788	1,788
Percentage	(15.4)	(15.4)	(15.4)	(15.4)
Equivalent Clearcut Acres	1,299	1,659	1,618	**
Percentage	(11)	(14)	(14)	
HYSED estimate (Tons/year)	7,178	7,528	7,489	**
Short Term Economic PNV	-0-	$857,351.22	$379,889.12	$367,765.36
Short Term Economic B/C Ratio	1	2.37	2.22	2.19

* Specific sites to be selected following additional analysis and documentation.

** While modeled values would change slightly under Alternative 4, there would be no significant change in conditions observed in the subject watersheds as a result of timber sale modifications. Therefore, no additional ECA or HYSED analysis is recommended to address the minor differences in effects for Alternative 4.

E. Consistency with the Forest Plan

The Collins Creek analysis area includes a number of management areas that are assigned specific prescriptions which are governed by the General Direction and Standards and Guidelines in Chapter III of the Forest Plan. These prescriptions determine what types of activities are allowed in the Management Areas. A Forest Plan consistency analysis was completed for each of the ì Alternatives Considered in Detailî to determine their consistency with all the direction stated in Chapter III of the Plan. The ID Team concluded that each of the alternatives is consistent with the direction in the Plan. The only exception is that the No Action Alternative

does not help to meet the Desired Future Conditions for vegetation, as displayed on pages IV-14 to IV-20 of the Final EIS for the Forest Plan.

F. Alternatives Considered But Not Fully Analyzed

The following alternatives were considered but eliminated from detailed study.

Alternative 5 - No Clearcutting:

The Interdisciplinary Team initiated the development of an alternative with no clearcutting. The silvicultural methods to be used were partial harvesting and uneven-aged management. At an early stage in the development of this alternative, the silviculturist was unable to find sufficient stands in the analysis area where partial cutting would be a suitable harvest technique that would make a commercially viable timber sale. Declining conditions in most of the mature lodgepole pine stands, due to a prevalence of heavy infections of dwarf mistletoe and comandra blister rust (*Cronartium comandrae*), eliminated the majority of the stands from partial cut consideration. As previously discussed, the Collins Creek analysis area has numerous examples of unsuccessful partial harvesting (from the 1980s) in lodgepole pine stands infected with dwarf mistletoe. The current condition of these stands clearly shows that it is not desirable to treat lodgepole pine stands that are heavily infected with dwarf mistletoe by silvicultural treatments other than clearcutting. Rather than repeat this mistake, the Responsible Official decided to drop this alternative from further consideration.

Alternative 6 - Achieve the Desired Condition Described in the Forest Plan More Quickly:

An alternative was examined that would treat more stands than was considered in either the Proposed Action or Alternative 3. The goal was to achieve the Desired Future Conditions described in the Forest Plan as soon as possible. This potential alternative was discarded because of the likelihood of adverse hydrologic effects that could occur as a result of the increased amount of vegetation treatments.

CHAPTER III. AFFECTED ENVIRONMENT

The following information is a summary of the various resource specialist reports on file at the Laramie Ranger District. See the individual reports for more detailed information.

A. Vegetation

The desired forest condition for the Medicine Bow National Forest, as described in the Forest Plan, is characterized as a healthy forest consisting of a mosaic of tree stands of different ages, species, and sizes ranging from the grass/forb stage to old growth timber. The 7E Management Prescription (Forest Plan, pages III-189 to 196) describes the desired condition as a mosaic of 20 percent grass/forb; 20 percent saplings; 40 percent pole timber; and 20 percent mature and overmature timber. Table 3 below shows a comparison of the distribution of desired size-classes of lodgepole pine as stated in the Forest Plan, with the current conditions.

Table 3 - Forest Plan Desired Vegetative Condition Compared to Current Conditions.

Structural Stage	Desired Condition - lpp[1] in Mgt. Area 7E		Current condition - lpp in Mgt. Area 7E	
	%	8537 Acres of lpp timber type	%	8537 Acres of lpp timber type
Grass / Forb	20	1,707	6	540
Saplings	20	1,707	15	1,304
Pole	40	3,416	14	1,181
Mature	20	1,707	39	3,347
Overmature	*	*	26	2,165
TOTAL	100	8,537	100	8,537

1 lpp = lodgepole pine

* The Forest Plan requires 10 percent old growth within each watershed. This percentage is not spatially identified in the plan.

Field reconnaissance information and stand data provide a good picture of the overall health of individual timber stands within the Collins Creek watershed. Of the 9,525 forested acres in the watershed, 3,851 acres (40 percent) are in the mature successional stage; and 2,509 acres (26 percent) are in the overmature successional stage. The majority of the forested acres in the watershed have reached or surpassed physical maturity, as evidenced by the presence of dead and dying tops and unhealthy crowns in many of the lodgepole pine stands. In addition, most of these same stands are infected to varying degrees with a mixture of dwarf mistletoe, comandra blister rust, and Western gall rust.

The older age classes in the area were probably created by wildfires about 120 years ago. Tree regeneration varied with fire intensity, the volume of viable seed, and growing conditions. These conditions created a mixture of stands that varied in density, size, and uniformity. From the mid- to late 1800ís to the early 1900ís, these originally continuous, large stands were impacted by timber harvest for railroad cross-ties. To minimize the amount of hand labor needed to produce the tie, trees of a specific size were harvested. In stands where most of the trees were usable for ties, the cutover area resembled a clearcut. Where tree size varied and only specific trees were harvested, the residual stand contained a mixture of tree sizes and densities. This provided optimum conditions for the spread of dwarf mistletoe, where it existed. In addition to railroad ties, trees were also harvested for building materials, firewood, and mineshaft timbers.

The majority of the acres in the Collins Creek watershed are forested with lodgepole pine (see Table 1). Lodgepole pine is an early seral tree species characterized by its ability to invade

disturbed areas where site conditions include bare mineral soil and open sunlight. The species does not regenerate as well where there is thick ground cover, or in shady conditions.

There are several insects and diseases associated with the lodgepole pine life cycle. Some species, such as dwarf mistletoe (*Arceuthobium americanum*) and comandra blister rust (*Cronartium comandrae*) generally intensify as stands age. Conversely, wildfire (a key disturbance for lodgepole regeneration) often eliminates or reduces the incidence and intensity of such disease agents. Where lodgepole pine is the desired regeneration species, silvicultural treatments are designed to produce conditions similar to those produced by the natural disturbances upon which this species depends.

As mentioned above, many of the stands in the Collins Creek watershed have reached or passed physical maturity and are heavily infected with dwarf mistletoe and other forest diseases (Johnson, 1977). A dwarf mistletoe rating system[2] was used to classify the levels of infection in all stands within the Collins Creek analysis area. An aerial survey of the Medicine Bow/Routt National Forests was conducted during August 1997 to assess damage and mortality in forest stands due to insects, diseases, and other factors. No major insect activity was reported for the Collins Creek watershed, however, significant dwarf mistletoe activity was noted.

Table 4 - Acres of Existing Dwarf Mistletoe Infection by Management Area

Management Area	Dwarf Mistletoe Rating (Hawksworth System)		Dwarf Mistletoe Present, but Not Rated	No Data*	Total Acres Infected**
	0.1 - 1.9	2.0 - 6.0			
7E	3297	3426	1034	780	8537
9A	179	209	14	11	413
10C	45	8	0	0	53
4B	35	0	0	0	35
Total Acres**	3556	3643	1048	791	9038*

* Mistletoe infection is not recorded during regeneration surveys.

** Total acreage includes all lodgepole pine and Douglas-fir stands in the analysis area.

Some of the pole-sized stands in the analysis area have stagnated and contain small-diameter trees that will not grow unless thinned. Where densely stocked pole stands are 70 years of age or less, thinning will allow the remaining trees to release and grow.

Laramie District Timber records indicate that portions of six timber sales have occurred in the Collins Creek watershed from 1975 to 1993. Currently, three sales are scheduled in adjacent watersheds. The White Swan (1996) and Bird Creek (1997) sales were approved in Decision Notices in 1996 and 1997, and are currently being prepared for sale. Data gathering for a potential Spruce Gulch timber sale began during 1999.

B. Transportation

The Collins Creek analysis area is served by two main arterial roads and several collector and local roads that feed into the arterial roads system. The area has 79.4 miles of inventoried roads, ranging from two-track, user-created roads to double-lane, graveled roads, and about 66 miles

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[2] This classification system was developed by Frank G. Hawksworth (1961), Plant Pathologist, Rocky Mountain. Forest and Range Experiment Station. Lightly infected stands are rated 0.1 - 1.9; moderately to heavily infected stands are rated 2.0 - 6.0.

are open to motorized travel. The existing road system is fairly well developed in the analysis area due to past harvesting, and also to provide easy access for recreational use.

Historically, roads constructed for logging or other purposes were left open for public access. In the Collins Creek analysis area, this has resulted in a network of open roads that exceeds the access needs. Transportation planning and a road review produced a list of roads that are not needed for access or recreation purposes. These roads could be removed from the system. Recently, several old, two-track, logging roads that are no longer needed for timber harvest have been decommissioned. Forest Plan direction (page III-76) is to work toward an open road and trail density of not more than 2.0 miles per 640 acres.

Arterial Roads:

The Platte River Access Road, NFSR 512, runs in a general east-west direction near the southern boundary of the analysis area. The road is mostly a double-lane, graveled road providing access to the North Platte River from Wyoming State Highway 230. It is one of the main access routes to a large portion of the forest. The road is 29.4 miles long, six miles of which pass through the Collins Creek analysis area. The past and present use of the road is a combination of recreational access for camping, fishing, and hunting, landowner access to private lands; and mining and timber harvest activities.

The Dry Park Road (NFSR 517) runs in a general north-south direction along the eastern boundary of the analysis area. The road is single-lane, native-surfaced, and serves as the main connection between the Centennial Valley and the community of Foxpark. The analysis area contains 5.5 miles of this 11.5 mile road.

Collector Roads:

Collector roads within the analysis area include the Roper Road, the Muddy Mountain Cutoff Road, the Foxpark Bypass Road, part of the Douglas Creek Road, and the Muddy Mountain Road. The Roper Road (NFSR 504) extends southwesterly from NFSR 512 and was used mainly for timber harvest removal. The Muddy Mountain Cutoff Road (NFSR 513) crosses the northeastern corner of the analysis area for 0.6 miles and serves as access to a major water supply pipeline. The Foxpark Bypass Road (NFSR 524) connects NFSR 512 and NFSR 517 near the community of Foxpark. It was built to reduce the disturbance caused by hauling timber through the town. A very short section of the Douglas Creek Road (NFSR 543) on the western edge of the analysis area, and the Muddy Mountain Road (NFSR 575) near the northwesterly side of the analysis area, were used for past timber harvesting operations.

Local Roads:

Several local and two-track roads extend from the arterial and collector roads. Many are short, dead-end roads that provide access to past timber cutting areas or to recreation sites. Most of these roads receive little or no maintenance, and several are closed to motorized travel.

The Resort Road (NFSR 509), near the western side of the analysis area, is a loop road which serves as an access route for several private dwellings in the Lake Creek Resorts community. This 3.1-mile, single-lane road is maintained for passenger car traffic. However, it has several dangerous curves and trees at the edge of the roadway, and therefore, does not meet safety standards. Since most of the through traffic remains on NFSR 512, this road handles primarily recreation use and traffic destined for the private land. Both action alternatives propose roadside clearing along this road to improve sight distance and reduce the safety risk. Suggested roadside clearing includes removing all trees within 5 feet of each road shoulder on straight sections and

clearing trees within 10 feet of the road shoulder on inside curves. This would result in an estimated 3.8 acres of vegetative treatment.

Railroad:

A short section of the Laramie, Hahns Peak, and Pacific Railroad runs along the eastern edge of the analysis area. It is connected to the main line at Laramie and passes though the communities of Centennial, Albany, and Fox Park, Wyoming, and to Walden, Colorado, to the historical terminus at Coalmont, Colorado. The rail line is eligible for nomination to the National Register of Historic Places due to its role in the development of southeast Wyoming timber and mining industries. The line has been abandoned and salvage operations have been completed. There has been some discussion that the corridor has potential for development as a trail.

C. Soil

The desired condition (as stated in the Forest Plan) is to achieve, by maintenance or improvement, the healthy soil conditions required to support ecosystems. Healthy soils and ecosystem sustainability will be assured if soil damage (erosion, displacement, compaction, severe burning, and nutrient drains) are kept within allowable limits.

Soil is a basic component of the environment and is the growing medium for most plants. It supplies nutrients for vegetation, which in turn supplies habitat for wildlife and other resources. Soil also absorbs and stores water, releasing it slowly over time. All renewable resources are directly or indirectly dependent upon soils. Soil is considered a nonrenewable resource because of the vast amount of time that it takes to develop into a fertile medium.

The soil resource affects the functioning health and total productivity of all ecosystems. Conceptually, the quality or health of a soil can be viewed simply as "its capacity to function." Soil health is the capacity of a specific kind of soil to function within natural or managed ecosystem boundaries, to sustain plant and animal productivity, maintain or enhance water quality, and support human health and habitation" (Karlen et al. 1997).

The primary goal of soil management is to maintain or enhance long-term site productivity. There are five categories of physical soil disturbance that have been found to affect soil productivity. The categories include: compaction, displacement, erosion, puddling, and severely burned. Adverse soil impacts may not exceed 15 percent of an activity area (USFS, 1992).

A soil survey of the analysis area, done to National Cooperative Soil Survey standards, was conducted during 1985. During field survey and mapping, soil observations were recorded, and typical soil profiles were described. The report describes the various soils within the analysis area, identifies their capabilities and limitations for management, and predicts soil performance and potential impacts of management.

In general terms, the soils of the Collins Creek analysis area can be characterized by moderately sloping to steep, well-drained, and deep soils. The soils in the area contain a large percentage of coarse fragments in the soil profile. See *Soil Survey of the Medicine Bow Mountains and Sierra Madre Mountains Area, Medicine Bow National Forest, Wyoming* (1989) for more information.

The geology of the area is divided into two main parts. The southern part of the analysis area is in the North Park Formation, with Lake Creek as the northern boundary. The rest of the area is made up of intrusive rocks (granite and gabbro). While some North Park formation also occurs in the Indian Creek area, most of this delineation is outside of the analysis area. The North Park

formation is a combination of sandstone, siltstone, and claystone and has a moderate potential for mass movement. The intrusive geology has only slight potential for mass movement.

Since there are no planned, major ground-disturbing activities such as road building in areas of geologic concern, no major soil stability problems will occur in the area. The major effects to the soil resource are expected from erosion due to disturbances of the soil surface.

Erosion hazard is the inherent susceptibility of a soil to erosive forces, such as raindrop impact or waterflow over the surface. It is dependent on soil particle size distribution, organic matter content, structure, permeability, rock fragment content, slope gradient, and rainfall characteristics. The erosion hazard potential on most of the soils in the analysis area can be characterized as slight to moderate.

Revegetation potential is the expected response of a soil to disturbance, and is primarily dependent on available water-holding capacity, infiltration capacity, depth to bedrock, fertility (including pH), and erosion hazard. Revegetation potential in most of the analysis area is moderate to high. Based on regeneration success of similar soil types in the area, there are no expected regeneration problems with the proposed units. Leaving large woody debris on the site to provide shade and retain moisture should enhance regeneration success.

Limitations on unsurfaced roads are determined by erosion hazard, revegetation potential, stability hazard, slope gradient, stone content, and low load-bearing capacity (i.e. low strength). The upland soil types in the Collins Creek area have slight or moderate limitations for road building, however, there are no significant limitations on road construction in the analysis area.

There are about 2,100 acres of riparian/floodplain soils in the analysis area. These soil types are located along stream channels of various widths. Based on field review of the area, none of the proposed harvest units will encroach upon any of the riparian areas.

There are two soil types in the area that have a high potential for soil compaction due to the texture, structure, and the low percent of coarse fragments in the surface layer. These soils are more susceptible to compaction than the other soils in the analysis area. The potential for compaction on these soil types does not automatically restrict timber harvest, but harvesting on these soil types must be carried out more carefully. This may require extra mitigation, such as designating specific locations for skid trails, requiring equipment to remain on skid trails, or scheduling harvest for the winter or during periods when the soil is less prone to compaction.

No prescribed burning is planned for this project. Therefore, no fire-related impacts to the soil resource are anticipated.

D. Hydrology

The Collins Creek analysis area is entirely within the 11,585-acre, 6th-level Lake Creek watershed. This watershed is composed of three basic landform types: moderately dissected, shallowly incised mountain slope; infrequently dissected, shallowly incised mountain slope; and hill, summit, and ridgetop. Upland vegetation is almost entirely lodgepole pine, while riparian vegetation is mainly willow, sedge, and other herbaceous species. Land types (combination of landform, geology, and vegetation) include coniferous crystalline high hills, coniferous sedimentary high hills, and coniferous crystalline mountains (Marston and Clarendon 1988).

Land capability ratings for erosion and water production suggest moderate to high hazard for erosion and moderate to high capability to produce favorable flows. These ratings are based on landform, vegetation, lithology, and soils. Other soil information (Medicine Bow soil survey)

indicates that all subwatersheds have less than 20 percent of soils with a high or severe mass wasting hazard rating, however, no landslides, active or inactive, exist in the analysis area.

Water resource problems in the analysis area are mainly the result of historic mining activity. However, other activities, such as road building, timber harvest, recreation, and livestock grazing, have likely had some additional effect. Channel instability and modified channel form are related to sediment loads mainly attributable to instream mining activities. These conditions need to be considered when developing management proposals for the analysis area.

Stream Survey Summary:

Currently, no stream segments within the analysis area are on the Wyoming Department of Environmental Quality (WYDEQ) 303(d) water quality impaired list. A watershed analysis has determined that all streams in the area have a Class II rating.[3] Stream surveys were completed during the summer of 1997 and included evaluations of channel stability and stream health. Conditions in the Lake Creek watershed are as varied as the activities that have occurred there. Many segments rate as "good" using the Pfankuch channel stability rating system, but downstream the rating drops to "fair."

Instream mining was the most common activity, which likely caused the conditions found in the lower watershed. Sediment transport in meandering streams is slow, and it can take decades to remove sediment that resulted from activities no longer occurring in the watershed. The lower reaches of Lake Creek are still adjusting to changes in sediment loading, mainly attributable to instream mining. Vertical and horizontal stability are not likely to improve until the extra sediment load is transported out of the system.

Watershed Disturbance and Equivalent Clearcut Acreage (ECA):

An analysis of ECA (Table 5) suggests varying disturbance levels for the five subwatersheds, ranging from 8 to 16 percent of the watershed area. Within the entire analysis area (6th-level watershed), the ECA disturbed area is estimated at 11 percent. Upper limits for ECA depend upon stream type and condition. The Rosgen C4[4] stream types found in the lower Lake Creek watershed have been rated as having "fair" channel stability due to natural characteristics and past activities. A "fair" rating indicates the amount of resistance to channel damage, channel instability, and moderate erosion and channel adjustment during extreme streamflow events (i.e., 25-year or greater). While the estimated ECA and disturbed area for these watersheds (6th or 7th-level) do not currently inhibit recovery from past impacts, additional activities, such as timber harvest or road building, should be carefully designed.

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[3] A stream with a Class II rating does not require capitol improvements to restore it to Class I condition. Sensitive areas in the stream are at risk for disturbance, or the stream has not recovered from past activities. Degraded segments can recover within 5 years through revised management. (according to Inland West Watershed Reconnaissance.) Natural and human disturbances pose some threat to stream health or hydrologic function.

[4] Refers to the stream channel classification system developed by Dave Rosgen.

Table 5 - Lake Creek Subwatershed Equivalent Clearcut Acreages - Current Condition					
Seventh-level, Subwatershed Name and Number	**NFS Acres within Area**	**Harvest ECA (acres)**	**Road ECA (acres)**	**Total ECA (acres)**	**ECA (%)**
Upper Lake Creek (0100)	3,098	227	31	258	8
Collins Cr./Lincoln Gulch (0200)	3,393	379	50	429	13
Hay Creek (0300)	1,145	104	17	121	11
Lower Lake Creek (0400)	2,956	305	28	333	11
Unnamed (Sawmill Creek) (0500)	994	145	13	158	16
TOTAL [ave.]	**11,585**	**1,160**	**139**	**1,299**	**[11]**

HYSED Modeling:

The HYSED model was used to estimate the increased sediment level due to historic management activities. This modeling suggests that, at 7,234 tons per year, the Lake Creek sixth-level watershed is currently under the threshold of 7,542 tons per year for sediment production. Threshold is the level at which channel morphology or stability may be threatened.

Historic Hydrologic Variability:

The range of historic variability for water resources in the Lake Creek watershed is broad and representative of the diverse influences that have occurred. Fire, mining, beaver activity, forest management, recreation, and grazing have been the major agents of change. Fire disturbance in the analysis area has ranged from small spot fires to major watershed-wide burns. These changes in vegetation and ground cover resulted in a variable input of sediment into streams that is proportional to the percent of land area affected by fires. Hydrology of an area changes after fires. In burned watersheds, less water is drawn from the ground by vegetation and intercepted by woody or herbaceous species. This causes increased water yield in the form of surface runoff.

Beaver activities have affected watersheds in the analysis area since prehistoric times. Their impacts are generally considered beneficial to the water resource.

Precious metal mining has occurred sporadically since the mid-1800s. Water resources were impacted by the practices of diverting water, in order to separate gold from accompanying sediments in off-stream areas and by instream dredging. These practices resulted in high sediment loads, pool filling, channel destabilization, modified channel geometry, and in some cases, acid mine drainage. Riparian areas were often devegetated and the soils compacted. Watershed function was altered as runoff patterns and sediment routing were affected. Over time, with the cessation of mining, riparian areas have recovered their vegetation and proper functioning conditions. Slower to recover are channel form and sediment routing. The symptoms of mining in the early part of this century still persist in the Lake Creek watershed in the form of heavy sediment loads and altered channel morphology. No acid mine drainage problems are known to exist at present.

Water resources have also been influenced by tie drives, timber removal, and road-building activities. Timber harvest started in earnest with the advent of railroad tie drives in the mid to late 1800ís, and streams were used to transport the logs to the railheads, which damaged streambanks and simplified channel structure. A description of effects can be found in Young et al. (1994). The end of tie drives in the early 1900ís allowed streams to begin recovery, which is continuing. While sediment levels have returned to normal, recovery of channel structure related to instream woody debris, boulders, and channel width will take longer to achieve.

Modern logging and associated road building increase the levels of fine sediments found in streams during periods of activity. These sediment levels diminish in time with proper

management, which includes reforestation of harvested areas, maintenance of roads and drainage structures, and obliteration and revegetation of unnecessary roads.

Water resources are often the focus of recreational activities. With the relative scarcity of water in the West, these resources receive a disproportionate amount of use and impact. Recreational activities that take place in the analysis area include hiking, horseback riding, hunting, riding motorcycles and all-terrain vehicles (ATVs), four-wheel-drive use, fishing, camping, picnicking, and firewood gathering. Impacts from these activities may affect riparian areas by compacting soils, trampling vegetation, eroding streambanks, contributing sediment, and disturbing stream channels. Within the analysis area, surveys found several ATV stream crossings listed as possible soil and watershed improvement projects, but no significant trends or system-wide degradation was noted.

Grazing impacts in the analysis area have varied with the numbers of animals stocked. At this time, surveys indicate adverse effects from grazing are isolated, thus grazing is a minor contributor to existing stream conditions.

In summary, streams in the analysis area have evolved through a variety of conditions that have changed over time. Presently, influence of fire and grazing is minimal. Timber harvest (mainly tie drive) related impacts are more pervasive but the streams have recovered substantially. Remaining effects of tie drives will continue to decrease as former channel configurations are regained. Due to the nature of these stream systems, recovery is slow. With riparian buffers and incorporation of hydrologic limits into management plans, streams will continue to recover.

Summary:

Overall, the Lake Creek 6th-level watershed is in fair to good condition. This determination is based on stream surveys and computer modeling and mapping. Cumulative effects (mainly instream mining) have combined with natural stream characteristics to produce stream stability ratings of "fair" in the lower Lake Creek channel and several other sites. One tributary stream section in the lower Lake Creek subwatershed (ID # 0400) was disturbed in the past by a harvest unit lacking a riparian buffer and by improper road location. While much of the stream channel within the watershed is rated as having "good" stability, the "fair" stability ratings for the Lake Creek main channel lower in the watershed provides a focal point for critical review of proposed projects. While timber harvest need not be foregone in this analysis area, this stream section should be considered as a limiting factor due to its location and condition.

E. Fisheries

Available data that describe the existing condition of fisheries resources in the Collins Creek project area are taken entirely from a Wyoming Game and Fish (WYGF) Division basin management plan (Snigg, 1995) and a WYGF Division Administrative Report (Oberholtzer, 1979). Fish populations in all of the streams in the project area are managed by the WYGF Division under the "wild" fisheries management concept. The "wild" management concept prohibits supplemental fish stocking in streams, and instead depends on natural reproduction and recruitment to maintain the fishery.

Streams in the project area are either WYGF Division Class 3, 4, or 5, or Wyoming Department of Environmental Quality (DEQ) Class 1 or 2 (coldwater fisheries unless otherwise identified). The WYGF Division Class 3 stream is important trout water and a fishery of regional importance. A Class 4 stream is a low production trout water, a fishery frequently of local importance, but generally incapable of sustaining substantial fishing pressure. Class 5 streams

are low production trout waters, often incapable of sustaining a trout fishery. Both the hydrology specialist report (Snook, 1998) and the WYGF Division Basin Management Plan (LE180, 76 Waters: Snigg, 1995) remark that some stream segments in the project area show channel and habitat degradation due to past mining and tie-drive activities.

Amphibians:

Two U.S. Forest Service, Region 2 sensitive amphibian species are possibly still in existence in the Collins Creek Area: the wood frog (*Rana sylvatica*) and the tiger salamander (*Ambystoma tigrinum*). The wood frog prefers beaver ponds that have well-developed shorelines (shallows leading to deeper water) with an abundance of emergent vegetation (Baxter and Stone, 1985). The tiger salamander prefers ponded water for breeding and moist hiding places (burrows, logs, and rocks) when not foraging at night (Baxter and Stone, 1985). According to Forest Service amphibian surveys and the Nature Conservancy (Wyoming Natural Diversity Database, Spring, 1997), wood frogs have been found in the project area. The Nature Conservancy database indicates that tiger salamanders are also in the analysis area.

Summary:

The Lake Creek watershed provides good quality water and habitat for fish. The tubifex worms found in Collins Creek are an indication that past mining activities may have increased heavy metals in that drainage, but the water quality is still adequate to support fish and aquatic insects.

F. Wildlife and Threatened, Endangered, and Sensitive (TES) Species

Habitat diversity is dependent on vegetation diversity attributes such as composition and structural complexity. Vegetative composition examines the species present (species richness) and the mix of age classes within the species. Structural diversity is measured by how the plant species and communities are intermixed, or arranged vertically and horizontally. The age classes of these communities are used to determine habitat diversity. These described vegetation and habitat conditions are linked to wildlife habitat relationships, which provide the basis for a discussion of relative wildlife conditions and changes due to proposed activities.

1. Vegetative Composition:

As described above, the analysis area is primarily dominated by coniferous forest, in which lodgepole pine is the most common tree species. The lodgepole pine stands exhibit a wide variety of structural and age classes. Small, mostly late-successional patches of spruce-fir are scattered throughout the lodgepole pine landscape. Less than 1 percent of the landscape is in pure aspen. Remnant pockets, scattered trees, and remnant snags of aspen trees in some conifer stands indicate that the species was more common but probably not as a dominant cover type within the last 100 years. Approximately 16 percent of the analysis area consists of naturally made, non-forested communities: patches of grasslands, sagebrush hillsides, and willow-dominated riparian areas.

Horizontal diversity is provided by the amount and distribution of various vegetative cover types including non-forest, grass/forb, seedling shrub, pole size forest, mature forest, and late-successional forest. Using habitat structural stage information in the RIS database, the analysis area is estimated to have a high amount of horizontal diversity and meets horizontal diversity standards of 30 percent listed on pages III-14 of the Forest Plan. This diversity is met in the following ways:

- Natural and man-made openings including non-forest, grasslands, seedling/shrublands, and riparian areas comprise approximately 31 percent of the area.
- Pole size forest comprise approximately 38 percent of the analysis area
- Mature forest comprises approximately 26 percent of the analysis area
- Forest stands with multi-successional stages and late-seral development comprise approximately 5 percent of the analysis area. This figure does not refer to old-growth forest, which will be addressed in later sections of this document.

Approximately 11 percent of the analysis is considered vertically diverse, having multiple canopies. Forest Plan standards (pg. III-14) allow for less than 20 percent of an area to be vertically diverse if dominated by lodgepole pine, because of that speciesí natural tendency towards development of a single story canopy. Vertical diversity is within Forest Plan standards.

Grass/Forb Stage:

This part of the age class structure and forest succession provides changes in diversity and species abundance. The Forest Plan states, "...in forested areas of a unit, maintain at least 5 percent in grass/forb stage (Forest Plan, III-14).î There are currently 540 acres (6 percent) of grasses/forbs in the analysis area.

Old Growth:

Forest Plan standards require the maintenance of at least 10 percent of forested areas in old growth conditions. Although most groups recognize the importance of old growth forest, definitions and/or identification of old growth varies across vegetation types, resource disciplines, geographic areas, public opinions, and scientific evaluation. As a result, previous estimates of old growth within the Collins Creek analysis area, which were conducted separately by various IDT specialists, produced a variety of results ranging from 26 percent old growth to less than 5 percent old growth. In general, the resource information database (RIS), which focuses on vegetation data for each forested stand, was queried for timber stand year of origin, old growth scorecard ratings, or habitat structural stage to determine stands which meet old growth characteristics. Using any one of these data fields (or others) will produce a range of results which are difficult to interpret. The current biologist examined a variety of RIS data together including old growth scores, habitat structural stages, stand-size, available snags, tree size, stand year of origin, and other data to determine a probable stand value for functioning as old growth forest. Generally, those stands which ranked high in three or more categories and had consistent supporting data (in other fields of the RIS database) were considered likely to satisfy old growth requirements. Stands which ranked high in only 2 categories and had varying or contradictory data were evaluated as ì undetermined, may or may not provide old growth habitatî and were **not** used to calculate base acreages of existing condition. Additional field verification would be necessary to evaluate these stands contribution towards old growth forest. Those stands that ranked high in only one category and had inconsistent supporting data, were evaluated as ì unlikelyî to provide for old growth habitat and were not used to calculate the base acreage of old growth in the analysis area.

- Based upon this analysis, review of aerial photos, and project specific knowledge of the area, approximately 11 percent of the forested area contains old growth conditions and thus meets Forest Plan standards.
- An additional 10 percent of the forested acres were identified as ì undeterminedî old growth. As discussed above, data for these stands indicate they may provide old growth,

but supporting data is inconsistent. It is likely that field verification of these ìundeterminedî stands would verify that some stands do indeed contribute to old growth, which would increase the base acreage of old growth in the analysis area. This suggests that the current condition estimate of 11 percent old growth retention is conservative and would increase with additional field verification.

Snag Retention:

Data on snag retention in the analysis area was collected in 1997 using random plots as well as surveys within past timber harvest areas. Surveys found that forested stands have high numbers of snags within them, though most are of a relatively small diameter (less than 8 inches) due to the young age of stands, and pole type lodgepole pine. Approximately 33 percent of the analysis area provides mature or later seral forest stages which likely meet or exceed forest plan guidelines for snag retention. Stands that have been harvested prior to creation of the Forest Plan have few if any snags. An effort to provide large diameter surplus snags in newly proposed harvest units would benefit wildlife by increasing potential nest sites for cavity nesting species.

Forest Fragmentation:

An Analysis of Landscape Structure for the Medicine Bow National Forest using G.I.S. (Baker, 1994) indicates that overall, approximately 80 percent of the variation in forest cover types and age classes is due to past harvest activities and approximately 20 percent of that variation is a result of environmental factors (such as fire disturbance). In Bakerís analysis, the Collins Creek Analysis area was specifically compared to the Rock Creek reference area and showed substantial differences. Primarily, the Collins Creek analysis area had:

- A higher percentage of forest patches originating after 1950 (56 times the reference area value)
- A higher percentage of forest patches originating between 1850 and 1950 (7.7 times the reference area value)
- A lower percentage of forest patches originating before 1850 (0.4 times the reference area value)
- A smaller mean interior size of forest patches.

A draft summary of Historic Variability for Upland Vegetation (Dillon and Knight, 2000) indicates that forests of the Medicine Bow National Forest are more fragmented now than prior to the advent of large scale timber harvesting and road building. These findings are also confirmed in other National Forest areas in Wyoming (Reed et. al. 1995, Tinker et. al. 1997). Forested stands generally have smaller patch sizes, perforation of interior forest by roads and harvest, and more edges between old and young forest.

Examining the current RIS database, there are approximately 3 blocks of forested stands greater than 150 years old that represent the least perforated sections of forest in the analysis area. These in general, are located between the 509 and the 512 roads (block 1), south of the 527 road (block 2), and east of the 517 road (block 3). Various other parcels of older forest exist, however, they are generally isolated by large expanses of younger forest. All three blocks are still largely perforated by roads and past harvest activity.

Surveys in the Collins Creek Analysis Area located species that respond favorably to fragmented forest (elk, mule deer, northern flicker); interior forest (marten, northern goshawk, golden-crowned kinglet); and forest edge (tree swallow, house wren, coyote). This indicates a diverse mix of habitat types and terrestrial wildlife species in the analysis area.

2. Wildlife Species Diversity:

Federally Listed Threatened, Endangered (T&E), or Proposed Wildlife Species

A list of species developed by the U.S. Fish and Wildlife Service (USFWS) (April 2002) representing federally listed T&E species that may occur on the Medicine Bow NF was reviewed during informal technical support with the USFWS. This support included discussion in which the current list of threatened, endangered, proposed, and candidate species was reviewed to develop a revised list of species pertinent to this project. **The only federally listed species which may occur on or near the project area includes Canada Lynx (*Lynx canadensis*) (see Appendix D).**

Canada Lynx:

The proposed treatments reside in lodgepole pine forests approximately 6 miles north of the Fox Park area. Vegetative cover is abundant and continuous across the analysis area. The characteristic vegetation is predominately early seral and mid-seral lodgepole pine, much of which is considered ìdoghair lodgepoleî because of a high density of trees per acre and small tree diameters. Much of the area has been harvested within the last 40 years, and has dense regeneration of small diameter lodgepole pine which is 10 to 20 feet tall. Mature and/or late-seral lodgepole pine is present in scattered patches. Spruce/fir dominated forests are limited to northern aspects, adjacent to riparian areas, and are marginally present within the analysis area.

Likely, the analysis area does not naturally provide adequate denning habitat due to lack of late seral/complex forest structure conditions, lack of large woody debris, and a lack of continuous spruce/fir timber. As a result of the natural lack of denning habitat and as agreed to by the USFWS, **The area proposed for treatment falls outside of established Lynx Analysis Units (LAUs).** The treatment areas provide marginal lynx foraging habitat as snowshoe hares are generally scarce in forested sites dominated by dry-site lodgepole pine.

- Canada lynx are not documented within the project area.
- Several treatments fall within a proposed lynx-linkage area. These treatments are primarily pre-commercial thinning in early seral lodgepole pine (9 units), and clearcutting in mature or late-seral lodgepole pine (5 units).
- Additional analysis may be found in the Biological Assessment completed March 16, 2000 for the Collins Creek project.

A Biological Assessment (BA) describing the biology and habitat requirements of Canada lynx has been completed and is located in the project record at 2468 Jackson Street, Laramie, Wyoming 82070.

Sensitive Species Analysis

Forest Service policy regarding sensitive species (FSM 2672.4) is as follows:

> ì Biological Evaluations. As part of the NEPA decision making process, review proposed Forest Service programs or activities in sufficient detail to determine how an action or Proposed Action will affect any speciesÖ or designated in Region 2 as sensitive.î

Documented occurrences of Forest Service Region 2 sensitive species within or adjacent to the project area include: American marten, northern goshawk, boreal owl, three-toed woodpecker, western boreal toad, wood frog, and tiger salamander. While only a few species occur within or adjacent to the project area, all species on the Region 2 sensitive species list were reviewed. Review information is contained in Appendix D.

American marten: The analysis area currently has a low modeled habitat capability value of 36 percent. The analysis area likely does not provide quality marten habitat due to the dominant timber type of early/mid seral lodgepole pine, and minimal amounts of mature spruce/fir forest. It is probable that the analysis area is naturally not dominated by high quality marten habitat because dry site conditions, lower elevations, and past disturbance by fire favor the retention of early and mid-seral lodgepole pine with minimal understory, little dead-down wood, and perforated by natural and disturbance created openings. In addition to these natural conditions, past timber harvest has additionally reduced the amount and quality of available marten habitat by decreasing the amount and block size of late-seral lodgepole pine stands in the analysis area.

Based on vegetation modeling and a review of marten sightings in the WYNDD database, the analysis area contains three blocks of marten habitat, and two of those blocks are more likely to be occupied by resident marten.

- These two blocks occur between the Forest Road 527 and Lake Creek (block one), and along Forest road 512 in the western half of the analysis area (block 2).
- These areas have a higher number of forested stands in later seral stages, and those stands are more continuous than in other portions of the analysis area.

Northern goshawk: Habitat capability modeling for goshawk indicates that approximately 61 percent of the analysis area is providing suitable foraging opportunities through areas of early seral forest, low tree density, riparian, etc., and that 37 percent of the analysis area is providing suitable cover habitat through mature forest with large diameter trees and a moderate to closed canopy. Widespread past timber harvest in mature lodgepole pine stands has likely reduced the overall amount of nesting and cover habitat in the analysis area. However, pre-commercial thinning, first-step shelterwood treatments, and other silvicultural practices that promote faster growing trees and limit the amount of understory have offset some amount of the loss of cover habitat. Foraging values are also likely improved by the increased amount forest in early-seral stages. The overall habitat capability index value suggests that 47 percent of the analysis area currently provides for goshawk needs, and that high road density in the analysis area further reduces the effectiveness and availability of habitat. Based on these figures, goshawk habitat capability meets forest plan standards and guidelines. However, a high road density and limited cover are significant factors that likely affect nest locations and could impact nest success.

The analysis area is estimated to contain up to 4 goshawk territories based on an estimated home range size between 4,000 and 6,000 acres, presence and location of possible nesting habitat, and past goshawk observations by field personnel. Blocks of mature, large diameter lodgepole pine forests with little understory and adjacent to riparian areas are the most probable locations for goshawk nesting. The four estimated goshawk territories roughly located are: south of Forest Service Road 527 and north of Lake Creek (Territory 1), in the vicinity along the Forest Road 512 and north to Forest Road 509 (Territory 2), in the vicinity of upper Lake Creek and road 517 (Territory 3), and in the vicinity of Collins Creek and Lincoln Gulch (Territory 4). Nests have been located by field personnel in territories 1 and 2 and are documented in Wyoming Natural Diversity Database (WYNDD). Surveys in territories three and four have not located any goshawk nests or activity.

Boreal owl: The project area has marginal habitat for boreal owls. Although isolated patches of spruce/fir exist, there is only one primary block of spruce fir forest in the analysis area. This

block is approximately 350 acres in size and is located in the upper reaches of Collins creek where it intersects Forest Road 512. Aspen is also minimal in the analysis area.

WYNDD and Forest Service records document two boreal owl sightings in the analysis area. One is located within the block of spruce/fir forest identified above. The other sighting occurs on the northern boundary of the analysis area and is adjacent to a 400 acre block of spruce/fir forest that is outside the analysis area boundary. Based on these observations and minimal suitable habitat, it is likely that boreal owls are absent from most of the analysis area except for the areas discussed above.

Three-toed woodpecker: The project area currently provides a relatively low amount of quality habitat for the three-toed woodpecker. Habitat capability modeling indicates that approximately 33 percent of the analysis area provides suitable habitat, but only 17 percent of the analysis area is made up of quality habitat modeled using habitat structural stages 4C and 5. Quality habitat resides in a band going east and west, primarily in the vicinity of the western portion of forest road 512. Additional field survey data indicates that newly regenerating stands have minimal snag retention, and most forested stands have low quality snags with small diameters. A history of fire suppression, timber harvest, and removal of hazardous snags has likely reduced the amount and quality of habitat available for this species within the analysis area. It should be noted that the Medicine Bow National Forest is estimated to provide a large amount of quality habitat (approximately 205,000 acres) in other areas of the forest. There has been one documented occurrence of three-toed woodpecker within the project area (1997).

Western boreal toad, wood frog, and tiger salamander: Amphibian species known to be present in the analysis area include wood frog and tiger salamander. It is likely that boreal toads are no longer present within the analysis area.

Boreal toads were likely historically present in the analysis area. WYNDD records observations of boreal toads nearby the analysis area in 1987, 1994, and 1996. Populations are mostly gone or strongly declining in the Southern Rocky Mountains, which is attributed to the affects and spread of Chytrid fungus throughout the region. This decline is not known to be related to habitat management or timber harvest. Amphibian surveys conducted in the project area have not located boreal toads and, over the past three years, only a handful of toads have been found in known breeding areas of the snowy range.

More detailed information regarding those species within or adjacent to the project area is contained in a Biological Evaluation, located at 2468 Jackson Street, Laramie, Wyoming, 82070.

Management Indicator Species (MIS)

MIS are defined as species that are selected for analysis because changes in their population indicate effects of management activities on the plant and animal community. The speciesí condition can be used to assess the impacts of management actions on a particular area.

MIS selected for this analysis include: Elk, mule deer, American marten, northern goshawk, boreal toad, and wood frog. American marten, northern goshawk, boreal toad, and wood frog were addressed under the Sensitive Species section above. Appendix C contains a table outlining all MIS on the Forest and reasons for why they were not analyzed in detail during this analysis.

Elk and Mule Deer: The project proposal occurs on spring/summer/fall habitat for both deer and elk. The analysis area does not contain winter range habitat for either species. Vegetation components such as grass/forb areas, forested hiding cover, and the amount of edge contrast are abundant, well distributed throughout the analysis area and provide moderate quality habitat. Habitat capability modeling which is based on habitat structural stages indicates that mule deer and elk habitat is at approximately 68 percent of its capability, and limited primarily by the amount and quality of available forage. Foraging areas are comprised primarily of natural openings in healthy conditions, and forested areas currently in shrub/seedling development from previous timber harvest. Open Road density (weighted based on the amount of travel on each road) is approximately 1.88 miles of road per square mile, which likely reduces the habitat effectiveness for elk. Based on the RIS database information and subsequent field surveys, hiding cover is currently being provided in 66 percent of the analysis area, is well distributed, and provides cover along 60 percent or more of the perimeter of natural and created openings. Forest Plan Standards and Guidelines for elk, mule deer, and associated habitat characteristics are currently being met.

3. Additional Considerations

Roads and Transportation:

An analysis of the current conditions of roads and their impacts to wildlife and habitat was conducted as part of the Collins Creek Roads Analysis, 2002. In summary, there are approximately 79 miles of existing road, many of which are closed, or get very little regular use. When adjusting road density for estimated use, there are approximately 1.8 miles of road per square mile, which is within forest plan standards and guidelines. Habitat for elk and mule deer is adequate despite the large number of roads because of substantial hiding cover, increased forage created by previous timber harvest, and limited traffic on many of the roads. Negative effects of existing roads likely include regular human disturbance to birds and other wildlife species dependant on riparian areas (most are roaded or ATV accessible), increased winter predation on prey species (related to snow compaction by snowmobiles), a decrease in large standing dead snags and cavities (firewood removal), and temporary disturbance to wildlife during timber harvest, hunting season, and recreational holidays. The additive effect of these disturbances to wildlife has not been locally quantified, but the Medicine Bow National Forest Roads Analysis (2001) suggests that these impacts are not substantial at a forest level. There are two blocks of land within the analysis area that are approximately 1200 feet or more from open roads and motorized trails which makes them more likely to act as a refuge for species sensitive to human disturbance. These areas include the south side of Lake Creek, and the south west side of Lake Mountain.

Neotropical Migratory Birds:

Neotropical migrants are those species that spend the nonbreeding season south of the United States, ranging to the central part of South America. While there has been a definite decline of certain song birds in eastern United States, the population status of western birds is less clear (Finch, 1991). Many possible factors for the decline in neotropical migrant populations have been identified. Some of these potential causes are related to conditions created through timber harvesting, while others are not. It is likely that a combination of factors is causing the decline.

G. Recreation

There are no developed recreation sites in the Collins Creek analysis area. However, due to its proximity to Wyoming highway 230 and Foxpark, Wyoming, the area is easily accessible and receives heavy dispersed recreation use year-round. Driving for pleasure with auto, motorcycle, and off-highway-vehicles; fishing; hunting; camping; hiking; snowmobiling, and exploring historic sites, parks, and meadows are the most prominent dispersed recreation uses. Most traffic on the roads in the area is to other recreation sites to the west and north. While recreation activities may be concentrated more intensively at other locations, the Collins Creek area provides many recreation opportunities and helps to disperse the recreation use across the Forest.

During the summer and fall of 1997, an intensive dispersed recreation campsite survey was conducted on about 75 percent of the Collins Creek analysis area. For each of the 46 sites found, a Frissell Class survey form was completed (see Table 6 below), and a picture was taken. Frissell Class condition includes data such as vegetation cover on the site, vegetation loss, mineral soil exposure, bare soil increase, tree damage, tree root exposure, development, and cleanliness. Frissell classes range from 1 to 5, with 1 indicating little disturbance. Each successive Class rating indicates increased environmental damage. According to Forest Plan direction (page III-23), sites with a Frissell rating greater than 3 need to be rehabilitated.

Table 6 - Dispersed Campsite Condition Survey Results

Frissel Class Rating	Number of sites
1	11
2	6
3	4
4	19
5	6

It should be noted that the Frissell Class form is subjective in nature. Because the information is recorded using visual estimates rather than scientific measurements, other information gatherers could have recorded the sites differently. Consequently, it is recommended that sites receiving a Frissell Class 4 or 5 should be revisited to evaluate the site-specific damage (if any) to other resources rather than closing all sites receiving a high rating. Closing these sites could displace campers to other non-impacted areas of the Forest.

During the winter months, snowmobile use in the Collins Creek area is heavy. Snowmobile use is accommodated by a snowmobile parking area located adjacent to Wyoming 230 at the Fox Park road junction. Although the parking area accesses two established snowmobile trails, snowmobile use occurs on the entire Collins Creek transportation system.

H. Visuals

The landscape in the Collins Creek analysis area is dominated by lodgepole pine forests and contains some smaller patches of Engelmann spruce-subalpine fir and non-forested cover types such as grass meadows and riparian corridors. Two arterial Forest roads, Platte Access Road (NFSR 512) and Dry Park Road (NFSR 517), pass through the analysis area. Several other collector and local roads and four wheel drive primitive roads provide access. There are several cabins on private land in the Lake Creek Resort area adjacent to NFSR 509.

Landscape changes attributable to the European culture began in the Collins Creek analysis area in the 1860ís due to railroad tie-hacking and prospecting for gold and copper. Miners and tie hackers removed timber of a specific size and quality for building materials, mine props, and railroad ties. Timber sales using clearcutting were introduced in the area during the late 1950ís

along with improved roads needed to remove the logs, as truck hauling replaced the log drives that used the streams for transport. Livestock grazing also caused some landscape alterations.

Visual Quality Objectives (VQO):

The VQOs for the Collins Creek area include retention, partial retention, and modification in foreground and middle-ground zones. Each visual quality objective describes a different degree of acceptable alteration of the natural landscape. The three VQOs are described below:

1. Retention: Management activities are not visually evident. Activities may repeat form, line, color, and texture that are normally found in the characteristic landscape.
2. Partial Retention: Management activities remain visually subordinate to the characteristic landscape. Activities may repeat form, line, color, and texture common to the characteristic landscape but changes in their qualities of size, amount, intensity, direction, pattern, etc., remain visually subordinate to the characteristic landscape.
3. Modification: Management activities may dominate the original characteristic landscape, however, activities of vegetative and landform alteration must borrow from naturally established form, line, color, and texture, and at such scale that its scenic characteristic meshes with natural occurrences within the surrounding area.

Forest Plan Direction for Visual Resource Management:

The Forest Direction and Management Area Direction in the Medicine Bow National Forest Plan (pages III-18 to III-19) provide management requirements for the visual resource. The desired condition for the visual resource as stated in the Forest Plan (pg. III-3) is to provide a characteristic landscape that satisfies the adopted visual quality objectives.

The adopted Visual Quality Objectives (VQOs) for the 7E Management Area within the Collins Creek area is Partial Retention within the foreground of arterial and collector roads and primary trails, and Modification in all other areas. The VQO is Retention in the 10C Management areas, Modification in 4B areas, and Partial Retention in 9A areas.

I. Heritage Resources

Evidence of historical use and occupation are common in the Medicine Bow Mountains of southeastern Wyoming. Numerous cabins, wagon roads, mining excavations (i.e., prospects) and other archeological resources occur across the Forest. Sites known to exist within the proposed Collins Creek Timber Sale area represent eight historic themes: Native American, early exploration, logging, mining, transportation, Civilian Conservation Corps and Forest Service Administrative sites, grazing, and townsites/settlements.

Archeological evidence suggests prehistoric Native American occupation of the vicinity began at least 11,000 years ago. Native American prehistoric and historic sites within the proposed timber sale area include short-term and seasonal camps, butchering sites, lithic procurement sites, trails, teepee rings, and wickiups. Several tribes have used the area, including the Eastern Shoshoni, White River Utes, Northern Arapahoe, Northern Cheyenne, and Ogalala Sioux.

The first documented Euro American presence in the area occurred in 1807 or 1808. After that, many other Euro Americans passed through the area. Known Early Exploration sites are rare in the vicinity of the proposed timber sale. They primarily consist of historic trails and wagon roads (some of which follow earlier Native American trails) and isolated camp sites.

As construction of the transcontinental railroad approached eastern Wyoming in 1867, it was recognized that the forests of southeastern Wyoming Mountains provided a ready supply of timber for crossties. Hand-hewn crossties were produced until 1940, when the portable sawmill provided a more efficient method for producing a specified standard crosstie in greater numbers. In the same year, crossties were no longer moved in the streams to the railhead, but transported by train or truck. Logging sites comprise the majority of cultural sites located in the proposed timber sale area. There are numerous recorded logging sites, isolated features, and artifacts in the proposed project area, including large company camps, small "bachelor" camps, roads and trails specifically built for logging activities, portable sawmill sets, and log and crosstie decks.

Construction of the Union Pacific Railroad promoted migration into and through the Wyoming Territory. The first documented gold strike in the area was in 1868, northwest of the proposed timber sale. Since then, there have been several short-lived gold rushes, and prospecting has continued to the present day in a variety of areas at various times. Mining sites are the second largest group of cultural sites identified within the proposed project area. There are several historical mining districts (i.e., Bramel, Douglas Creek, Keystone, and Pearson) that lie within or partially within the area. Cultural sites in the area include camps, shaft houses, milling sites, flumes, pipelines, prospect pits, and a variety of other mining-related features and artifacts.

Historic transportation routes not only connected people and resources together, they also helped create the major historic themes which form the unique character of the region. The first trails in the area were established by Native Americans and early Euro American explorers. The first road systems were constructed in the 1800ís in response to logging, mining, grazing, and other activities. Between 1907 and 1911, the Laramie, Hahns Peak, and Pacific Railroad was constructed along the east side of the Medicine Bow Mountains, providing access to many previously untapped resources and providing a more direct and convenient connection with suppliers in nearby and distant towns. Some of the early roads in the area include the Laramie-Douglas Road, Laramie-Encampment Road, Lewis Road, Albany-Walden Stage Road, Lake Creek Stage Road, and the Munson Trail.

The establishment of the Forest in 1902 and the Civilian Conservation Corps (CCC) in the 1930ís resulted in the construction of numerous guard and ranger stations, recreational facilities, and roads. Sites related to this theme are located adjacent to the analysis area and include the Fox Park Ranger Station and various erosion control improvements.

Many ranches were established in the area as a result of the Pre-emption Act, the Homestead Act, and the Stone and Timber Act; several of these are adjacent to the National Forest boundary. Following the establishment of the Medicine Bow National Forest, a regulated grazing program was implemented on National Forest System lands. Within the area, there are a variety of grazing related sites, including water developments and fence lines. Small communities and facilities arose in response to logging, mining, recreation, and transportation needs. Many of the small settlements have been abandoned, but several continue to provide services. Historic settlements within the area include Albany, Fox Park, and Lake Creek.

A Class III, 100 percent intensive, cultural resource inventory was conducted for the Collins Creek Timber Sale on the Laramie Ranger District. A total of 7,688 acres were intensively surveyed, and thirty-seven new cultural sites were discovered. Of the thirty-seven new cultural sites, four were considered to be eligible for inclusion in the National Register of Historic Places. Ten sites were not evaluated for cultural significance and must be treated as eligible sites until further documentation and evaluation can be completed. In addition to the newly discovered sites, there were twenty previously recorded cultural sites located in or near the timber sale area.

Of these, fourteen were considered to be eligible or were not evaluated. During the survey, one of the previously unevaluated sites was recorded and determined not eligible for the Register.

J. Economic and Social

Management of the Medicine Bow-Routt National Forests affects local economies, which is analyzed and disclosed in the EIS that accompanies the Medicine Bow Forest Plan. See the Economics section of Chapter 3 (p. III-5 to 28) of the Forest Plan EIS for a description of the employment composition and the affect or potential impact to each county due to management of the Medicine Bow National Forest.

The communities that may be most directly affected by this project include Albany, Woods Landing, Encampment, Mountain Home, Saratoga, and Laramie, Wyoming. All these communities are relatively stable at the present time. Laramie, however, is the only community with a highly diversified economy where processing logs for resale as wood products plays a smaller role. There is much greater dependence on logging in Encampment and Saratoga. All of these communities rely on tourism to some degree for their economic well-being, with towns of Albany, Woods Landing, and Mountain Home as the most heavily dependent on tourism.

Use of the project area and adjacent areas by those living in the local communities centers on recreation use, such as hiking, horseback riding, hunting, camping, driving for pleasure, and snowmobiling. In meeting these recreation needs, management of the Forest plays an important role in defining the fabric of the community. Additionally, the Forest is the reason that many residents live in these locations.

Results of the forest planning social impact analysis indicated that management strategies which use activities like logging to enhance wildlife habitat, recreation, and visual quality would have a net positive effect on social structure and long-term economic stability. The Annual Monitoring and Evaluation Report for the Forest Plan supports this conclusion. This report is available from the Forest Supervisor's Office in Laramie.

K. Range

The Collins Creek Timber Sale and Road Obliteration analysis area is in portions of the Boswell and Fox Park cattle allotments. The analysis area is partially within three pasture units; two on Fox Park (Lake Owen & Douglas Creek), and one on Boswell (Somber Hill). Only one cutting unit is in the Boswell allotment. There are four cutting units entirely within and two cutting units partially within the Lake Owen pasture of the Fox Park allotment. Twenty-two cutting units are entirely within and two are partially within the Douglas Creek pasture of the Fox Park allotment. Cutting unit locations and numbers vary by alternative (see Alternative maps 2-1 and 2-2).

Permitted livestock use on the Boswell allotment is from June 25th through September 30th. A total of 557 cattle (cow/calf pairs) are grazed in common by 4 operators with term permits. The current operators are Hohnholz Ranch, Elizabeth McCabe, James/Judith McLaughlin, and Simon Ranch. Permitted livestock use on the Fox Park allotment is from June 25th through September 30th. A total of 612 cattle (cow/calf pairs) are grazed by one operator, Federated Mutual Insurance. Both allotments are grazed with a deferred rotation grazing system. No stocking adjustments or adverse range conditions have been identified in AMPs for either allotment.

L. Plants

Extensive plant collecting and ecological studies have been done on the Laramie Ranger District.

A plant species list is available for review at the Laramie District Office. The Forest Plan does not list any plants as Management Indicator Species.

IMPORTANT NOTE: This section discusses R2 Sensitive Plants only. Recommendations were made in a separate document that discusses several Locally Rare Plants. Several of those Locally Rare Plants have recently been recommended for R2 Sensitive Plant Status including: *Carex paupercula, Eriogonum exifolium, Eriophorum gracile, Petasites sagitattatus, Salix candida,* and *Trichophorum pumilum*). A revised Region 2 Sensitive Plant Species list is expected to be released in December of 2002.

- The project area has no known or suspected occurrences, or potential habitat, for plant species formally listed or officially proposed under the Federal Endangered Species Act (WYNDD, 2002).
- No Region 2 Forest Service Sensitive plant species were previously known to occur within the Collins Creek analysis area (WYNDD, 2002).
- The project area has potential habitat for the following Region 2 Forest Service Sensitive plant species**:** *Cypripedium fasciculatum, Festuca hallii,* and *Machaeranthera coloradoensis* variety *coloradoensis* (WYNDD, 2002).

Clustered Ladyís Slipper Orchid (cypripedium fasciculatum): No populations of clustered ladyís slipper orchid are currently known to occur within project area or proposed harvest unit boundaries. Populations are known to occur in the vicinity of the planning area so the proposed harvest units are considered potential habitat for this species. Forested locations where roads are proposed to access harvest units are also potential habitat for this species.

The Medicine Bow-Routt N.F. and Region 2 represent a substantial outlying southeastern segment of clustered ladyís slipper orchidís distribution (Species Conservation Project Website). There are 26 reported populations of clustered ladyís slipper orchid on the Medicine Bow N.F. (WYNDD, 2002). There are an additional 79 populations reported to occur on the Routt N.F. (CNHP, 2002). Despite the availability of fairly extensive potential habitat, clustered ladyís slipper orchid populations are relatively infrequent and highly isolated across the landscape, and these populations frequently support low population numbers (7-50 plants/population).

Hall Fescue (festuca hallii): No populations of Hall fescue are known to occur within the project area or proposed harvest unit boundaries. One population is known to occur in the vicinity of the planning area so the forest edges and openings in and around proposed harvest unit boundaries are considered habitat for this species. Non-forested locations where roads are proposed in order to access units or skid timber are also potential habitat for this species.

Colorado Tansy Aster (machaeranthera coloradoensis variety coloradoensis): No populations of Colorado Tansy Aster are known to occur within the project area or proposed harvest unit boundaries. Populations are known to occur in the vicinity of the planning area. It is possible, but not likely that habitat exists within proposed harvest unit boundaries. Non-forested habitats adjacent to proposed harvest units and gravelly open locations where roads are proposed in order to access units or skid logs provide the greatest potential habitat for this species.

CHAPTER IV. ENVIRONMENTAL CONSEQUENCES

The following information was extrapolated from the specialist reports on file at the Laramie Ranger District. Please see these reports for more detailed information.

A. Vegetation

Direct and Indirect Effects:

All stands proposed for treatment in the Collins Creek watershed have been analyzed for attainment of Culmination of Mean Annual Increment (CMAI). Most of the stands meet or exceed the requirement. Exceptions to the CMAI requirement include the following:

- Harvesting for specific purposes such as thinning or other stand improvements.
- Salvage/sanitation harvesting stands damaged by fire, windthrow, or other event.
- Salvage/sanitation harvesting stands in imminent danger from insect or disease attack.

Generally, clearcutting is applied to tree stands that are mature, overmature, or have reached CMAI. However, clearcutting is proposed for some stands in the analysis area even though they have not reached CMAI. The trees in these stands are heavily infected with dwarf mistletoe and other diseases and are experiencing high mortality. Many of the trees are stressed and in poor health. Standing dead and down dead are common, as are trees with sparse and dead crowns. Natural regeneration is usually heavily infected with dwarf mistletoe and in a suppressed condition. Drought conditions may further weaken unhealthy stands. Based on experience and professional judgment, these unhealthy stands are in imminent danger of heavy loss due to intensification of disease and insect attack. Multiple use objectives would be better attained at this time by clearcutting these decadent stands and replacing them with healthy regeneration.

The clearcutting silvicultural system has been effectively used to regenerate young, disease-free stands. Clearcutting lodgepole pine stands infected with dwarf mistletoe restricts re-infection of the new regeneration from infected adjacent stands. The clearcutting method would move the currently infected stands most rapidly to disease-free conditions and is therefore the most optimal method for reaching the Forest Plan objective for these stands.

Effects Common to all Action Alternatives:

The vegetative effects from clearcutting include reduction in acres of dwarf mistletoe infection centers; reduction in acres of comandra blister rust and Western gall rust diseases; reduction in acres of unhealthy stands and replacement with young, healthy trees; removal of dead and dying trees; and production of sawlog, post, and pole products for local industry. Other effects include a change in stand age and size-class distribution and a meaningful progression towards the desired condition identified in the Forest Plan.

The Forest Plan standards restrict the size of clearcuts and created openings to less than 40 acres. The Proposed Action (Alternative 2) originally scheduled two units that would exceed this limit. In both cases, clearcutting was the desirable prescription from a disease (dwarf mistletoe) standpoint. Due to other resource considerations, however, both these units were adjusted to a smaller size as part of the mitigation measures, especially for watershed protection.

Overstory removal would be applied to two-storied stands having an overstory (scattered large trees) and an understory which is relatively disease-free or can be sanitized through post-sale treatment of the residual vegetation. The majority of the large diameter trees would be removed

with probable retention of occasional spruce or fir for species diversity. The vegetative effects of applying an overstory removal treatment include;

- reduced competition and increased growing space as the understory trees are released from competition from the large overstory trees,
- increased availability of water and soil nutrients for remaining trees,
- a reduction in size and age class for the remaining stand and reduction of the number of diseased and inferior quality trees,
- increased risk of logging damage to residual trees, increased opportunity to remove dead and dying trees, and reduced dwarf mistletoe spread from large trees to small trees.

Group selection is an uneven-aged regeneration method intended to treat stands where merchantable trees are arranged in a pattern of groups. Some of the stands within the Collins Creek watershed have this pattern of stands in two structural conditions; an overstory of scattered groups of lodgepole pine sawtimber, and understory groups of advanced lodgepole pine regeneration. In these stands, the mature and overmature sawtimber is infected with dwarf mistletoe, while the regeneration appears free of mistletoe or has a low level of infection that can be treated with post-sale release and weeding treatments. The scattered groups of sawtimber range in size from one-half acre to two acres. Timber harvest would remove the scattered groups of mature and overmature trees. This action would eliminate the spread of dwarf mistletoe from the overstory to the understory and release the advanced regeneration from competition.

Commercial thinning would be accomplished, where viable, in a few overly dense, small diameter stands that have not met CMAI. Thinning these dense stands would result in increased health and vigor of the remaining trees.

There are 537 acres of 15 to 30 year-old regeneration that needs to be thinned during the next 5 years to maintain or increase growth. Under both action alternatives, site-specific field data would be collected and stands that meet tree density and age criteria established for thinning would be treated. Final scheduling of thinning will be based on this inventory, and will be documented according to the NEPA requirements, including additional public involvement. The effects from pre-commercial thinning include increased growing space and reduced competition, increased availability of water and soil nutrients, a reduced number of diseased and inferior quality trees, retention of stands and their forested appearance, and improved health and vigor of remaining trees.

Timber Supply and Demand:

The analysis area is within the Northern Rockies Timbershed with an estimated overall demand for approximately 65.0 MMBF of sawtimber per year (Forest Plan EIS, page III-64). The sawtimber volume from the harvest of this project is estimated at 4.17 MMBF, which is only 6 percent of the total demand. The sale (or no sale) of the sawtimber from this project would have no significant impact on the timber supply or demand within the timbershed. In contrast, this project would help local timber industries to meet their needs for raw materials.

Dwarf Mistletoe:

The amount and intensity of dwarf mistletoe infection in the Collins Creek area was analyzed using a combination of RIS Data Base information and field reconnaissance data collected in 1977. Since dwarf mistletoe is the most significant factor affecting the growth and mortality of these stands, proposed stand prescriptions for both action alternatives are heavily weighted

towards treatments appropriate to address the level of dwarf mistletoe found in the stands. Lodgepole pine stands tentatively identified for treatment in the proposed Collins Creek Sale were observed to have relatively high levels of dwarf mistletoe. A certified silviculturist has reviewed and approved all timber stand prescriptions and has certified that all timber stands planned for clearcutting will be adequately restocked within a five-year period following harvest. This certification is based on the best information available, including field reconnaissance of stands, past and present research on lodgepole pine management, experience and knowledge of lodgepole pine regeneration on the Medicine Bow National Forest, and clear evidence of a successful natural regeneration program locally.

Table 7 ñ Dwarf Mistletoe Rating and Silvicultural Treatment for Alternative 2, Proposed Action

Dwarf mistletoe rating	Proposed Silvicultural Treatment					Total (acres)	Total (%)
	Clearcut * (acres)	Group Selection (acres)	Over - Removal (acres)	Shelter-Prep Cut (acres)	Comm. Thinning (acres)		
0	0	0	0	0	0	0	
0.1 - 1.9	75	0	39	40	0	154	32
2.0 - 6.0	148	94	27	0	18	287	59
DM Present - not rated	44	0	0	0	0	44	9
TOTAL	267	94	66	40	18	484	100

* Stands selected for treatment by clearcut were ground-verified to have relatively high levels of dwarf mistletoe as a selection criteria for inclusion in the sale.

Table 8 - Dwarf Mistletoe Rating and Silvicultural Treatment for Alternative 3, Partial Cut Emphasis

Dwarf mistletoe rating	Proposed Silvicultural Treatment						Total (acres)	Total (%)
	Clearcut * (acres)	Group Selection (acres)	Over - Removal (acres)	Sanit- and Salvage (acres)	Shelter-Prep Cut (acres)	Comm. Thinning (acres)		
0	0	0	0	0	0	0	0	
0.1 - 1.9	29	0	54	132	73	75	363	51
2.0 - 6.0	9	124	27	52	0	62	274	38
DM Present - not rated	53	30	0	0	0	0	83	11
TOTAL	91	154	81	184	73	137	720	100

* Stands selected for treatment by clearcut were ground verified to have relatively high levels of dwarf mistletoe as a selection criteria for inclusion in the sale.

Table 9 ñ Dwarf Mistletoe Rating and Silvicultural Treatment for Alternative 4, Wildlife Mitigation

Dwarf mistletoe rating	Proposed Silvicultural Treatment					Total (acres)	Total (%)
	Clearcut * (acres)	Group Selection (acres)	Over - Removal (acres)	Shelter-Prep Cut (acres)	Comm. Thinning (acres)		
0	0	0	0	0	0	0	
0.1 - 1.9	75	0	39	20	0	134	32
2.0 - 6.0	147	94	27	0	18	286	68
DM Present - not rated	0	0	0	0	0	0	0
TOTAL	222	94	66	20	18	420	100

* Stands selected for treatment by clearcut were ground verified to have relatively high levels of dwarf mistletoe as a selection criterion for inclusion in the sale.

Tables 7 through 9 show that dwarf mistletoe exists as a significant infection in all areas proposed for treatment under the three action alternatives. Inventories have also frequently found Western gall rust and comandra blister rust diseases in these stands. In both action alternatives, silvicultural treatments address the current stand conditions, with the ultimate

purpose of reducing the potential for significant loss from forest pests in the future. When considering these disease problems and the fact that the majority of timber stands have reached or surpassed physical maturity, it is not surprising that so many of them are currently in poor condition. The proposed Collins Creek Timber Sale would improve stand health by removing unhealthy trees and regenerating young healthy trees to replace them. Biodiversity would be enhanced by creating a better mix of stand ages and conditions.

Alternatives 2 through 4 include even-aged and uneven-aged silvicultural techniques for regenerating stands and completing intermediate harvests. Each action alternative works towards the desired forest condition at a different rate. A regeneration harvest method such as clearcut would create an immediate change to successional stages by converting pole, mature or overmature stages to a regenerated stand in an early seral (i.e., grass/forb) stage. The overstory removal prescription would immediately remove the infected mature or overmature overstory and preserve the established understory of saplings. The sanitation and salvage prescription is designed to remove infected and high risk trees of all ages and sizes, while preserving the healthiest trees.

Thinning is designed to remove trees of high risk, slow growth, and poor form characteristics from an overstocked stand while retaining the healthiest trees for the future. The stands in the Collins Creek analysis area scheduled for uneven-age management currently exist as a mosaic of two or more age classes occurring in groups of the same age class. The group selection method would be used to remove some of the groups of mature and overmature trees while leaving the poles and saplings. As time passes, this pattern would be continued with a combination of commercial thinning and a final harvest at rotation age.

Fire and Fuels:

Climate in the area is characterized by long snowy winters and short cool summers. Normal weather patterns include heavy snow accumulations, early spring rains, rainy conditions from mid July through early August, and long dry periods in September and October. Prior to the turn of the century, fires were allowed to spread mostly unchecked. In the early 1900ís, aggressive fire fighting limited the size and intensity of free burning fires. This slowed the natural disturbance created by fire and allowed natural fuels to accumulate.

Timber harvesting would temporarily increase the amount of fine fuels. These fuels respond quickly to changes in moisture, so there would be a short term increase in risk of fire ignition. Fine fuels also rot quickly and are incorporated into the duff layer. The Proposed Action would not increase fire risk and fuel hazard significantly, since post-treatment site preparation would meet Forest Plan standards. Primarily due to the emphasis on partial harvesting, Alternative 3 would create a higher risk fuel profile over a larger acreage than the Proposed Action. It would, however, still meet Forest Plan standards. The period of higher fire risk is expected to be less than five years. The objective of fuels management and fire protection is to identify, develop, and maintain a fuels profile that will facilitate a cost-effective fire management program. Records of past fire disturbance suggest that fire may have occurred at intervals of 100 to 300 years. Recent inventories indicate there are few stands more than 300 years old in the area.

Cumulative Effects Common to all Action Alternatives:

Clearcutting under the action alternatives would introduce additional openings and edges in the watershed. The White Swan and the Bird Creek timber sales are located in drainages adjacent to Collins Creek. The proposed White Swan timber sale, located to the west of Collins Creek was prepared for sale in 1996 but received no bids. Whether or not this sale will be harvested is

unknown at this time. The proposed Bird Creek Timber sale was scheduled for layout and sale in the watershed north of Collins Creek in 1999, however, it has since been dropped. These sales occur in watersheds tributary to Douglas Creek, and their effects were considered in the analysis.

District records verify that areas harvested more than 5 years ago are certified as fully restocked with seedlings and saplings. Many stands harvested 15 years ago have been pre-commercially thinned to recommended stocking levels or are scheduled for thinning in the near future.

Data gathering for a potential Spruce Gulch Timber Sale began in 1999. Conceptual designs and plans for this project will not begin until on-the-ground data has been gathered and analyzed. This project would occur in a watershed tributary to Douglas Creek south of Collins Creek.

Alternative 1 - No Action:

Forest vegetation would continue to change by natural succession. Individual tree mortality would increase as dwarf mistletoe, Western gall rust, and comandra blister rust infections increase. Trees already stressed by disease would be increasingly susceptible to insect infestations and infection by other pathogens. Individual tree growth can be expected to decline. Pole stands would become increasingly stagnated as competition for moisture and minerals inhibit growth. As mature and overmature stands continue to age and die, fuel loading would increase and some stands would shift towards more shade-tolerant species such as Engelmann spruce and subalpine fir. Entire stands or portions of stands may be replaced over time by fires or insects. Taking No Action at this time would forego the opportunity to regenerate decadent, unhealthy stands; to thin stagnated stands; to release young, healthy stands; and to create greater age-class diversity. The selection of this alternative would not assist the Forest Service in achieving the desired future conditions described in the Forest Plan.

Cumulative Effects

Managed and unmanaged forest acreage will probably remain mostly unchanged unless a major natural event occurs. The overall health and condition of stands in the older age classes will continue to deteriorate. More trees will become susceptible to insects, disease, and weather related problems. Overstocked stands will become more stagnant and weak, and natural tree mortality will increase. The additional dead trees (standing and down) will increase the amount of available fuels. Some natural regeneration will occur in places where trees have died. The current level of dwarf mistletoe infection will continue to increase without any man-made alteration or fire event. Timber stands previously treated may or may not remain physically healthy depending on age, condition, and previous treatment.

Alternative 2 - Proposed Action:

As displayed in Table 7, this alternative would treat forest vegetation with a variety of harvest methods. In addition, there would be 537 acres of pre-commercial thinning during the next five years that would improve the growth rate and health of young stands that are currently stagnated.

Cumulative Effects

Historic tie-hacking and the six timber sales in the past 25 years included partial cut (1,451 ac.), overstory removal (1,156 ac.), and clearcut (544 ac.) harvesting which caused the current mixture of structural stages, health, and condition. The Proposed Action currently under consideration would treat additional stands with clearcut (267 ac.), group selection (94 ac.), overstory removal (66 ac.), shelterwood-prep cut (40 ac.), and commercial (18 ac.) and pre-commercial thinning (537 ac.) prescriptions. The combination of the proposed treatments and past sales would move lodgepole pine stands in the 7E Management Area within the Collins

Creek watershed closer to conditions described in the Forest Plan. The proposed treatments will improve the health of existing stands, reduce the acreage of unhealthy stands, eliminate dwarf mistletoe infection centers, and reduce the rate of dwarf mistletoe spread in some stands.

Alternative 3 - Partial Cut Emphasis:

Under this alternative, harvest methods other than clearcutting are emphasized (see Table 8). In addition, 537 acres would be pre-commercial thinned. Stands receiving similar silvicultural treatment and the effects of these treatments were described previously under Alternative 2.

The sanitation and salvage treatment would involve the removal of an average of 35 percent of the basal area of mature and overmature lodgepole pine stands. These stands consist of large diameter trees with scattered pockets of lodgepole pine regeneration. In the lodgepole pine stands selected for this type of treatment, dwarf mistletoe is prevalent in the overstory trees but is considered manageable in the young regeneration. Trees selected for removal would include those with dwarf mistletoe, sparse and fading crowns, comandra blister rust, Western gall rust, and those with poor quality form.

The shelterwood preparation harvest would be applied to single-story stands of large diameter lodgepole pine with little or no regeneration. This initial entry is a preparatory cut that resembles the first step of a three-step shelterwood and approximately 35 percent of the basal area would be removed. The trees to be removed should include trees from each crown class in the overstory so that the stand is not susceptible to windfall. Trees with sparse and dying crowns, poor quality trees, and trees infected with dwarf mistletoe, Western gall rust, and comandra blister rust would be removed. Second and third entries would occur 20 and 40 years later.

Effects of this treatment include increased growing space and reduced competition for remaining trees, increased availability of water and soil nutrients for remaining trees, reduced numbers of diseased and inferior quality trees, and increased potential skidding damage to residual trees. Additional effects are increased risk of wind damage to residual trees, increased salvage opportunities to remove dead and dying trees, reduced spread of dwarf mistletoe from overstory to understory, and production of sawlog, post, and pole products for local industry.

Cumulative Effects

The cumulative effects of Alternative 3 are similar to Alternative 2 in that both would move the lodgepole pine stands in the 7E Management Area of the Collins Creek watershed closer to conditions identified in the Forest Plan. Alternative 3 would emphasize partial cutting over clearcutting and would include 234 more acres of timber harvest than Alternative 2. Partial cut harvesting would remove the unhealthiest trees and improve the general condition of the stands treated. However, the more open stand conditions created by partial cutting provide favorable conditions for the spread and intensity of dwarf mistletoe. Although the lodgepole pine stands selected for this treatment were closely inspected to verify that current levels of dwarf mistletoe are within manageable levels, the disease is expected to persist and increase as the stands age. Infection levels and the resultant growth reduction are expected to intensify as the stands approach rotation age. Therefore, while growth rates may be considered acceptable, total growth over time is expected to decrease. In summary, Alternative 2 does more to move lodgepole pine stands in the watershed towards desired forest conditions in the Forest Plan and to improve the overall health and condition of stands than Alternative 3.

Alternative 4 ñ Wildlife Mitigation:

The proposed treatment of the Collins Creek Watershed by Alternative 4 is very similar to that of

Alternative 2. Both alternatives treat forest vegetation with a variety of harvest methods. The main difference between the two alternatives is the proposed acres of treatment by similar methods. Alternative 4 would treat the watershed with 222 acres of clearcut, 94 acres of group selection, 66 acres of overstory removal, 18 acres of commercial thinning, 20 acres of shelterwood and 537 acres of pre-commercial thinning.

Clearcutting would be prescribed for stands that have generally met CMAI and other stands that are close to reaching CMAI that are heavily infected with dwarf mistletoe, are close to or beyond maturity and are in poor condition. Clearcutting has been determined to be the optimum harvest method for regenerating unhealthy lodgepole pine stands and for meeting both objectives and requirements of the Forest Plan. This is in accordance with the National Forest Management of 1976, Sec 6(g)(3)(F)(i), 6(m)(1,2). Clearcutting is scheduled for lodgepole pine stands that are mature or overmature and are infected with either D.M., comandra blister rust, Western gall rust or all three diseases. In addition, these stands are heavily populated with dead and dying trees having unhealthy crowns.

Effects from clearcutting include: reduction in acres of tree stands infected with D.M., comandra blister rust and Western gall rust, removal of dead and dying trees, creation of conditions that are optimal for the natural regeneration of lodgepole pine to become a new stand within five to ten years, and creation of new forage areas for wildlife and transitional range for livestock. In addition, provide an increase in water yield from the watershed through the additional collection of snow, reduce overall stand ages, change size class distributions, change current conditions of successional stages of vegetation to work towards the desired forest conditions described in the Forest Plan and provide a necessary supply of sawlog, post and pole products for local markets.

Overstory removal would be applied to two-storied stands having an overstory of scattered large trees and an understory of relatively disease-free regeneration. The majority of the large diameter trees would be harvested except for occasional, healthy spruce or fir to be left for species diversity. The effects of this treatment include: release of understory trees from competition with large trees and improved growing space, increased availability of water, sunlight and soil nutrients for understory, improved opportunity for snow deposition for increasing water yields, creation of new forage areas for wildlife and transitional range for livestock and reduction of stand ages. In addition, this type of harvest would: change size class distributions, reduce the number of diseased and poor quality trees, increase the susceptibility of logging damage to residual trees, provide wood products for local demands, improve general health of remaining trees by removing diseased and unhealthy trees, and change current conditions of successional stages of vegetation to work towards the desired forest conditions described in the Forest Plan.

Group selection is an uneven-aged regeneration method intended to treat stands where trees are naturally arranged in a pattern of groups. A few of the stands within the Collins Creek Watershed have this pattern. These stands generally consist of two stories; an overstory of scattered groups of LP sawtimber and an understory of advanced LP regeneration. Dwarf mistletoe is found in much of the overstory while the understory is relatively mistletoe free. The groups of sawtimber are scattered and range in size from one-half to two acres. Timber harvest would concentrate on the removal of the unhealthiest groups of mature and overmature sawtimber. This treatment would reduce the spread of D.M. from the overstory to the understory and release the understory from competition with the overstory. In addition, harvest would: increase growing space for remaining trees, change size class distribution, reduce age classes, provide wood products to meet local demands, improve stand conditions to allow for increased

snow deposition and subsequent increased water yields, and change current conditions of successional stages of vegetation to work towards desired forest conditions described in the Forest Plan.

Commercial thinning would be done in small diameter lodgepole pine stands that have not met CMAI. Thinning would improve health and vigor, reduce competition for water, soil nutrients and sunlight, and increase growing space for all remaining trees. This treatment would also reduce stand susceptibility to insect and disease attack, provide wood products for local industry, improve ground conditions for increasing forage production and improve opportunities for snow deposition to increase water yields.

During the next five years, pre-commercial thinning needs would be assessed on 537 acres of 15-25 year old lodgepole pine regeneration. Field data would be collected on stand density and age, and based on this information, decisions would be made on which stands are ready for pre-commercial thinning. Effects from thinning include: improved growing space for remaining trees, reduction in individual competition, increased availability of water, soil nutrients and sunlight for remaining trees, and reduced number of diseased and inferior quality trees. Other effects include: improved health and vigor of remaining trees, improved wind firmness of trees, and increased opportunity for removal of dead and dying trees.

Cumulative Effects

The cumulative effects associated with Alternative 4 would be similar to the Proposed Action.

B. Transportation

Direct and Indirect Effects - Road Densities:

Alternative 1 - No Action:

Adjusted open road density would remain the same at 1.88 miles per square mile.

Alternative 2 - Proposed Action:

Under this alternative, 0.7 miles of new road would be constructed and 1.4 miles of existing road would be reconstructed. Since the new road construction would be closed to motorized traffic after harvest, this road would not affect the open road density. About 7.4 miles of road would be decommissioned and rehabilitated, mostly two-track roads with very small amounts of traffic. Therefore, the adjusted open road density would be lowered only slightly from the existing 1.88 miles per square mile to 1.86 miles per square mile.

Alternative 3 - Partial Cut Emphasis:

Approximately 1.6 miles of existing road would be reconstructed with no new construction planned. The same 7.4 miles of two-track roads as indicated for Alternative 2 would be decommissioned for this alternative. The adjusted open road density for this alternative would be the same as Alternative 2, at 1.86 miles per square mile.

Alternative 4 - Wildlife Mitigation:

Under Alternative 4, 0.7 of new road would be constructed and 1.4 miles of road would be reconstructed. The new road would be closed to motorized traffic after harvest; this road would not affect the open road density. About 10.1 miles of road would be decommissioned and rehabilitated, mostly two-track roads with very small amounts of traffic. The adjusted open road density would be lowered from the existing 1.88 miles per square mile to 1.80 miles per square mile.

Cumulative Effects

The transportation system in and around the area is generally showing a slight decrease in the amount open to motorized travel. If traffic volumes remain at current levels, the decreased miles of open road would result in a slight increase in traffic volume on the remaining open roads.

Short term effects of timber harvesting include increased truck traffic, increased dust production, and increased road maintenance activities.

The decommissioning of NFSR 575.AB is in direct opposition to the 1984 Lewis Creek Transportation System Analysis which recommended that NFSR 575.AB be reconstructed and extended northward to access timber on the east side of Muddy Mountain (T14N, R78W, Section 21). Since then, alternate access to that timber was analyzed and planned as part of the 1997 Fall Creek/Bird Creek Timber Sale Environmental Assessment.

If Alternatives 2 or 4 are selected, a new road would be constructed to access timber units 31 and 32 (T13N, R78W, Section 4). Even though the road would be closed to motorized traffic after the sale, it could be reopened at a later date and extended further northward into Section 4 to access additional timber for proposed projects in the future.

C. Soils

Direct and Indirect Effects:

Studies on the Fraser Experimental Forest in northern Colorado showed that construction of a timber sale road system and associated harvesting, "caused little erosion, with no apparent reduction in water quality (USDA 1985; GTR RM-118).î Conservation measures (such as culverts and adequate road surface drainage) were implemented on the harvest area. The increased sediment yield during actual road construction "decreased rapidly after logging despite continuing increase in runoff after timber harvest (USDA, 1985 op cit).î

In *Effects of Timber Management Practices on Soil and Water* (DeBano, et al., 1989), some direct and indirect effects of timber harvests are discussed. "The cycling of nutrients is clearly linked with the hydrologic cycle. As with water, the nutrient cycle of forests undergoes alteration when management practices interrupt recycling practices." The amount of soil erosion, if any, is largely determined by cutting methods and mechanized equipment, kinds and steepness of the soil units, weather patterns, and BMPs (Best Management Practices) utilized during and after the disturbance. Roads constructed within a sale area show greatly reduced rates of erosion and sedimentation within 5 years after a sale. Best Management Practices help to ensure that erosion from cutting units or roads is not excessive. DeBano (et al., 1989) summarized that, "effective procedures ... are available ... that minimize sediment from harvesting practices, and most management goals can be achieved by implementing the best management practices concept."

Another study in a Montana forest found that, "with the most intensive logging method (clearcutting), less than 0.25 percent of the total content of biologically essential cations in the effective root zone were removed with bark and wood (Stark, 1979).î Decaying woody debris serves as the primary food base for many decay fungi, which serve as nutrient fixers (sinks) and may reduce mineral nutrient losses.

Post-disturbance conditions can approximate pre-harvest levels of nutrients and cycling. Coarse woody debris decomposes slowly over time and contributes to long-term soil nutrient levels. With the possible exception of potassium, "the forest floor is the major biomass compartment

accounting for the immobilization of the nutrients (N, P, Ca, Mg) ... at least during the first 40-80 years of stand development (Pearson, et al., 1987).î Forest litter (large and small debris) plays a major role in the overall retention of the nutrients. "Silvicultural practices that lead to significant reductions in the amount of woody detritus may be detrimental to long-term site productivity (Knight, 1987).î Coarse woody debris (>3 in.) generally releases nutrients at much slower rates than fine litter. The slower release allows nutrients to be retained in the ecosystem until tree regeneration and production recovers to approximate pre-harvest levels. Coarse woody debris also potentially stores a great deal of carbon within the forested ecosystem (Harmon, 1991).

After the site preparation and fire hazard reduction treatments are completed, it is imperative to leave sufficient large woody material on the site. As mentioned earlier, residue has several properties important for maintaining forest productivity. Graham, et al. (1991) recommends leaving a minimum of 10 to 15 tons per acre of large woody material after timber harvesting and other site treatments. These recommendations are general and would be refined as research makes them more site-specific (Graham, et al., 1994).

Various studies of the effects of timber harvesting activity on soil compaction have been completed in the United States. Differing results and conclusions have been reached, depending on the scope and location of the particular study. Some suggest that soil compaction may heal itself within 15 years or less. Other studies are inconclusive about duration of soil compaction impacts, but point out that the effects may continue beyond 30 years. Soil types, soil moisture, harvest equipment, and soil depth are parameters that affect the amount and duration of compaction. Davis (1992) suggests that repeated mechanized entry into a forested stand probably increases the cumulative area of higher bulk density. Not re-entering forest stands for 20 years (or longer) would tend to reduce cumulative effects of soil compaction and disturbance.

In west-central Idaho, undisturbed soils were compared to those on harvest area skid-trails. The soils were both from granitic and volcanic parent materials. The granitic soils in the study may be compared to some of the soils encountered the Medicine Bow National Forest. On granitic soils, 10 to 15 years after harvest, the soil surface had returned to acceptable levels of compaction. At all soil depths tested (2, 6, and 12 inches), the soils had returned to acceptable levels of compaction within 15 to 25 years after harvest. At 23 years post-harvest, only the 2 inch depth soil bulk densities had returned to undisturbed values (Froehlich, 1985). This study was done on skid trails, where typically more compaction is expected due to the high use.

There is a strong suggestion of a relationship between the percentage of area detrimentally compacted and overall changes in average bulk densities (Davis, 1992). Some studies, such as Wert (1981) in western Oregon, have linked skid road compaction with decreased soil productivity. The western Oregon study was conducted in a Douglas-fir zone and showed, "trees growing in the skid trails took 4.1 years longer to reach breast height than those growing in the undisturbed areas (Wert, 1981).î This study was conducted in a different climate than Wyoming, but it does point out some harvesting effects on soil productivity.

The *Soil Management Handbook* (FSH 2509.18 R2, 1992) lists soil bulk density increases greater than 15 percent as detrimental compaction (USDA, 1992). It is believed that an increase of 15 percent or more in soil bulk density would represent a loss of soil productivity. The Handbook (Chapter 2) also has soil quality monitoring standards for soil disturbances, standards for detrimental compaction and detrimental puddling, and other standards. Standards and Guidelines in the 1985 Medicine Bow Forest Plan require minimizing soil compaction by reducing vehicle passes, or skidding on snow or frozen or dry soils conditions.

Effects Common to All Action Alternatives:

Under both action alternatives, harvest acres range from about 485 to 719 acres of sawtimber and poletimber-size trees. These proposals also include from 0 to 0.7 miles of new specified road construction. There are also proposals to decommission roads, including some within the proposed timber sale area. The road obliteration projects would result in a small amount of short-term disturbance, however, the obliterations would reduce disturbance in the long term. Both action alternatives would meet the Forest Plan standards and guidelines for the soil resource, with given mitigation measures.

Alternative 1 - No Action:

No further effects on the soil resource would occur since no disturbance such as road or timber harvest activities would be implemented. A discussion of the existing watershed condition can be found in the Hydrology section. The benefits from road closures and maintenance associated with a timber harvesting project would not occur.

Alternative 2 - Proposed Action:

Approximately 485 acres would be affected within the cutting units of the Collins Creek timber sale. Impacts to the soils resource caused by the Proposed Action would largely be due to the associated cutting units and the mechanized equipment entry. Direct effects include the potential for soil compaction and displacement and loss of soil productivity from the temporary roads or skid trails (short term effect). Indirect effects include short-term decreases in soil productivity within the cutting units and in association with newly disturbed roads or skid trails.

Under this alternative, 0.7 mile of new road would be constructed. The road would affect the soil resource by reducing soil productivity. Many of the effects of roads occur during the first years immediately following construction or reconstruction. When the closures are implemented and revegetation occurs, the soil productivity would be restored to near pre-harvest level. DeBano (1989) and USDA (RM-118, 1985) discuss the effects of roads on the soil and water resource. There would be about 7.4 miles of roads decommissioned with this alternative. This would reduce the potential for sediment and return the roads to productive forest land.

Where roads cross or otherwise impact streams, mitigation measures, such as those discussed in *Watershed Conservation Practices Handbook* (WCP) and the *Packer's Guide* need to be implemented. Mitigation measures may include restricting operations to frozen soil (winter operations), buffer strips, avoidance, stabilized fill slopes, and Forest Service location of culverts. The Proposed Action does not constitute a detriment to the soil resource.

Alternative 3 - Partial Cut Emphasis:

Approximately 719 acres would potentially be affected by the Collins Creek timber sale. Harvest prescriptions such as clearcutting, overstory removal, commercial thinning, sanitation and salvage, group selection, and shelterwood would be the treatment methods. Under this alternative, the use of mechanized equipment for harvesting and the more frequent re-entry interval would affect the soil resource. Direct effects would include potential soil compaction and displacement and short-term loss of soil productivity due to the temporary roads and skid trails. Indirect impacts include probable short-term decrease in soil productivity within the cutting units and in association with newly disturbed roads or skid trails.

Many public forestry agencies have shifted from even-aged to uneven-aged management, primarily because of the public perception that uneven-aged management is less damaging to the environment, better for wildlife, and would result in a more aesthetically pleasing landscape.

Many forest structural attributes are retained with uneven-aged management because fewer trees are cut at one time in a given area. Operations such as weeding and thinning, however, are necessary to allow reasonable growth of replacement trees. Harvey et al. (1994), stated that with uneven-aged management, the potential for soil damage increases. With fewer trees removed over larger areas, the use of ground-based equipment is mandatory to avoid the excessive cost of other equipment that might have less effect on the soil resource.

Proper implementation of the uneven-aged silvicultural method requires entries into the stand approximately every 20 to 30 years to remove mature trees and stimulate regeneration. With clearcutting, only one entry for harvest occurs at the end of the rotation, which is 90 to 140 years (Medicine Bow Forest Plan, pages III-44 and 45). With uneven-aged management, the frequent entries with heavy equipment create a greater potential for soil compaction. This increased probability of excessive soil damage threatens long-term wood production. Short and long-term growth reductions from traffic-induced soil compaction and soil displacement are expected.

While not all of the acres harvested in this alternative would be accomplished using uneven-aged management with tractor logging, there is an increase of about 60 acres (of group selection) compared to the Proposed Action.

There would be about 7.4 miles of roads decommissioned in this alternative which would reduce potential sediment source and return the road acres to a forest landscape. Approximately 0.7 miles of permanent road would be constructed.

Mitigation measures would need to be implemented where roads cross streamcourses. Appropriate mitigations are listed in the *Watershed Conservation Practices Handbook* and the *Packer's Guide*. Mitigation measures may include frozen soil (winter) operations, buffer strips, avoidance, stabilized fill slopes and culverts at stream crossings.

With the proper mitigation measures, this alternative does not constitute a detriment to the soil resource. Establishing main skid trails approximately 100 feet apart would keep the land area in skid trails to about 11 percent (Garland, 1997). The Regional standard for the maximum amount of disturbed area is 15 percent.

Temporary and permanent roads to be constructed could potentially violate Forest Plan standards. The standards and guidelines can be met if prescribed conservation measures are implemented in any of the alternatives. Sources discussing conservation measures (Best Management Practices or BMPs) include the *Watershed Conservation Practices Handbook*, the *Packer's Guide*, and the Wyoming Forestry Best Management Practices. Road construction across streamcourses must meet guidelines found in the riparian area (Management Area 9A) direction of the Forest Plan. Monitoring during and after harvest operations would be needed to verify compliance with water quality constraints and soil standards and guidelines. Residual large and small woody debris left within clearcut units would keep soil erosion within tolerance levels and help improve long-term soil nutrient levels. Temporary roads would be closed or otherwise rehabilitated as specified in the Forest Plan. Drainage for these roads should be designed according to the *Packer's Guide*, as specified by the Plan.

Alternative 4 - Wildlife Mitigation:

Under this alternative there would be approximately 420 acres of harvesting with the Collins Creek timber sale. The effects would be similar to the Proposed Action.

Cumulative Effects

Cumulative soil erosion has been intensively documented during research. Soil erosion studies in northern California concluded that, "... most erosion occurring on timber harvest areas was due to large mass wasting found on a small fraction of the harvest sites (Rice, 1991).î The study further suggested that relatively few (logging or road) sites account for most of the erosion; therefore, identifying, avoiding, and mitigating these sites is the key to reducing erosion on a cumulative basis. Although the climatic and environmental conditions for the California study differ from the conditions on the Medicine Bow National Forest, the study yields some simple insights about erosion from timber harvest activities. These conclusions are applicable to the proposed Collins Creek sale, which if implemented, would avoid excessive soil erosion by not disturbing areas predisposed to mass wasting.

Repeated harvest activity within the same site (or cutting unit) can lead to detrimental loss of topsoil or excessive compaction and displacement. Medicine Bow National Forest standards and guidelines call for minimizing soil compaction (indicated by a 15 percent increase in bulk density) by reducing vehicle passes and skidding on snow or frozen/dry soil conditions. Harvested stands would not be re-entered for 20 years or more, therefore cumulative compaction and displacement would be minimized.

New road construction, both temporary and permanent, can be considered cumulative in nature, especially if roads are not properly drained or are constructed in unstable locations. By using proper BMPís in any new road construction, cumulative effects on soil productivity will be minimized. Erosion from road construction also decreases with time. Within 5 years after a sale, roads in the sale area show greatly reduced erosion and sedimentation rates.

D. Hydrology

Direct and Indirect Effects:

During project scoping and analysis, several water resource issues arose. Internal issues centered on existing channel conditions in lower Lake Creek, which is the main drainage in the analysis area. Historic placer and hydraulic mining are responsible for various impacts in the watershed. These impacts are probably responsible for lower Lake Creek's "fair" channel stability rating (using the Pfankuch Channel Stability Index). The lack of channel stability also raises concerns about potential water yield and sediment increases from the proposed project. This situation was addressed by alternative design, watershed rehabilitation, and mitigation measures.

Concerns from external scoping included water quality and quantity, and fish habitat. The water quality concerns were not well defined in the scoping comments, but concerned parties suggested activities could impair the designated beneficial use. Some commentors suggested that activities would enhance "favorable conditions of flow." They felt timber harvest could add flow to the North Platte River drainage and help support sensitive species downstream in eastern Nebraska. Some people advocated structural improvements, in order to trap sediment and support fish.

Internally generated concerns included channel stability, which was addressed by limiting timber harvest (and therefore water yield increases) to levels appropriate for present channel conditions, as determined with stream surveys. Although this would limit sediment production and help retain existing water quality and beneficial uses, it would not produce the type of water yield increase needed to help support sensitive species downstream. Although water yield increases are expected from any vegetation removal, maximum levels could not be reached due to channel stability concerns. Structures in the main stream are also precluded, since channel stability must

be high to support any hydrologic controls. Instream reservoirs are not practical due to maintenance needs and the amount of riparian disturbance associated with them.

The Equivalent Clearcut Acreage (ECA) and disturbed area for each watershed was determined for each alternative. The Alternative 1 (No Action) results are the same as those identified for the existing conditions. Tables 10 and 11 display ECA (existing conditions plus the Proposed Action), disturbed area, and the percent disturbance for Alternatives 2 and 3. In both alternatives, approximately 7.4 miles of road would be decommissioned to keep water yield and sediment production within threshold levels. Including new road construction, this would result in a net reduction of 6.4 miles, or approximately 15 acres of road surface. This would reduce the total ECA for the watershed to 1,644 acres and 1,603 acres, respectively for alternatives 2 and 3. These acreages were used in the HYSED model to estimate sediment production. While modeled values would change slightly under Alternative 4, there would be no significant change in conditions observed in the subject watersheds as a result of timber sale modifications. No additional ECA or HYSED analysis is recommended to address the minor differences in effects for Alternative 4.

Table 10 - Equivalent Clearcut Acreage and Disturbed Area for Alternative 2, Proposed Action

Watershed ID	Harvest ECA	Total ECA	% ECA
Upper Lake Creek	79	337	11
Collins Cr./Lincoln Gulch	81	510	15
Hay Creek	113	234	20
Lower Lake Creek	62	395	13
Unnamed (Sawmill Creek)	25	183	18
TOTAL [avg.]	360	1,659	[14]

Table 11 - Equivalent Clearcut Acreage and Disturbed Area for Alternative 3, Partial Cut Emphasis

Watershed ID	Harvest ECA	Total ECA	% ECA
Upper Lake Creek	115	373	12
Collins Cr./Lincoln Gulch	65	494	15
Hay Creek	50	171	15
Lower Lake Creek	62	395	13
Unnamed (Sawmill Creek)	27	185	19
TOTAL [avg.]	319	1,618	[14]

Mitigation Measures:

As discussed above, approximately 7.4 miles of road would be decommissioned and approximately 1 mile of new road would be constructed under Alternatives 2 and 4. Under Alternative 4, 10.1 miles of road would be decommissioned. Several roads and nonsystem routes would be decommissioned and rehabilitated. These include NFSR 575.AB, NFSR 527.DA, and non-system routes 3432, 3434, 3435, 3440, 5127, 3441, and 3433. The resulting net reduction of 6.4 miles (approximately 15 acres of road surface) would reduce the total ECA for the watershed to 1,644 acres. This number was used in the HYSED model to estimate sediment production.

For the Proposed Action (Alternative 2), ECA modeling suggests varying disturbance levels, ranging from 11 to 20 percent of watershed area, for the 5 subwatersheds. For the entire analysis area (the 6th-level watershed) ECA/disturbed area is estimated at 14 percent (post-harvest).

Upper limits for ECA depend on stream type and condition. Most of the subwatershed streams are Rosgen B3/B4 types, with a moderate to high resistance to management (ECA upper limit of

20 to 30 percent). However, the lower Lake Creek mainstem is a Rosgen C4 type and has a low to moderate resistance to management (ECA upper limit of 10 to 20 percent). This C4 stream type places more limitations on timber harvest-related activity in the contributory watershed. Since the entire watershed above this segment contributes to it, the overall harvest in the 6th-level watershed was limited to approximately 14 percent of the area. The proposed road obliterations would eliminate approximately 15 acres of disturbance to reduce sediment contributions and keep both the Proposed Action and Alternative 3 at or below thresholds predicted by HYSED modeling. The five subwatersheds have more resistant channels; their ECAs/disturbed areas range up to a high of 20 percent. This was consistent with the HYSED model general guidelines for these stream types.

HYSED Modeling:

The HYSED computer model was used to estimate sediment productions levels within the 6th-level watershed. ECA is used to estimate the increased water yield that may occur with vegetation removal. HYSED modeling suggests that sediment production under the Proposed Action and Alternative 3 (Partial Cut Emphasis) would be slightly below threshold after implementation. This assumes average levels of precipitation and maximum levels of snow redistribution in harvest units. To limit the risk of adverse effects, the most sensitive reaches of stream channel at the lower end of the Lake Creek mainstem were used as the overriding constraint. Due to the higher impact that road miles have on water quality, road decommissioning was used as mitigation rather than further reducing harvest acres.

Roaded Area / Stream Crossing Analysis:

Cumulative effects in managed, forested watersheds can be estimated through an analysis of equivalent roaded area. This includes compacted areas such as roads, log landings, and other hardened or disturbed sites. Approximately 139 acres of roads (1.2 percent of the analysis area) are present in the existing condition, along with 30 stream crossings. Proposed management would reduce this to approximately 124 acres with 29 stream crossings. Although this mitigation results in only a very slight reduction of roaded area and stream crossings, it begins a trend to reduce roaded area in the watershed. Harr et al. (1975) studied 12 watersheds that showed increases in larger-than-mean annual floods when 12 to 15 percent of a watershed was severely compacted by roads, skid trails, and other soil disturbance. His work suggests that large flood peaks would not be significantly affected in watersheds with less than 10 percent compacted area. Neither the Proposed Action nor Alternative 3 would result in more than 10 precent of the watershed being compacted, nor would they result in an increase in stream crossings.

Forest Plan Consistency:

Guidance for water resource management on the Medicine Bow National Forest is outlined in the Forest Plan. Some historic activities were inconsistent with current Forest Plan standards and guidelines. The BMPís to be applied includes specific measures that will be included in any timber sale contract resulting from this analysis. Design and mitigation measures required for the proposed timber sale will maintain consistency with the Forest Plan standards and guidelines.

Water Yield Increases:

Harvesting timber increases water yield from mountain watersheds. Under the No Action Alternative, water yield from the analysis area would decrease as regeneration in the older clearcuts continue to mature and utilize more water. This trend would continue as long as no new entry is made into the analysis area, and the areas are populated with mature vegetation.

Since timber harvest activities reduce water consumption by vegetation, Alternatives 2 and 3 would increase annual water yield from the affected watersheds. Predicted water yield for the action alternatives is displayed in Table 12 below, and assumes average precipitation. Actual water yield increases would vary with snowpack water content. High-water snowpacks produce water yield increases above the predicted numbers; low-water snowpack years would produce less. The yield in year one is an estimate for the year immediately following harvest, which would produce the highest yield. As harvest units regenerate, subsequent yields would decrease. Complete recovery to pre-harvest conditions is estimated to take 70 years.

Alternative 4 would reduce the amount of clear cutting by 45 acres (17 percent) and reduce the amount of partial harvest 20 acres (10 percent) compared to the Proposed Action (Alternative 2). There are no changes proposed in the Forest Service road system compared to the Proposed Action, although amounts of road maintenance activities would decrease slightly because of fewer units to access. These changes would result in approximately proportional reductions in sedimentation and water yield compared to what was disclosed for the Proposed Action. While modeled values would change slightly, there would be no significant change in conditions observed in the subject watersheds as a result of timber sale modifications. No additional analysis is recommended to address the minor differences in effects for Alternative 4.

Table 12 - Predicted Annual Water Yield Increases Over Existing Condition

	Alternative 1, No Action	Alternative 2, Proposed Action	Alternative 3, Partial Cut Emphasis
Yield - Year one	0 acre-feet	340 acre-feet	300 acre-feet
Total yield - Event duration (70 years)	0 acre-feet	12,508 acre-feet	10,640 acre-feet

Determination of Need for Stormwater Discharge Permit: An appeal of the Collins Creek Timber Sale stated, ìTo help protect water quality, the State also requires a storm water construction permit for projects which disturb more than five acres.î (Biodiversity Associates, et al 2000). The Forest Service ìReviewing Officer recommends the District Rangerís decision be reversed with instructions to determine the need for a Section 402 Storm Water permit for this project Ö .î (USDA Forest Service, 2000b).

The Forest Service has worked with the Wyoming Department of Environmental Quality (WYDEQ) to address this issue since 2000. Laramie Ranger District requested guidance on how to determine whether a storm water permit is required for the proposed Collins Creek Timber Sale and Road Decommissioning Projects (Gardner, 2002). WYDEQ provided guidance on determining the need for a storm water permit for decommissioning of roads (WYDEQ, 2002). Based on the guidance provided by WYDEQ and our evaluation of the proposed activities, this project does not require a storm water discharge permit. Some roads involved in the proposed project do not require a storm water permit because they fall under a silvicultural exemption. Proposed road decommissioning mainly involves scarification, seeding and placement of slash on the existing road templates. The type and amount of ground disturbing activities on roads to be decommissioned do not require a storm water permit (WYDEQ, 2002). Road decommissioning will help protect and improve water quality. Standard best management practices, such as seeding and placement of slash on scarified road surfaces, will be used to protect water quality.

Effects Common to the Action Alternatives:

There would be a net reduction of approximately 15 acres of road surface (reduction of about 10 percent), an increase of about one mile of new road, road reconstruction segments, and removal and rehabilitation of one stream crossing.

Harvest activities create temporary soil disturbances, which if located next to streams, can cause new sediment sources. Both action alternatives would use buffer strips where units approach streamcourses, therefore, no new sediment sources are expected. These buffers are designed using criteria from WYDEQ BMPs and Forest Plan standards and guidelines.

Impacts from historic mining made stream channels in the Collins Creek area more sensitive to water yield increases. Both action alternatives would temporarily increase the ECA. Therefore, water yield into the streamcourses would increase to near threshold levels. This yield would decrease as trees regenerate and begin to use larger amounts of moisture. While no specific impacts are anticipated from approaching the estimated threshold, it increases the likelihood that additional water entering the system could cause stream channel instability. If the project is implemented, natural events could more readily increase water yield to a level above the estimated threshold.

Effects Specific to Alternatives:

Alternative 1 - No Action:

This alternative proposes no management action; therefore, the area would continue the current trend. No harvest or restoration activities would take place. As vegetation matures in previously harvested locations, hydrologic recovery would continue. Assuming no natural disturbance occurs, water yields from past harvesting would continue to decline, resulting in lower peak flows of shorter duration. Sediment in the channel would decrease as high spring flows decrease to pre-harvest levels. With proper maintenance, sediment contribution from the roads would decrease as cut and fill slopes continue to revegetate. Overall, Alternative 1 would improve water quality and decrease flows slightly over time.

Alternative 2 - Proposed Action:

This option contains more intensive management of the two active management options. The ECA for the 6th-level Lake Creek watershed would be 14 percent. The proposed vegetation removal would be hydrologically equivalent to clearcutting approximately 360 acres. Increased flows related to vegetation removal are generally not detectable until about 25 percent of the vegetation in a forested watershed is removed. Under this alternative, changes in the size, duration, and timing of high flows would be minor. Low flows would not be affected. Even though a 340 acre-foot (2 percent) water yield increase is predicted, it would be very difficult to detect within the estimated 13,966 acre-foot water yield now estimated to occur. While road construction/reconstruction will disturb additional areas, flow increases attributable to this disturbance will be insignificant, particularly as these areas begin to regenerate.

Stream temperatures and oxygen levels would be unaffected due to preservation of stream-shading buffers required by the BMPs. Channel width/depth ratios would remain constant as long as channel stability is protected. This is predicted to be the case, although an extreme flow event may affect width/depth ratios. Summer and winter low flows would not decrease as a result of timber harvest activities. This will help protect aquatic organisms from temperature and dissolved oxygen extremes.

New road construction and reconstruction is minimal. The small amount of road disturbance and use of BMPs to protect water quality would limit sediment production to minor amounts.

Harvest-related sediment for the Proposed Action would be essentially the same in both action alternatives. Though additional sediment production from proposed roads and harvest activities would be minimal, the total sediment is predicted to reach near-threshold levels. This increases the risks of channel damage and instability resulting from large flow events (25-year return period or greater) or water yield increases and associated changes in sediment routing.

The proposed operations would not create a major water quality impact. Minor effects would be created by removing stream crossings in streamside areas during road decommissioning. With one less water crossing, this alternative would also maintain water purity and existing beneficial uses of Lake Creek area streams. Low harvest intensity (14 percent ECA), harvest design, and use of BMPs would eliminate toxic effects, eutrophication, and the occurrence of pathogenic organisms in the watershed. Federal and state water quality standards would be met as a result.

Overall, the Proposed Action would be consistent with Forest Plan standards and guidelines, state water quality standards, and Federal water quality regulations. Some water yield increase (approximately 2 percent) is expected with these activities, but it may not be a measurable amount.

Alternative 3 - Partial Cut Emphasis:

Hydrologically, Alternative 3 is essentially the same as the Proposed Action. While the harvest method produces less water per acre, more acres of harvest are proposed, making the ECA and water yield similar to the Proposed Action. As displayed in Tables 10 and 11, the anticipated ECA from both alternatives is approximately 14 percent. Therefore, the potential effects are similar to that for the Proposed Action.

This option would cause the least intensive management of the two proposed active management options. Road reconstruction and construction of about 4.9 miles of new temporary road would create newly disturbed soils. Road rehabilitation measures would also create disturbed areas, although these areas are expected to revegetate within 2 to 5 years.

Stream temperatures and oxygen levels would be unaffected due to preservation of stream-shading buffers required by the BMPs. Channel width/depth ratios would remain constant as long as channel stability is protected. This is predicted to be the case; see the above discussions on sediment production and flow regimes. Summer and winter low flows would not decrease as a result of timber harvest activities. This will help protect aquatic organisms from temperature and dissolved oxygen extremes.

Effects to the water resource are expected to be minor, because new road construction and reconstruction is minimal. The small amount of road disturbance and use of BMPs to protect water quality would limit sediment production to minor amounts. Harvest-related sediment for the Proposed Action would be essentially the same in both action alternatives. Though additional sediment production from proposed roads and harvest activities would be minimal, the total sediment is predicted to reach near-threshold levels. This increases the risks of channel damage and instability resulting from large flow events (25-year return period or greater) or water yield increases and associated changes in sediment routing.

The proposed operations would not create a major water quality impact. Minor effects would be created by removing stream crossings in streamside areas during road decommissioning. With one less water crossing, this alternative would also maintain water purity and existing beneficial uses of Lake Creek area streams. Low harvest intensity (14 percent ECA), harvest design, and use of BMPs would eliminate toxic effects, eutrophication, and the occurrence of pathogenic organisms in the watershed. Federal and state water quality standards would also be met.

Overall, Alternative 3 would be consistent with Forest Plan standards and guidelines, state water quality standards, and Federal water quality regulations. Some water yield increase is expected with these activities (approx. 2 percent), but it may not be a measurable amount.

Alternative 4 - Wildlife Mitigation:

Hydrologically, Alternative 4 is similar to the Proposed Action. However, due the reduced volume and additional road decommissioning, the effects would be slightly less. Decommissioning additional roads would reduce the overall watershed effects described in this REA by reducing sediment and increased water yield in the project area. Alternative 4 would be consistent with the Forest Plan.

Cumulative Effects:

Cumulative effects analysis recognizes effects of the Proposed Action, plus those of all past, present, and reasonably foreseeable future actions that affect watershed condition. Results of project and existing conditions analyses are combined to evaluate the project's incremental effects on total watershed conditions. Past effects to the water resources include those associated with mining, recreation, grazing, road building, and timber harvest. Changes in riparian vegetation, streamside soils, streambanks, sediment, and flow regimes have occurred in conjunction with the activities listed.

Stream reaches on Collins Creek and Lake Creek were hydraulically and placer mined in the late 1800ís. While most channels exposed to mining impacts have recovered, lower Lake Creek (below the Lake Creek Resort) is still experiencing altered channel form and fine sediment infill. Recreation, primarily from off-highway vehicle use and camping has created eroding stream crossings on Hay Creek, Lake Creek, Collins Creek, and several un-named channels. While the disturbed areas associated with these crossings are not large (usually 2 to 3 square yards), they do contribute sediment during high flows and vehicle passage.

Grazing has created denuded banks on Collins Creek between NFSR 517 and the confluence with Lake Creek, which also contribute sediment during high flows. Road building eliminates riparian vegetation at stream crossings and creates disturbed areas with temporarily bare soils. This increases sediment contributions to streams due to new or reconstructed roads. Timber harvest can change flow regimes (discussed in the Environmental Consequences section above) and affect stream channel stability and morphology. Six timber sales have occurred either partially or completely within the Lake Creek 6th-level watershed since 1975. Hydrologic impacts from past and proposed timber sales and roading within the watershed are included in the HYSED and ECA modeling.

In the lower-gradient reaches of main streams in the 6th-level watershed (Collins Creek and Lake Creek), cumulative effects have resulted in sediment increases. Although additional sediment production from implementing the Proposed Action would be minimal, the total sediment is predicted to reach near-threshold levels. This increases the risk of channel damage and instability resulting from large-flow events (25-year return period or greater) or water yield increases and associated changes in sediment routing.

While timber harvest need not be foregone in the analysis area, Lower Lake Creek should be considered a limiting factor due to its location and condition. Implementation of the Proposed Action does not currently threaten the recovery of streams in the lower Lake Creek watershed. However, the condition of these streams necessitates careful design of activities such as timber harvest or road building. Mitigation measures, including road mileage and crossing reductions,

BMPs, and alternative design, will be incorporated into the proposed activities to reduce their potential effects.

Mitigation for sensitive areas and degraded systems

To protect sensitive areas and degraded systems, harvest units are located away from streams by buffer strips of at least 100 feet. The width of this buffer increases if the terrain is steeper than 20 percent. Units are also distributed throughout the 6th-level watershed and are not concentrated in any one location. No harvest would occur in wetlands or floodplains.

Timing, severity, and duration of disturbances and their effects

Timing of disturbances is not expected to produce major impacts. Road building and reconstruction would take place after snowmelt, allowing reduced sediment production. Some sediment production is inevitable near stream crossings during storms and snowmelt seasons immediately following disturbance. The removal of one stream crossing would reduce this sediment production. Harvest-related disturbance would occur over several seasons and would be limited to either winter or dry-season operations. Hydrologic effects would be limited to minor increases in peak flows, peak flow duration, and sediment during snowmelt. Severity of the effects is expected to be minor due to the scale of the operations and the mitigation measures employed, while the duration varies. Sediment production would peak in the season immediately following harvest and then decrease during the next 5 to 10 years as disturbed surfaces revegetate and temporary roads are obliterated. Flow regimes are expected to return slowly to pre-harvest conditions, as harvest units and temporary road corridors revegetate and mature. Research suggests that complete hydrologic recovery takes about 70 years.

Effects on state-classified water uses in 3rd-order and larger streams

No adverse effects on existing WYDEQ-classified, beneficial uses are expected for any of the alternatives, due to the scale of operations, limited new road construction, and the use of BMPs to protect water quality. The risk of negative effects to water resources (primarily increased watershed sensitivity to natural disturbance) was determined to be moderate. The proposed activities, as planned, should create only minor disturbances or effects.

Effects on the stream health of 3rd-order and larger streams

Existing conditions once again suggest that prior activities (mainly instream mining) may have affected stream health. Ratings of "fair" channel stability in lower Lake Creek suggest possible sensitivity to management. While these conditions are likely to improve over time, stream health protection through mitigation measures, Forest Plan standards and guidelines, and BMPs are essential to prevent any further impacts.

Effects to State Classified Beneficial Uses

There are no State-designated impaired streams affected by this project (WYDEQ, 2002), and beneficial uses existing as of November, 1979 (Anti-degradation clause of Clean Water Act) would be retained. Existing analyses (Snook 1998a, Snook 1998b and Snook 2000) address this issue. More recent water quality assessments confirm that ì[d]redging and roads have been identified as water quality concerns on Douglas Creek below Rob Roy Reservoir and above the wilderness boundaryî (WYDEQ, 2002 p. 46). Water quality of streams within the project area were not monitored during that assessment, but Douglas Creek below the wilderness boundary (over 5 miles downstream from the project area) was monitored and found to be fully supporting its aquatic life uses (WYDEQ, 2002).

Effects to streams, Streambanks, Shorelines, lakes, wetlands and other bodies of water

Existing analyses (Snook 1998b and Snook 2000) address this issue based on on-site field review and no new information is available to supplement those analyses.

Overall effects on functions of the riparian network in the watershed

The riparian areas of the Lake Creek watershed would be protected from harvest activity by riparian buffers and location of units. BMPs would limit and control activities within riparian areas. Mitigation measures would reduce sediment contributions to the watershed. No new stream crossings are proposed in any alternative. This protects riparian functions by severely limiting disturbance in these sensitive areas. Disturbance related to proposed removal of one stream crossing would be limited to the former constructed road surface and culvert bed and would not impact the surrounding riparian area.

Both action alternatives would affect sediment and flow regimes. Riparian ecosystems would be affected by soil disturbances associated with the rehabilitated stream crossing. These effects would be minor and would decrease as vegetation becomes established after the project ends. However, the effects would be cumulative when added to other minor effects from mining, recreation, grazing, and road building. Proposed Action analysis suggests that beneficial uses existing as of November, 1979 (Anti-degradation clause of Clean Water Act) would be retained with implementation of any proposed management option. The proposed activities would not encroach upon riparian management areas, floodplains, or wetlands since no construction of new stream crossings is included. These minor effects and the rationale for dismissing other potential effects are detailed in the Environmental Consequences section, above.

E. Fisheries

Direct and Indirect Effects:

Alternative 1 - No Action:

The No Action alternative means no timber harvest or associated activities would occur in the proposed Collins Creek project area. There would be no material anthropogenic disturbances to soils, vegetation, or streams due to timber harvest, road construction/reconstruction, road obliteration, or other rehabilitation activities. Natural sediment budgets in the analysis area would largely be driven by physical and chemical weathering of the local lithology and precipitation, but some disturbance would occur because of multiple-use activities such as motorized off-road use. Variation in watershed hydrographs would be largely driven by precipitation. The No Action Alternative would not address aquatic wildlife concerns in the Collins Creek analysis area.

Effects common to all action alternatives:

As discussed in the Hydrology section, sediment production is approaching threshold levels in some of the analysis area streams. With the existing conditions being close to the threshold, these streams are at moderate risk for channel damage or instability from an extreme flow event. If such an event occurred, the resultant increase in sedimentation could adversely affect spawning beds and other fish habitat, such as pools. Under extreme circumstances, increases in water yield and sediment yield can directly harm fish and other aquatic organisms. Direct mortality to trout and other aquatic organisms due to suspended sediment is difficult to document in the field, but it does occur under extreme turbidity conditions (>1,000 mg/L) (Waters, 1995). Other factors, such as developmental stage, age of individual organisms in a population, heavy metal concentration, and water temperature, determine whether or not suspended sediment would have a lethal or sublethal effect on aquatic organisms (Waters, 1995). Most of the research

conducted on the effects of sediment on fish and other aquatic organisms addresses the indirect, sublethal, and lethal effects of sediment (suspended and deposited) on aquatic organism behavior and history.

Potential indirect effects of sediment yield and water yield on aquatic organisms due to timber harvest and associated road building are well documented in the scientific literature and are apparent in several ways. Suspended sediment can alter normal behavior in fish and other aquatic organisms by causing them to avoid areas in streams that experience acute or chronic turbidity (Waters, 1995). Suspended sediment eventually comes out of suspension to be deposited (sedimentation) in pool habitat, spawning habitat, and rearing habitat (Waters, 1995; Hunter, 1991). Sedimentation can diminish pool depth, which reduces the effectiveness of pools to provide trout with hiding cover and overwintering habitat (Waters, 1995). Spawning habitat inundated by sediment causes incubating trout embryos to suffocate, if spawning can occur at all (Waters, 1995). Also, sedimentation can decrease rearing habitat if substrate interstices (hiding and resting) and backwater pools (rearing) are covered (Waters, 1995). Finally, much of the sedimentation that can negatively affect fish can also reduce habitat effectiveness for aquatic insects, aquatic plants, and amphibians for many of the reasons previously mentioned (Ward and Kondratieff, 1992; Ward, 1995).

Alternative 2 - Proposed Action:

The proposed Collins Creek timber sale and the road construction/obliteration projects would cause some short-term soil disturbance and increased sediment movement within the watershed. Implementation of the Proposed Action may cause some perceptible detriment to fish and other aquatic resources due to increased sediment and water yield, though this outcome is unlikely. Additionally, timber harvest prescribed under the Proposed Action could result in increased water yield to surface streams in the watershed beyond the typical hydrograph. Changes in the typical hydrograph could place the Collins Creek streams closer to the threshold than the No Action alternative. All of the aforementioned outcomes are unlikely under the Proposed Action because of the relatively low water yield predicted by HYSED, and the use of BMPs.

Under the Proposed Action, predicted water yields generated by HYSED provide some insight about the potential effects to fisheries and other aquatic resources. The predicted difference in water yield after one year between the Proposed Action and Alternative 3 is only 13.3 percent (340 acre-feet versus 300 acre-feet, respectively). The differences in total water yield between the Proposed Action and Alternative 3 is about 17.6 percent (12,508 acre-feet and 10,640 acre-feet, respectively). Although these values are clearly different from the zero acre-feet increase predicted under the No Action alternative, the Hydrology Report suggests no material difference between the Proposed Action and Alternative 3. Essentially, no disturbance to fish populations and fish habitat is anticipated from predicted changes in water yield resulting from implementation of the Proposed Action.

Predicted values for equivalent clearcut acres (ECA) under the Proposed Action are also revealing. According to the Hydrology Report, at 14 percent for both, there appears to be no difference in average ECA and disturbed area plus Proposed Action or Alternative 3. This value is substantially below the threshold value for most of the stream types in the analysis area because of the relatively low ECA (20-30 percent ECA). The exception is the lower section of Lake Creek mainstem (10-20 percent ECA). Because of the low overall watershed disturbance relative to threshold values due to implementing the Proposed Action, it is unlikely that fisheries or other aquatic resources would be measurably harmed due to implementing the Proposed Action.

Alternative 3 - Partial Cut Emphasis:
The partial cut emphasis alternative is smaller in magnitude than is the Proposed Action in number of silvicultural treatments prescribed, number of acres clearcut, and gross timber volume harvested. While the acreage proposed for harvest is larger, the ECA and the water yield to project-area streams would be similar to the Proposed Action. Since HYSED modeling suggests that expected watershed disturbance, water yield, and sediment yield are essentially the same for both action alternatives, the potential effects on fisheries are also similar.

Alternative 4 - Wildlife Mitigation:
The effects of Alternative 4 would be similar to the Proposed Action.

Effects to Aquatic T&E Species:

This project would have ***no effect*** on aquatic or riparian-dependent threatened or endangered species. The existing documentation determines that there are no threatened or endangered aquatic or riparian-dependent species or habitats within this project area. However, stream flows from this analysis area ultimately contribute to conditions in the Platte River mainstem. Thus, determinations of effect should be included in the project record for the bald eagle *(Haliaeetus leucocephalus)*, Ute ladiesí-tresses orchid *(Spiranthes diluvialis), w*hooping crane *(Grus americana)*, least tern *(Sterna antillarum),* piping plover *(Charadrius melodus),* pallid sturgeon *(Scaphirhynchus albus)*, Eskimo curlew *(Numenius borealis) and* western prairie fringed orchid *(Platanthera praeclara).* These species are native to the Platte River mainstem ecosystem, where their life cycles depend on natural flow regimes that include flood flows and substantial sediment transport. Their biology is fully described in USFWS 1996 (Biological Opinion for Water Depletions in the Platte River). These are new findings to be added to project documentation.

The Platte River species are included in this review even though they occur far outside the project areas, because projects that change timing or amounts of flow through cumulative water depletions have been found to adversely affect habitat and populations of species in the Platte River mainstem ecosystem. It has been suggested that water yield resulting from vegetation treatment may benefit mainstem ecosystem species. Changes in forested vegetation (e.g. timber harvest, fire, beetle kill) can lead to increases in water yield at the local level due to reductions in transpiration and reduced interception losses of snow in the tree canopy. These effects are seen most obviously when more than 25 percent of the watershed is in an equivalent clear-cut area. However, local increases in water yield are small and often immeasurable. Watersheds in the Collins Creek analysis area have equivalent clear-cut areas ranging from 11 to 20 percent, including the acres of harvest proposed for this project (Snook 1998b and Snook 2000). The initial projected water yield from this project would be approximately 340 or 300 acre-feet per year, for alternatives 2 and 3 respectively, with water yield increases declining as vegetative regrowth and hydrologic recovery occur (Snook 1998b and Snook 2000). For descriptive purposes, if these water yields were spread equally across the first year of effect, they would equate to a total increase of 0.41 (Alternative 3) to 0.47 (Alternative 2) cubic feet per second of flow in the entire Lake Creek watershed. Since harvest activities would be distributed throughout the 7^{th} level sub-drainages of the watershed, these tiny flow increases would similarly be distributed across all of the affected streams. In reality, flows would be relatively higher during run-off, and would be greatest in sub-drainages that have the most concentrated harvest activity. However, this simple analysis shows that while real, these increased yields are nearly impossible to measure within the project area.

Water quantity is not a limiting factor for populations of resident fishes in the Lake Creek watershed. Even if water yield could be measured at the regional level where water quantity and timing of flows are limiting factors, no legal means to protect this water are available. Incidental water yield increases would likely be used through application of water rights for municipal and agricultural purposes long before water reached the Platte River mainstem ecosystem. Thus, there would be no significant, beneficial, or measurable local or regional change in water yield from this project.

Finally, habitat for the Platte River mainstem species is so far removed from these projects that there would be no translation of other potential direct or indirect effects to their habitats. The bald eagle, Ute ladiesí-tresses orchid, whooping crane, least tern, piping plover, pallid sturgeon, Eskimo curlew and western prairie fringed orchid were given ***no effect*** determinations for impacts related to water yields. No consultation with the Fish and Wildlife Service is required for these species. Findings for threatened and endangered species in the revised Environmental Assessment, Decision Notice and Finding of No Significant Impact should be updated to reflect these determinations.

Effects to Aquatic Sensitive Species:

This project ***may adversely impact individuals but is not likely to result in a loss of species viability on the planning area nor cause a trend toward federal listing or loss of species viability range-wide*** for some aquatic sensitive species. Potentially affected sensitive aquatic species on the Medicine Bow National Forest include western boreal toad (*Bufo boreas boreas*), wood frog (*Rana sylvatica*), and tiger salamander (*Ambystoma tigrinum*). Yellowstone and Colorado River cutthroat trout (*Oncorhynchus clarki bouvieri*) and *Oncorhynchus clarki pleuriticus*) are also considered sensitive in Region 2, but do not occur in the project area and have been dismissed from analysis. Wood frogs (*Rana sylvatica*) have been documented in the project area (WNDD 2000), and are addressed in the Biological Evaluation (Kozlowski, 2000). Western boreal toad and tiger salamander have been documented immediately adjacent to the project area (WNDD 2000), and are also addressed in the Biological Evaluation (Kozlowski, 2000). During field review, Snook (1998) did not observe any sensitive amphibians, nor note any NFS habitats that were likely to be adversely affected by the proposed activities. Habitat for wood frog, western boreal toad and tiger salamander would not change, because Forest Plan standards and guidelines would protect riparian areas during project design. Contract administration and project monitoring would be used to continue protection through the implementation phase. These findings suggest a ìno impactî determination for sensitive amphibians. However, local project activity increases the likelihood that an amphibian could be killed by logging equipment, log trucks, crew vehicles, timber sale administrators, monitoring teams or other personnel associated with the sale. This uncertainty and the potential for unauthorized impacts to amphibian habitats render the **ì*may adversely impact individuals but is not likely to result in a loss of species viability on the planning area nor cause a trend toward federal listing or loss of species viability range-wide*î** finding appropriate with no additional need for analysis.

Effects to Aquatic MIS Species:

This project would have no significant effect on populations or habitats of aquatic MIS, and no aquatic MIS should be used for monitoring for this project. Aquatic MIS in the Medicine Bow National Forest Plan include Colorado River cutthroat trout, ìcommonî trout species (brook, brown and rainbow trout), western boreal toad, and wood frog. Colorado River cutthroat trout do not occur in the project area (WNDD 2000), and impacts from the project are not expected to

extend beyond the project area boundary to areas that would affect any other potential habitats. Colorado River cutthroat trout have been dismissed from detailed consideration for project analysis or monitoring.

Habitat for MIS amphibians, including wood frog and western boreal toad, is present in the analysis area but excluded from treatment areas. In the event that sensitive or MIS amphibians would occur in the immediate vicinity of harvest units, habitats would be protected by adherence to Forest Plan standards and guidelines during project design and implementation. We recommend that project implementation monitoring include evaluation of physical impacts to potential amphibian habitats, but not amphibian population monitoring. Wood frogs are relatively abundant in this portion of the Laramie District (WNDD 2000 and Forest amphibian survey records). While a baseline for comparison of effects exists, no change in wood frog status is expected, and no population monitoring should be conducted unless project implementation monitoring suggests that unexpected habitat changes have occurred. Forest-wide amphibian population monitoring would continue as part of our routine North Zone aquatics program and Laramie District wildlife program..

In contrast, western boreal toads are very rare on the District. They have been documented in the vicinity of Dry Park, just across the watershed divide to the north and east of the Lake Creek watershed, and also in the vicinity of Foxpark, adjacent to the southeast boundary of the analysis area. Western boreal toads were originally selected as MIS for this project (Kozlowski 2000). During the analysis of Alternative 4 they were dismissed as a MIS because there are not sufficient baseline records of boreal toads in this area to allow comparison of project effects. Effects on western boreal toads have already been disclosed in the Biological Evaluation (Kozlowski 2000). Boreal toads will continue to be monitored at the Forest-wide level in conjunction with cooperative Boreal Toad Recovery Team efforts. Their populations should not be monitored specifically for this project unless project implementation monitoring suggests that unexpected habitat changes have occurred or unexpected concentrations of toads are located during Forest-wide monitoring. If boreal toads are located in wetland or riparian habitats in the analysis area, project design and mitigation should be revised to include additional mitigation as appropriate for the situation.

Common trout species (specifically brook, brown and rainbow trout) do occur in the analysis area (USFS 2001). Brook trout are documented and common in most headwater perennial streams. Brown trout and rainbow trout occur lower in the mainstem of Lake Creek close to its confluence with Douglas Creek. Population sampling is described by Eaglin (1998). Snook (1998) observed abundant brook trout in several streams in the analysis area. The Inland West Watershed Initiative summarizes population strength for MIS species on the Forest, and findings for the Collins Creek analysis area are summarized below.

No direct, indirect or cumulative changes in habitat or population conditions for brook, brown or rainbow trout are expected as a result of this project. Although fish bearing streams occur throughout the analysis area, timber sale activities would be buffered to prevent loss of riparian vegetation. Intact riparian buffers would provide thermal protection, large woody debris, a source of terrestrial insects for food, and structure to protect bank stability. Because these non-native species are so widely distributed, have strong populations across the planning unit as a whole, and risk of project impacts to habitats is low, there is no significant concern for population or habitat condition, and no concern for adverse impacts from this project. While potential impacts to common trout species were disclosed in the previous Environmental Assessment, it is not recommend that project-specific population monitoring be conducted. The

Forest is currently developing a prioritized list of watersheds for systematic, recurring MIS monitoring. Wyoming Game and Fish Department also periodically conducts monitoring at specific monitoring stations. The most recent monitoring occurred in the mid 1990s, and should reflect the cumulative effects of past management activities in the watershed. Results of that monitoring indicated good fish population size and distribution, with no significant deficiencies in reproduction or growth noted. This indicates that while the current level of resource disturbance may depress the rate aquatic habitat recovery, it does not impede successful habitation by brook trout and other common trout MIS. It is recommended that project implementation monitoring focus on evaluating physical changes to habitat as a result of timber sale and road obliteration activities. Population monitoring should only be conducted at the project-level if unexpected habitat impacts are observed.

Cumulative Effects:

A variety of disturbance activities have occurred in the Collins Creek watershed or in adjacent watersheds in the last seven decades. From 1975 to 1987, portions of six different timber sale projects have occurred in the Collins Creek area. Historic tie drives occurred in the Muddy Creek drainage between 1924 and 1928 (Young, et al., 1994). Historic and recreational mining have occurred in the Collins Creek area as well. Although there is little, if any, pretreatment data that describe watershed conditions prior to these activities, it is reasonable to assume that they have affected the aquatic resources in the proposed project area.

It has been suggested that there is a somewhat uniform substrate size distribution in the streams in the project area due to past mining activities. Mining debris and tailings have provided a ready source of transportable, gravel-size material that has filled in some pool habitat and inundated larger size substrates. As a result, there may be an increase in available spawning habitat, but an overall loss of habitat diversity and abundance for other life stages and uses (i.e., overwintering habitat, rearing habitat, hiding habitat, etc.). Fish population and habitat surveys conducted by the Wyoming Game and Fish Department in 1979 suggested that populations and habitats were in generally good condition, but residual impacts from tie drives persist in the Douglas Creek and Lake Creek (and tributaries) watersheds (Oberholtzer, 1979).

Summary:

The fish populations and habitats found in the major streams located in the Collins Creek analysis area appear to be in good condition overall, although there exists some residual aquatic habitat degradation from past tie drives and mining. Neither the Proposed Action nor Alternatives 3 or 4 would cause the project area watersheds to exceed threshold conditions. Adverse effects to stream channel stability and fisheries are not expected at this level of proposed disturbance. However, greater-than-typical water yields due to severe weather conditions could cause threshold values to be more readily exceeded than if no timber harvest and associated road construction/reconstruction were to occur. A large natural event could also cause watershed threshold values in the Collins Creek analysis area to be exceeded without any proposed, additional anthropogenic disturbance.

F. Wildlife and TES Species

A Biological Evaluation and Biological Assessment have been developed to disclose the effects of the alternatives on potential species. Appendix D summarizes these effects.

1. Vegetative Composition:

Direct and Indirect Effects:

Alternatives 2 through 4 are expected to have minimal negative impacts on vegetative diversity. Horizontal diversity would improve as more forest edge is created and mature timber is temporarily converted to earlier successional stages. Vertical diversity would remain constant or improve slightly temporarily. Stands proposed for clearcut timber harvest would have no impact on vertical diversity as they are generally single storied stands. Stands proposed for overstory removal and group selection harvest would contribute to a small loss in vertical diversity as trees in the older canopy are removed, and the remaining forest (regeneration as a result of previous harvest) are even aged. Commercial thinning and shelterwood harvest may temporarily improve vertical diversity as the forest canopy is opened up moderately allowing additional tree seedlings, shrubs, and forbs to develop on the forest floor.

Grass/Forb Stage:

Direct and Indirect Effects:

The Forest Plan states, ì Ö in forested areas of a unit, maintain at leas 5 percent in grass/forb stage (Forest Plan, III-14).î With the proposed timber treatments and the acreage of grass/forb created through road decommissioning, this structural stage (grass/forb) would approach 4.5 percent of the analysis area for the Proposed Action and Alternative 4 and nearly 2.5 percent for Alternative 3. Alternatives 2 through 4 would move the forest toward achieving this Forest Plan standard; the No Action alternative does not. The remaining forested structural stage categories would vary less than 2 percent among the action and No Action alternatives.

Old Growth:

Direct and Indirect Effects:

The Forest Plan states, "... In forested areas of a unit maintain ... at least 10 percent of the conifer potential natural vegetation type in old growth (Forest Plan, III-14).î Inventories of the Collins Creek analysis area have located only 1,788 acres that achieve an Old Growth score card rating of 38 or higher. Most of these stands are widely scattered, though they are joined by younger forest. An additional 1,473 acres have been identified as replacement old growth. The Forest Plan requires 1,145 acres of old growth (10 percent), therefore, all of the alternatives would meet the Forest Plan standard for old growth. The No Action alternative would retain the 1,788 acres (15 percent) of the analysis area currently qualifying as old growth. The Proposed Action would result in retention of 1,788 acres (15 percent) of the area as old growth. The Partial Cut Emphasis alternative would result in retention of 1,788 acres (15 percent). Alternative 4 proposes harvest in approximately 80 acres of forest used to calculate existing old growth retention. These treatments include units 8, 22, 24, 25, and 29. As a result, old growth retention will be reduced approximately 0.6 percent from existing conditions, and still be within Forest Plan standards. All of the alternatives would be consistent with the Forest Plan standard for old growth in the short and long-term.

Snag Retention:

Direct and Indirect Effects:

All alternatives are designed to retain suitable numbers of snags to meet minimum Forest Plan standards (2 to 6 snags per 10 acres) in harvested areas. Snag retention and recruitment in unharvested areas would not be affected by the project proposal.

Forest Fragmentation and Cumulative Effects:

Direct and Indirect Effects:

All action alternatives add to short term effects of fragmentation by perforating existing patches of older forest, as well as increasing the amount of edge between younger and older forests. Alternative 4 has the least impact on increased fragmentation of older forest. By dropping units 9, 9a, and half of unit 1 from harvest (compared to Alternative 2), several of the forested stands which contribute to connectivity of block 2 are being retained. Remaining harvest units in alternatives 2 and 4 are generally connected to recent clearcuts or are in isolated patches of older forest and thus do not increase fragmentation of older forest blocks. Alternative 3 appears to have the most impact on fragmentation of older forest blocks by proposing treatments throughout block 2 and block 3. Group selection harvest in this alternative will continue to perforate older forest blocks and increase edge. Additional fragmentation is expected to occur by other treatments in the alternative since proposed harvest units are scattered throughout older forest blocks 1, 2, and 3.

It should be noted that proposed harvest in all action alternatives could have a long term positive impact on fragmentation if management strategies are kept consistent over a century or longer. Many of the harvest units were designed to consolidate smaller patches of younger forest into one larger unit of early seral stages. As these consolidated stands succeed into mature forest over a period of decades or centuries, large and continuous blocks of older forests could again be established in the analysis area.

2. Wildlife Species Diversity:

Federally Listed Threatened, Endangered (T&E), or Proposed Wildlife Species

Analysis of effects on Canada lynx:

Direct Impacts of the action alternatives:

- Cover provided by vegetation and topography would be retained in abundance and distribution such that any lynx that may be moving through the area to more suitable habitat could avoid negative encounters associated with the Proposed Action.
- Amount and distribution of quality foraging habitat for snowshoe hare (primary prey species for lynx) would not be altered. Treated stands generally have minimal understory to support snowshoe hare populations.
- Due to the small amount of treatment compared to surrounding forested areas (fully vegetated), abundance of current prey species for lynx is estimated to remain similar to current levels and continue to provide forage for lynx that may be moving through the area.
- Canada lynx are not known to currently inhabit the proposed treatment areas, are unlikely to be present, and therefore individuals are unlikely to be directly impacted by the Proposed Action.
- Vegetative cover within the **lynx-linkage area** would be retained in sufficient quantity and arrangement to allow for the movement of lynx through the area.

Indirect Impacts of the action alternatives:

- Proposed treatments would retain adequate vegetative cover and vegetative mix to maintain existing prey base and travel corridors.

- Lynx habitat is more suitable and abundant at higher elevations in the watershed and other areas of surrounding National Forest. These areas would be retained in adequate condition to support lynx, and access to them would not be impacted by the proposed treatments.

Cumulative Impacts of the action alternatives:

- Past management in the project area has maintained an adequate mix of early seral forests to provide for foraging areas and travel cover. The alternatives would not affect the overall effectiveness as temporary foraging and travel for lynx.
- Future activities on surrounding National Forest are mandated to comply with recommendation of the Lynx Conservation Assessment and Strategy, and thus, would maintain lynx habitat in a condition suitable to support a resident population within LAUs and adequate transitory range (foraging, and cover) outside of LAUs.
- Management on private lands in the surrounding area is minimal and outside of LAUs. As such, private land management is not expected to affect lynx populations or their habitat.

Analysis of effects on Canada lynx - No Action Alternative:

Direct Impacts:

- Current management practices protect and maintain foraging and travel habitat outside of LAUs. All future projects on the forest are mandated to maintain adequate lynx habitat.

Indirect Impacts:

- Changes expected from natural succession or disturbances processes would continue to develop foraging habitat and denning habitat. Periodic management reviews such as Forest Plan Revisions or project analysis would monitor habitat conditions and strategize methods to maintain adequate lynx habitat.

Cumulative Impacts:

- Past management in the project area has maintained an adequate mix of early seral forests to provide for foraging areas and travel cover.
- Future activities on surrounding National Forest are mandated to maintain lynx habitat in a condition suitable to support a resident population within LAUs and to maintain adequate forage and cover within transitory range outside of LAUs.
- Private lands are minimal in the surrounding area and are outside of LAUs and thus, actions taken on nearby private lands will not affect lynx populations or their habitat.

Determinations for Threatened, Endangered, Proposed Species:

Determination for Canada lynx

All action alternatives would have No Effect on Canada lynx.

The No Action Alternative would have No Effect on Canada lynx.

Rationale:

- Direct, indirect, and cumulative impacts for both the No Action alternative and Alternative 4 are not expected to affect individual Canada lynx, nor change the overall conditions of denning habitat, foraging habitat, travel cover, or prey availability.

- The treatment areas are outside of Lynx Analysis Units (LAUs) established in cooperation with the USFWS. Canada lynx are not expected or known to reside in the project area because of its naturally marginal capability to provide quality denning and foraging habitat.
- Surrounding forested areas are well vegetated and would continue to provide adequate forage and cover. The treatment areas are small in size compared to surrounding forest, and are not continuous such that they would act as barriers to lynx movement.

All other applicable Threatened, Endangered or Proposed species were reviewed and the project proposal would have no effect on such species as demonstrated in Appendix D.

Consultation Requirements for T&E species:

Consultation with the US Fish and Wildlife Service (USFWS) is not required for this project (50 CFR 402.10) since there are no effects from this project on potential critical or suitable habitats or any federally listed Threatened or Endangered species. In addition, this action is not likely to jeopardize the continued existence of any species proposed for listing as T&E or their habitat.

Sensitive Species Analysis

American Marten - Action Alternatives:

Because of the marginal quality of the analysis area as marten habitat, it is questionable whether the proposed timber harvest units would impact individuals of this sensitive species. It is possible that identified marten habitat in the analysis area is unoccupied by resident marten and local sightings are primarily juvenile animals trying to establish new territories in marginal habitat. As a result, the following impacts to individual marten or their habitat may or may not occur.

Direct Impacts ñ Most of the proposed commercial timber harvest units are in pine marten habitat made up of mature lodgepole pine. Habitat capability modeling indicates that all action alternatives decrease the existing marten habitat in the analysis area by approximately 2 percent. Alternative 2 likely has the most impact on marten habitat because it proposes a higher proportion of clearcut acreage, and several of the harvest units perforate larger blocks of marten habitat. Alternative 3, while having significantly fewer clearcut acres proposed for treatment, harvests a higher number of acres overall. In addition, increased emphasis on salvage, overstory removal, and commercial thinning would likely continue to detract from a forested standís value as marten habitat by removing older trees, green snags, and damaging the large woody debris on the forest floor. Alternative 4 has the least impact to marten of the action alternatives by dropping portions of harvest units 1, 9, and 9A from Alternative 2. This mitigation helps retain continuity of one of the larger continuous blocks of marten habitat in analysis area (maps available in district files).

Indirect Impacts ñ One marten home range may or may not be displaced as a result of implementation of the action alternatives. Harvest units 1,2,4,5, 8, and 9 are within and around one of the estimated marten home-ranges, which was identified based upon connected blocks of mature timber. Approximately 15 years following treatment, all harvest units would regenerate enough to provide cover for dispersal of young and eventually provide limited foraging. It is assumed they could develop into quality pine marten habitat approximately 100 years after harvest as they mature into large diameter trees, snags begin to develop, and an understory of

spruce/fir begins to grow. Pre-commercial thinning units would increase the rate at which early-seral lodgepole pine develops into larger trees. If some of these thinned stands are retained into their later seral stages (60 to 100 years from now), quality pine marten habitat would develop at a greater rate than it would without this additional treatment.

Cumulative Impacts ñ Alternatives 2 and 3 would continue a trend of perforating marten habitat comprised of mature or late seral lodgepole pine (habitat structural stage 4B, 4C, and 5). Past timber harvest has modified a substantial amount of this type of marten habitat both within the analysis area and across the snowy range. Marten habitat provided by lodgepole pine forests likely is in smaller patches than existed 50 years ago, is somewhat discontinuous, and is perforated by timber harvest treatments and roads (Dillon et. al. 2000, Baker 1994, Reed et. al. 1995). Alternative 4 would retain continuity of mature forest within one of the larger blocks of marten habitat within the analysis area.

American Marten ñ No Action Alternative:

Direct Impacts ñ The No Action alternative would maintain current amounts of marten habitat by retaining all underbrush, down woody material, ladder fuels, snags, and some older trees. Continuous, untreated stands of conifer would remain intact throughout the project area, and would thus maintain adequate habitat to support current populations of pine marten.

Indirect Impacts ñ The No Action alternative would maintain marten habitat in its present amount, quality, and distribution. No indirect impacts are expected.

Cumulative Impacts ñ Across the watershed, there has likely been some loss of marten habitat in late-seral lodgepole pine stands. Large diameter, decadent lodgepole pine has typically been harvested in areas where timber production is a primary objective. The No Action alternative would maintain current levels of late-seral lodgepole pine and would not contribute additional cumulative impacts to marten habitat.

Determination for marten: Implementation of the action alternatives may adversely impact individual marten, but is not likely to result in a loss of viability on the planning area nor cause a trend toward federal listing or a loss of species viability range-wide.

> **Rationale** ñ The entire analysis area only provides habitat for a small number of pine marten. Far better quality habitat exists at higher elevations, in areas where timber harvest does not occur, and in other areas across the forest. Loss of a few individual marten or habitat affecting one home-range, would not measurably affect the overall population across the forest planning area.

Implementation of the No Action alternative would benefit marten by retaining current habitat and allowing further development of late-seral lodgepole pine forest.

Northern Goshawk ñ Action Alternatives:

Direct Impacts ñ Units 1, 2, 8, 9, 9a, 24, and 25 occur near known nest sites and within post-fledging areas. Activity within these stands could disturb nesting individuals if conducted during the spring and early summer, and could change the standsí characteristics in such a way as they become undesirable as a nest site.

- If implemented, Alternative four is expected to have minimal impacts on goshawk individuals and populations.
- Known and active nest sites would remain well outside of project treatment areas.
- 30 acre nesting areas identified around active nests would remain in their current vegetative condition, thus providing a secure environment and stable landscape for continued annual nesting.
- Alternate nesting habitat identified in the vicinity of active nests would remain in their current vegetative condition, provide additional nesting habitat within the post-fledging area, protect alternate nest sites which may not yet be identified, and provide returning goshawks with a wider range of options to avoid unforeseen project related disturbances.
- Habitat capability modeling indicates that forage values would increase by approximately 1 percent, and cover values would decrease by approximately 1 percent as a result of proposed clearcuts, group selection harvest, and shelterwood harvest. The overall habitat capability index would decrease by 1 percent indicating a minor shift in habitat capability which would remain within Forest Plan Standards and Guidelines.

Direct and indirect impacts to goshawk are expected to be greater in Alternatives 2 and 3 than in Alternative four because the harvest units are closer to or include known nesting areas, and potential alternate nest sights are not accounted for. A 300 foot buffer and seasonal restrictions would still be enacted around known nest sites to remain within Forest Plan Standards and Guidelines. Modeled habitat capability would decrease approximately 2 percent and would remain within Forest Plan Standards and Guidelines.

Indirect Impacts - Proposed activities outside of the nesting area and within fledging and foraging areas may be beneficial to goshawk in that they would move stands toward a less dense understory and improve hunting opportunities and prey availability for goshawk.

Cumulative Impacts ñ Cumulative impacts may be present across the watershed in that late seral lodgepole pine stands with large diameter trees and little understory (nesting habitat) have typically been harvested in areas managed for timber production. The likely impacts from the action alternatives continue this trend, though alternative four is expected to have the least impact. The regular practice of commercial thinning, and pre-commercial thinning in lodgepole pine stands has likely offset some loss of quality nesting habitat and improved some areas as foraging habitat. Overall, existing goshawk nesting habitat is expected to be adequate to support viable and healthy populations.

Northern Goshawk ñ No Action Alternative:

Direct Impacts ñ Habitat occupied by goshawk would remain in its current condition and continue to provide nesting, fledging, and foraging opportunities at suitable levels.

Indirect Impacts ñ As existing lodgepole stands mature over time, additional nesting areas would develop. Future disturbances caused by fire and insect outbreaks may remove some of the existing nesting habitat but would improve foraging opportunities across the forest. Current management practices governed by Forest Plan Standards and Guidelines and sensitive specie protection are designed to ensure protection of adequate goshawk habitat.

Cumulative Impacts ñ Cumulative impacts may be present across the watershed in that late-seral lodgepole pine stands with large diameter trees and minimal understory (nesting habitat)

have typically been harvested in areas managed for timber production. The regular practice of commercial thinning and pre-commercial thinning in lodgepole pine stands has likely offset some of this loss of quality nesting habitat. Overall, existing goshawk nesting habitat is expected to be adequate to support viable and healthy populations. The likely impacts from the No Action alternative maintain current habitat and do not contribute additional cumulative impacts.

Determination for northern goshawk: Implementation of the action alternatives may adversely impact individual goshawk, but is not likely to result in a loss of viability on the planning area nor cause a trend toward federal listing or a loss of species viability range-wide. Alternative 4 is the most favorable action alternative for goshawk.

> **Rationale** ñ The analysis area provides habitat for only a small number of goshawk territories (approximately 3) and proposed vegetation disturbances which may change habitat characteristics affect only a small portion of these territories. Mature lodgepole pine stands 30 acres or larger, which provide suitable cover and nesting habitat, are dispersed throughout the analysis area. Goshawk are known to readily disperse throughout available habitat, and habitat trends are stable in the region.

Boreal Owl ñ Action Alternatives:

Direct Impacts ñ Alternative 3 is the only action alternative which may directly affect boreal owls or their habitat. One harvest unit (unit 30) is located in an identified spruce/fir forest, within (connected to) the block of suitable habitat discussed above, here a boreal owl was heard calling. Harvest within this 25 acre unit could impact unknown but active nests, as none have been located. Remaining action alternatives (including Alternative 4) would likely have no direct impacts on boreal owls or their habitat.

Indirect Impacts ñ Over decades or centuries, it is possible that portions of the analysis area would succeed to forested areas where spruce/fir is more dominant than now, and larger blocks of suitable habitat for boreal owls could develop. All action alternatives would set back this successional progression and maintain conditions more favorable to lodgepole pine. However, since only a small amount of acreage is proposed for harvest (less than 1 percent of the analysis area), this indirect impact is estimated to be minimal.

Cumulative Impacts - It is currently not known what effects past management has had on boreal owl populations. Current studies are underway to evaluate population trends, patterns of habitat use, and capability of boreal owls to disperse across large areas of unsuitable habitat. At a forest and watershed level, habitat for boreal owls is being retained through retention of late-seral spruce/fir stands at higher elevations. The action alternatives would not impact late-seral spruce/fir stands, and thus would maintain boreal owl populations (on the Medicine Bow NF) at their current level and would unlikely to contribute additional cumulative impacts.

Boreal Owl ñ No Action Alternative:

Direct Impacts ñ Potential and/or occupied nest cavities for boreal owls would be retained. Populations and habitat would be maintained at its current level.

Indirect Impacts ñ Suitable habitat in higher elevations would continue to develop as lodgepole pine and spruce/fir stands mature and additional late-seral stands develop over time.

Cumulative Impacts - It is currently not known to what extent past timber harvest has had on boreal owl populations. Current studies are underway to evaluate population trends, patterns of habitat use, and capability of boreal owls to disperse across large areas of unsuitable habitat. At a forest and watershed level, habitat for boreal owls is being retained through retention of late-seral spruce/fir stands at higher elevations. The No Action alternative retains high elevation spruce/fir stands, and thus would maintain boreal owl populations (on the Medicine Bow NF) at their current level and would not contribute additional cumulative impacts.

Determination for boreal owl: Alternatives 1 (No Action), 2, and 4 are expected to have no measurable impact on boreal owls or their habitat. These alternatives do not propose treatments within spruce/fir stands suspected of being suitable and/or occupied boreal owl habitat.

Implementation of alternative 3 may adversely impact individual boreal owls, but is not likely to result in a loss of viability on the planning area nor cause a trend toward federal listing or a loss of species viability range-wide.

> **Rationale** ñ The analysis area provides suitable habitat for only a small number of boreal owls, and this habitat is located in spruce/fir dominated sites. Because this habitat is isolated from more suitable habitat in higher elevations, it is likely that this habitat is not critical to sustaining the boreal owl populations. In addition, the small size of the harvest unit (approximately 25 acres) makes it likely that any boreal owls in the area would be unaffected by harvest.

Three-toed Woodpecker ñ Action Alternatives:

Direct and Indirect Impacts ñ All action alternatives may have impacts on individual three-toed woodpeckers and/or their habitat. Alternative 3 has the highest projected impact as a larger portion of harvest units are located within predicted quality three-toed woodpecker habitat. A total of 186 acres of habitat would be treated causing a 2 percent decrease in habitat capability across the analysis area, or approximately 10 percent decrease in the total amount of quality habitat within the analysis area. Alternatives 2 and 4 would treat very little quality habitat (less than 50 acres total) and most of these acres are in small isolated patches unlikely to be occupied. Within the analysis area, habitat capability would change less than 1 percent, and existing quality habitat would decrease less than 3 percent.

Cumulative Impacts ñ Cumulative impacts across the analysis area include a reduced amount of late-seral lodgepole pine from past timber harvest, and a reduced amount of snags because of fire suppression and timber harvest activities. The action alternatives generally continue this trend by treating forested stands in later stages of seral development. However, the small overall acreage of habitat proposed for treatment and other areas of quality habitat across the forest minimize this projects overall contribution towards cumulative habitat decline.

Three-toed Woodpecker ñ No Action Alternative:

Direct Impacts - The No Action alternative would have no negative impacts on Northern Three-toed woodpeckers as no habitat would be treated.

Indirect Impacts ñ Gradual development of snags in spruce/fir and lodgepole pine stands may improve nesting and foraging opportunities over a long period of time.

Cumulative Impacts ñ Cumulative impacts across the project area include a reduced amount of late-seral lodgepole pine from past timber harvest, and a reduced amount of suitable snags because of fire suppression and timber harvest activities. The No Action alternative would maintain current amounts of late-seral spruce/fir and lodgepole pine vegetation and therefore is not expected to contribute additional cumulative impacts to the three-toed woodpecker or its habitat.

Determination for three-toed woodpecker: All action alternatives may adversely impact individual three-toed woodpeckers and/or their habitat, but are not likely to result in a loss of viability on the planning area nor cause a trend toward federal listing or a loss of species viability range-wide. Alternative 3 is expected to have a larger impact than all other action alternatives.

> **Rationale** ñ The analysis area provides a minimal amount of quality habitat for three-toed woodpeckers. Larger blocks of quality habitat are retained in other areas across the forest including wilderness areas and unroaded areas. The action alternatives would treat only a small amount of quality habitat which may or may not be occupied.

The No Action alternative would have no negative impacts on the three-toed woodpecker.

Western boreal toad, wood frog, and tiger salamander ñ Action Alternatives:

All action alternatives were designed to protect the functioning of riparian areas and wetlands. As a result, habitat for amphibian populations is protected and impacts to amphibians are minimal. The remote possibility of direct impacts to wood frog or tiger salamander could occur where project related traffic inadvertently runs over an individual or timber harvest disturbs a portion of terrestrial habitat occupied by amphibians. Placement of culverts or gravel in wet areas during road improvements, or road decommissioning activities near riparian areas could also inadvertently kill a few individuals. These impacts, if they occur at all, are expected to be minimal since project design and layout specifically avoids marshy areas, wetlands, and adjacent riparian areas more typically associated with amphibians. Harvest units are in upland sites, and road improvements will occur primarily on dry sites or narrow channel crossings. The project would not affect boreal toads as they are not expected to occur and habitat is not being disturbed.

Western boreal toad, wood frog, and tiger salamander ñ No Action Alternative

The No Action alternative would maintain amphibian habitats in their present condition. No impacts are expected.

Determination for amphibians: All action alternatives may adversely impact individual wood frogs, boreal toads, tiger salamanders and/or their habitat, but are not likely to result in a loss of viability on the planning area nor cause a trend toward federal listing or a loss of species viability range-wide.

> **Rationale** ñ The treatment areas generally do not affect amphibian habitat. Only minimal disturbance would occur to riparian areas, wetlands, marshy areas, and adjacent terrestrial habitat. As a result, impacts to wood frog and tiger salamander, if they occur, would be minimal. No impacts are expected to boreal toads as they are not present in the area.

The No Action alternative would have no negative impacts to amphibians or their habitat.

Management Indicator Species

MIS selected for this analysis include: Elk, mule deer, American marten, northern goshawk, boreal toad, wood frog, and northern leopard frog. American marten, northern goshawk, boreal toad, and wood frog were addressed under the Sensitive Species section above. Appendix C contains a table outlining all MIS on the Forest and reasons for why they were not analyzed in detail during this analysis.

Elk and Mule Deer: The No Action alternative would maintain 66 percent of the analysis area as hiding cover. The Proposed Action and Partial Cut Emphasis (Alternative 3) alternatives would result in approximately 62 percent of the analysis area in hiding cover. Alternative 4 would lower hiding cover in the analysis area to approximately 63 percent through treatments including clearcuts, group selection harvest, commercial thinning, and shelterwood harvests. These treatments are estimated to convert dense forested stands with suitable hiding cover (as determined by habitat structural stage ratings) to more open stands. Other treatments of the project proposal do not affect the amount of calculated hiding cover.

Clearcut timber harvest in Alternative 4 is estimated to temporarily increase the estimated amount of forage available to deer and elk. Approximately 2 percent of forested habitat structural stages would temporarily be set back to grass/forb and seedling/shrub structural stages. Removal of the forest canopy will allow additional growth of grasses and forbs on a previously shaded forest floor. These benefits will last 20 to 40 years as lodgepole pine regenerates and eventually dominates the site.

- Timber harvest activities of all action alternatives would maintain hiding cover for deer and elk well within Forest Plan standards and guidelines and temporarily increase available forage.
- Road decommissioning aspects of all action alternatives proposal would improve the effectiveness of the habitat by limiting some vehicle traffic and offering additional security/isolation areas within the analysis area. Based on these expected impacts, the snowy range elk population is expected to remain at or above goals set by the Wyoming game and fish department. Mule deer populations are expected to continue to slowly increase. For both species, it is likely that animal harvest and licensing strategies are currently more important to maintaining population levels than is habitat management on spring/summer/fall ranges. Such habitat is abundant in the analysis area.

3. Additional Considerations:

Roads and Transportation:

All action alternatives of the project proposal include the decommissioning of approximately 7.4 miles of road (Alternatives 2 and 3) with 10.1 miles of road being decommissioned under Alternative 4. Several of these roads are within and along riparian areas. While decommissioning would cause some temporary disturbance to soil and vegetation within the road bed, the overall value to wildlife habitat would improve over time. In the vicinity of the road decommissioning, human access would become less common, motorized use would decrease, and sediment loads into streams and wetlands (from road erosion) would decrease. Any additional road closure, decommissioning, or enforcement which reduces motorized use of Lake Mountain and Lake Creek would further benefit wildlife.

Neotropical Migrant Birds:

Under all action alternatives, habitat changes from timber harvest activities are likely to affect certain individuals. This would be an adverse effect in the short-term but beneficial in the long-term. Similarly, habitat changes from road decommissioning would have an adverse effect in the short-term, but a beneficial one in the long-term. Disturbances during the breeding EAson would also cause adverse effects, but only for the short-term.

Species composition or abundance is not likely to change since the action alternatives do not propose vegetation or habitat type conversion. Changes in population density are estimated to be relatively small and immeasurable.

Forest Plan Compliance:

As discussed throughout the document, all alternatives are in compliance with applicable Forest Plan standards and guides related to wildlife and wildlife habitat. Alternative 4 emphasizes greater habitat protection for species dependant on later successional stages of forest (goshawk and pine marten) which are also USFS Region 2 Sensitive Species.

G. Recreation

Direct and Indirect Effects:

All of the action alternatives would result in a short-term disturbance to the recreation resource. Recreational driving and dispersed camping would be affected by logging operations in close proximity to roads and campsites. Due to the proposed amounts of timber harvesting and road construction and reconstruction, the Proposed Action would affect the recreation resource more than Alternatives 3 and 4. The No Action alternative would have no impact.

Logging activities associated with the action alternatives would increase noise and dust. Although the effects would be short-term, they would detract from the dispersed camping experience. These effects would be greatest under the Proposed Action because of the amount of timber harvesting and road construction/reconstruction proposed, followed by Alternative 3, Alternative 4, and Alternative 1 (No Action). However, standard mitigation measures incorporated into the timber sale contract would minimize these effects.

Under Alternatives 2 and 3, approximately 7.4 miles of road would be decommissioned to meet resource needs other than recreation (i.e., to improve watershed or wildlife conditions). Approximately 10.1 miles of road would be decommissioned under Alternative 4. Although recreation opportunities would not be eliminated, the type of opportunity available would be modified; motorized recreation opportunities would decrease, while nonmotorized recreation opportunities would increase. Recreation opportunities would not be affected under the No Action Alternative because no roads would be obliterated. Under Alternatives 2 and 3, the change in recreation opportunities would be the same because the roads to be decommissioned would be the same. There would be a greater change under Alternative 4 due to increased road decommissioning.

The major haul routes for the proposed timber sale are NFSR 517 and NFSR 512 from Foxpark, Wyoming. These roads are also major snowmobile routes during the winter months. If winter logging is permitted, a conflict between logging traffic and snowmobiling could occur. Plowing both roads simultaneously for timber hauling would severely impact snowmobile access from the parking lots at Wyocolo, Mountain Home, Wold, Foxpark, and Ticks. In order to avoid this problem, snow plowing would only be allowed on one road or the other, but not on both roads at

the same time. Another method to reduce this potential conflict is to limit hauling activities to the weekdays and prohibiting snowmobiles, while allowing snowmobiling on the weekends and prohibiting timber hauling. Signs would also be posted to inform all users of this situation.

Cumulative Effects:

The action alternatives under consideration would not significantly change existing recreational activities within the analysis area. Short-term, harvest-related disturbances would result in a temporary displacement of some camping and general Forest users during the life of the sale. The area will continue to provide a wide variety of recreation opportunities year-round.

H. Visuals

Direct and Indirect Effects:

Beginning in the 1860ís, the landscape of the Collins Creek area was being altered by tie hacking and mining. Forest Service timber sales and associated road building have impacted the landscape for the last four decades; however, new young trees are growing in many of the created openings. Several stands of young regeneration have been pre-commercially thinned. Livestock grazing also is occurring in the project area. The visible changes in the analysis area landscape can be observed by forest visitors while driving through the area on Forest roads.

The Proposed Action would introduce additional visual changes to the existing landscape. Visitors would notice newly created openings with slash, stands with mature/overmature trees and dwarf mistletoe trees removed, and pre-commercially thinned stands. Several Forest road sections would be reconstructed and one new road would be constructed.

Alternative 1 - No Action:

There would be no ground-disturbing activities under this alternative; therefore, direct and indirect effects would not occur. The existing landscape in the Collins Creek analysis area would be affected only by the dynamic forces of nature.

Alternative 2 - Proposed Action:

The Proposed Action includes clearcutting, overstory removal, group selection, commercial thinning, and roadside clearing. Four proposed clearcut units (21, 22, 24 and 25) would visually rehabilitate 1960ís strip cuts that currently are not meeting the Forest Plan adopted visual quality objectives. One new specified road of less than a mile would be constructed to access two units. Direct visual effects would occur when harvest activities change the appearance of the existing landscape and forest visitors observe sites with slash, exposed soils, stumps, and skid trails. The roadside clearing, clearcut unit 20 in the foreground of NFSR 509, and clearcut units 24 and 25 in the foreground of NFSR 512 would be visible from the roads. All proposed clearcut units located in the middle-ground areas would be partially noticeable or not noticeable at all due to the landform and vegetative screening.

Silviculturally treating mature/overmature stands and dwarf mistletoe stands, and thinning young stands, would improve the visual appearance of the landscape by creating a more diverse forest mosaic that would better withstand insects and diseases. Over time, the natural regeneration in the harvested areas between old strip cuts would restore the landscape to a more desirable visual quality and help to meet the Forest Plan goal for desired condition of the visual resource.

Mitigating measures for visual resources of the project area were developed to ensure that the Proposed Action will meet the Forest Plan adopted visual quality objectives. There would be no significant effects in visual resources as long as mitigating measures are followed.

Alternative 3 - Partial Cut Emphasis:

This Alternative is similar to the Proposed Action except that fewer acres of clearcuts and more acres of partial harvest are proposed. Clearcut units 21, 22, 24 and 25 would visually rehabilitate old stripcut areas that currently are not meeting the Forest Plan adopted visual quality objective. Proposed commercial thinning units 26 and 30 could introduce visual impact adjacent to NFSR 512. Proposed group selection unit 14 also could introduce visual impact adjacent to NFSR 517. Several local roads would be reconstructed to access harvest units. Some temporary roads would be constructed and would be closed after the end of the project. No new roads would be constructed. The direct and indirect effects would be similar to the Proposed Action, and there would be no significant effects as long as mitigating measures are followed.

Alternative 4 - Wildlife Mitigation:

Alternative 4 is similar to the Proposed Action Alternative (2) except that it provides additional protection to wildlife species ñ pine marten and goshawk. This alternative would have less visual impacts than the Proposed Action due to clearcut units 9 and 9a dropped and the northern half of clearcut unit 24 also dropped within the analysis area. Unit 24 is within the old strip cut area that is currently not meeting the Forest Plan adopted visual quality objectives. By dropping only a portion of unit 24, the treatment still would rehabilitate the strip cut pattern to better blend with the landscape and meet the visual quality objective.

Alternative 4 would be consistent with the Medicine Bow Forest Plan adopted visual quality objectives as long the mitigating measures developed for the analysis area are followed. This alternative would not result negatively in the cumulative effects of visual resources.

The western half of ITM unit 1 in Partial Cut Emphasis Alternative (3) would be dropped to provide a 30-acre buffer around an existing and active goshawk nest. By dropping the western half, the landscape change of the unit would be smaller and still would be consistent with the Forest Plan adopted visual quality objectives.

Forest Plan Consistency:

The Visual Management System Handbook (Handbook # 462 USDA, 1974), the Medicine Bow National Forest Inventoried Visual Quality Objective map and Existing Scenic Integrity map were used to analyze the visual resources of the Collins Creek area. Both General and Management Area direction in the Medicine Bow Forest Plan were consulted to ensure the project would be consistent with the adopted visual quality objectives. The visual quality objectives for the Collins Creek area are retention, partial retention, and modification in foreground and middle-ground zones. Each visual quality objective describes a different degree of acceptable alteration of the natural landscape.

The No Action Alternative would be consistent with the Medicine Bow Forest Plan adopted visual quality objectives, except that the strip-cut areas would not be rehabilitated to meet the desired visual quality objectives. The strip-cut patterns will continue to dominate the characteristic landscape of the Collins Creek area.

The Proposed Action (Alternative 2), the Partial Cut Emphasis Alternative (Alternative 3), Alternative 4 (Wildlife Mitigation) would be consistent with the Medicine Bow Forest Plan adopted visual quality objectives as long as the mitigating measures are followed.

Cumulative Effects

Past, present, and future management activities within and adjacent to the Collins Creek area were analyzed for cumulative effects on visual resources. The analysis area has been altered by mining, timber harvest, road building, grazing, and dispersed recreation since the 1860ís. Adjacent areas also have been visually changed by such activities. Most of the created openings from past timber sales have become stocked with regeneration. All proposed harvest units would be designed to complement the surrounding landscapes and to meet the Medicine Bow Forest Plan adopted visual quality objectives. If applicable mitigation measures are followed, none of the alternatives would negatively impact visual resources.

I. Heritage Resources

Direct and Indirect Effects:

Implementing the Proposed Action or any of the alternatives could directly or indirectly affect several known, and possibly some unknown, cultural sites. This determination is based on a comparison of 100 percent intensively surveyed acres, documented cultural site locations, and proposed timber unit and road work locations.

Alternative 1- No Action:

This alternative would have no direct effects on any known heritage resources in the area. Indirect effects could occur from erosion or continued recreational use. Some of these effects could be mitigated by implementing activities included in the Proposed Action alternatives (i.e., erosion control measures to protect sites).

Alternative 2 - Proposed Action:

This alternative includes a combination of silvicultural prescriptions, new road construction and reconstruction, road pre-haul maintenance, decommissioning of existing roads, and roadside clearing along NFSR 509. One eligible site was located within proposed clearcut unit 19. Prior to project implementation, the boundary of unit 19 was modified to avoid the site and provide an adequate protective buffer. An archaeologist assisted in unit layout to ensure the site was not impacted. The buffer slightly reduced the size of the unit, and consequently, the volume produced. Prior to any road construction, reconstruction, maintenance, or decommissioning, a 100 percent intensive cultural survey will have been completed.

Alternative 3 - Partial Cut Emphasis:

This alternative includes a combination of silvicultural prescriptions, new road construction and reconstruction, road pre-haul maintenance, decommissioning of existing roads and roadside clearing along NFSR 509. One eligible site was located within proposed clearcut unit 19. Prior to project implementation, the boundary of this unit was modified to avoid the site and provide an adequate protective buffer. An archaeologist assisted in unit layout to ensure the site was not impacted. The buffer reduced the size of the unit, and consequently, the volume produced.

Two eligible sites were located within proposed unit 12. Prior to project implementation, the boundary of unit 12 was modified to avoid the sites and provide an adequate protective buffer. Road 3443 will not be used as a haul or skid road to avoid impacts to an eligible site. An archaeologist assisted in unit layout to ensure the site was not impacted. The buffer reduced the size of the unit, and consequently, the volume produced. Prior to any road construction, reconstruction, maintenance or decommissioning a 100 percent intensive cultural survey will have been completed.

Alternative 4 - Wildlife Mitigation:

The effects of Alternative 4 would be similar to the Proposed Action.

Cumulative Effects:

Timber harvest, slash treatment, and road construction, reconstruction, obliteration, and decommissioning can have adverse effects on heritage resources. Only one of the past timber sales occurring in this area received a significant heritage resource inventory. Visual inspection indicates that many sites may have been destroyed or severely damaged by logging and other activities. Project design combined with cultural resource protection clauses in the Timber Sale Contract, will mitigate cumulative negative effects to the heritage resources in the Collins Creek watershed. The No Action Alternative may contribute marginally to the cumulative negative effect by allowing continued deterioration of sites.

J. Economic and Social

Direct and Indirect Effects:

A discussion of the economic setting for this area is included within the Final Environmental Impact Statement for the Medicine Bow Forest Plan (Pages III-5 through III-15).

Effects to income and employment

Generally a single project does not have an impact on employment or income. If a particular project was not approved, there would be other timber sales in other areas. Any impact on recreation opportunities due to the timber sale would shift the use from one area to another, with no overall net change in use on the Forest.

The Forest Plan analyzes effects to jobs and income from the total timber sale program. See the Economics section in Chapter 3 of the EIS for the Forest Plan. Monitoring the implementation of the Forest Plan analyzes the effect on jobs and income that are the result of the Forest timber sale program.

Effects on Economic Efficiency

The main criterion used in assessing economic efficiency is Present Net Value (PNV), which is defined as the value of discounted benefits minus discounted costs. A PNV analysis includes all outputs, such as timber, grazing, and recreation, to which monetary values are assigned. The monetary values include both market and non-market values. In addition, a financial efficiency analysis was completed to determine the financial returns of each alternative. A financial efficiency analysis is the PNV of Federal revenues and costs.

Two efficiency analyses were conducted for the Collins Creek area: for both short-term and long-term economic efficiency. The short-term analysis was conducted for a 70 year period, from sale preparation during 2000 until regeneration surveys in 2005 to 2010. The long-term analysis was performed for a 190-year period including all of the short-term analysis, plus a complete rotation from a future re-entry harvest.

Table 14 below displays the PNV and benefit/cost ratio for each alternative for the short-term for both the financial and economic efficiency analyses. Table 15 displays the PNV and benefit/cost ratio for each alternative for the long-term for both the financial and economic efficiency analyses. All monetary values are expressed in constant dollars, with no allowance for inflation.

A four percent discount rate was used. The reduction of PNV compared to the most efficient solution is the economic trade-off, or opportunity cost, of achieving that alternative.

Table 14 ñ Short-Term Analysis by Alternative				
	Alt. 1	**Alt. 2**	**Alt. 3**	**Alt. 4**
B/C Ratio	1	2.37	2.22	2.19
Present Net Value ($)	0	$857,351.22	$379,889.12	$367,765.36

Table 15 ñ Long-Term Analysis by Alternative				
	Alt. 1	**Alt. 2**	**Alt. 3**	**Alt. 4**
B/C Ratio	1	1.87	1.77	1.69
Present Net Value ($)	0	$359,969.44	$267,519.86	$258,623.74

The Present Net Values in the tables above show that all action are economically efficient in both the short and the long-term in both the financial and economic analyses. The PNVs and benefit/cost ratios are highest in all cases for Alternative 2. Since no costs or outputs are associated with Alternative 1, the PNV for Alternative 1 is zero and the benefit/cost ratio is also zero.

When evaluating trade-offs, the use of economic efficiency measures is one tool used by the decision maker. Many things cannot be quantified, such as effects to wildlife and forest health. The responsible official takes many factors into account in making the decision.

Cumulative Effects:

There are many factors that influence local economies. Population growth, economic growth, and the economic diversity and dependency of individual counties and communities all affect local economies. This project is not expected to add to any existing cumulative effect.

K. Range Resource

Direct and Indirect Effects:

A. Transitory Rangeland

Tree harvesting activities associated with the proposal commonly create transitory rangeland with herbaceous forage for livestock and wildlife where it previously did not exist. All harvested units would result in creation of herbaceous forage that will be available for livestock use for at least 15-20 years or until tree regeneration/cover causes herbaceous forage species to die out. The short term increase in forage on the cut acres would increase the feed base for livestock and big game and thus reduce overall forage consumption levels throughout the Fox Park allotment. Resource value ratings for livestock in the Douglas Creek pasture should improve at a greater rate than if no harvesting activities occurred. A slight reduction in utilization levels in primary rangeland sites (riparian & upland) is possible in the Douglas Creek pasture as a result of having a slightly larger feed base.

B. Livestock Distribution/Operations

It is expected the harvesting activities would improve livestock distribution patterns. New roads and skid trails can create travelways to new and existing foraging areas. Cutting units and roads can eliminate barriers to livestock movements. A slight improvement in livestock distribution patterns in the analysis area (AA) would occur as a result of implementing the action alternatives.

Increased distribution patterns for livestock often make it more difficult to manage and control livestock in large heavily forested pastures. Finding stock to redistribute, remove or rotate them in a efficient manner is difficult when well distributed in a large forested pasture. Maintaining rotational integrity in the Douglas Creek pasture will require greater effort by the permittee.

C. Noxious Weeds

It is not uncommon for some noxious weed species to become established following site disturbances created by tree harvesting operations, especially if a seed source is in the immediate area or brought into the area by forest users. There are widely scattered individual noxious weed plants and small patches that exist adjacent to and within the AA. Infestation levels are low. Most patches have less than 5 percent cover occurring. The existing noxious species include yellow toadflax, musk and canada thistle. Other noxious weeds species have been observed within several miles of the AA. They include dalmation toadflax and hounds tongue. It is estimated that less than 60 total acres of noxious weed infestations currently exist in the AA. It is estimated that an additional 5-10 acres of noxious weeds would become established within 5 years of completing the proposed harvest activities. Newly infested areas would be strongly related to harvest and road activities associated with the action alternatives.

D. Structural Range Improvements

Approximately 7.75 miles of pasture division fence and 1 mile of allotment boundary fence exists in the AA. About 1/4 mile of division fence is located in cutting unit CC-32. Approximately 1/4 mile of boundary fence is immediately adjacent to a pre-commercial thinning unit adjacent to NFSR 504. It is expected that only the division fence would be adversely affected by implementation of the proposal or other action alternatives.

Hay Creek Cow Camp is within the AA. It is located less than 1/4 mile northeast of cutting unit SC-11 and within 200 yards of one pre-commercial thinning unit. The camp is in very poor condition and no longer used for managing livestock. It should not be adversely impacted by harvesting activities associated with any alternative. No plans currently exist to make the camp operational in the future. Its current value is more of a cultural nature than as a site for managing rangeland uses.

No livestock water developments are located in the AA, nor or any new rangeland improvements planned. A º acre fenced range study exclosures exist in the AA. The exclosure is remote from any planned harvest or road treatments and would not be impacted by the proposal or alternatives.

L. Plants

Clustered Ladyís Slipper Orchid (cypripedium fasciculatum):

Alternative 1 (No Action): The No Action Alternative would not treat or build roads in or around any stands in the analysis area including those stands which could be providing habitat for populations of Clustered ladyís slipper orchid. Consequently, no populations of ladyís slipper orchid would be lost as a result of magement actions.

Action Alternatives: Proposed harvest units and proposed roads have not been surveyed for this species. Assuming presence of this species, management actions associated with timber harvest and road building could result in the extripation of ìunknownî populations. *Cypripedium fasciculatum* populations would be most threatened by proposed actions which could cause physical damage to plants and their habitat including tree felling and/or tree skidding, soil compaction caused by heavy machinery, or as a result of microclimate change caused by canopy removal. Assuming presence, populations of clustered ladyís slipper orchids could be negatively impacted within proposed harvest units as a result of all action alternatives.

Most populations of ladyís slipper orchid on the Medicine Bow-Routt N.F. are small (7-50 plants). Some populutions do occur which are large (500-1000+ plants). Those large populations are likely to be more important to the viability of this species. Without a survey designed to specifically locate and census populations of this species within the impacted area, it is impossible to accurately evaluate the consequences of each action alternative. However, because there at least 105 populations known to occur on the Medicine Bow-Routt N.F., gross generalizations can be made. Loss of ìunknownî populations of any size would reduce the viability of this species on the project level. Loss of small ìunknownî populations may effect, but would not likely adversely affect the viability of this species on the forest level. Loss of large ìunknownî populations would likely reduce the viability of this species on the forest level. Loss of ìunknownî populations of any size would not be likely to adversely affect the viability of this species across its known range.

Assuming mitigation is implemented under all action alternatives, no known clustered ladyís slipper orchid population would be lost as a result of management activity. Therefore, under all action alternatives, there would be no adverse impacts to clustered ladyís slipper orchid.

Hall Fescue (festuca hallii):

Alternative 1 (No Action): The No Action Alternative would not treat or build roads in or around any proposed harvest units within the analysis area including forest edges or forest openings within stands which could be providing habitat for populations of *Festuca hallii.* Consequently, no populations of Hall fescue would be lost as a result of management actions.

Action Alternatives: Proposed harvest units have not been surveyed for this species. Assuming presence of this species, management actions associated with timber harvest and road building could result in the extripation of ìunknownî populations. Hallís fescue would be most threatened by physical damage to plants and their habitat caused by tree felling and/or tree skidding, soil compaction caused by heavy machinery, or by loss of the ìedge effectî caused by

canopy removal. Assuming presence, it is likely that populations of Hallís fescue would be negatively impacted in and around proposed harvest units as a result of all action alternatives.

Only one population of Hall fescue is known to occur on the Medicine Bow N.F. and only a handful of populations of this species are known to occur on region 2 lands. Without a survey designed to specifically locate and census populations of this species within the impacted area, it is impossible to accurately evaluate the consequences of each action alternatives. Because so few populations are currently known to occur on the Medicine Bow-Routt N.F. and on Region 2 lands, generalizations can be made. Loss of ì unknownî populations of any size would be likely to adversely affect the viability of this species on the project level, the forest level and across the known range of this species.

Assuming mitigation is implemented under all action alternatives, no known *Festuca hallii* population would be lost as a result of management activity. Therefore, under all action alternatives, there would be no adverse impacts to *Festuca hallii.*

Colorado Tansy Aster *(machaeranthera coloradoensis var coloradoensis):*

Alternative 1 (No Action): The No Action Alternative would not treat in or around any stands in the analysis area including those stand edges or openings which could be providing habitat for populations of Colorado Tansy Aster.. Consequently, no populations of Colorado Tansy Aster would be lost as a result of management actions.

Action Alternatives: Proposed harvest units and proposed roads have not been surveyed for this species. It is possible (but not likely) that habitat exists within proposed harvest unit boundaries. It is likely that habitat exists for this species in open gravelly locations where roads are proposed to access units or skid logs. Assuming presence, management actions associated with timber harvest could result in the extripation of unknown populations. Colorado Tansy Aster would be most threatened by physical damage to plants and their habitat caused by road building including soil compaction caused by heavy machinery, by tree skidding across its habitat and possibly by tree felling. Assuming presence, it is likely that populations of Colorado Tansy Aster would be negatively impacted in and around proposed harvest units as a result all action alternatives.

Only two populations of Colorado Tansy Aster are documented on the Medicine Bow-Routt N.F. Without a survey designed to specifically locate and census populations of this species in the impacted area, it is impossible to accurately evaluate the consequences of each action alternative. Because there are so few populations known to occur on the Medicine Bow-Routt N.F., gross generalizations can be made. Loss of ì unknownî populations of any size would be likely to adversely affect the viability of this species on the project level, and on the forest level. Because this species is relatively secure on R2 lands in Colorado, loss of ì unknownî populations of any size may effect but would not be likely to adversely affect the viability of this species across its known range.

Assuming mitigation is implemented under all action alternatives, no known population of Colorado Tansy Aster would be lost as a result of management activity. Therefore, under all action alternatives, there would be no adverse impacts to Colorado Tansy Aster.

VII. UNAVOIDABLE ADVERSE EFFECTS

The application of the Forest Plan Standards and Guidelines and the listed mitigation measures would limit the extent and duration of any adverse environmental effects due to this project. However, it is impossible to avoid all potential impacts completely. Refer to the discussion of Environmental Consequences for each resource in the preceding sections of this document for the disclosure of all the environmental effects. Also refer to the discussion of unavoidable adverse effects in the Forest Plan EIS, pages IV-187 to 189.

VIII. SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

Short-term uses are those expected to occur on the Forest during the next ten years. These include, but are not limited to; recreation use, grazing, mineral development, timber harvest, and prescribed burning. Long-term productivity refers to the capability of the land to provide resource outputs beyond the ten-year period.

The minimum management requirement established by regulation (36 CFR 219.27) provides for the maintenance of long-term productivity of the land. Minimum management requirements prescribed by the Forest Plan Standards and Guidelines will be met under all alternatives. Minimum requirements assure that long-term productivity of the land will not be impaired by any of the short-term uses that are proposed by any of the activities of this project.

Although the alternatives were designed to maintain long-term productivity, there are some differences between the alternatives in the long-term availability of the resources. There are also some differences between the alternatives in the long-term expenditure of funds necessary to achieve desired conditions.

Short-term uses include harvesting timber and disturbance of the land surface for the associated equipment and travelways. These areas would be returned to vegetative cover and would not reduce long-term productivity. Regeneration would occur more quickly and the lands would produce the next generation of wood products faster on the treated areas than with the No Action alternative. Refer to the Forest Plan EIS, page IV-184, for further discussion of this section.

IX. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The irreversible commitment of resources means that non-renewable resources are consumed or eliminated. Examples include coal extraction which consumes a non-renewable resource, or the potential elimination of an historical site due to some management activity on the ground.

The irretrievable commitment of a resource is an opportunity that is foregone as a result of implementing some activity. They often represent a trade-off in the use and management of forest resources. An example of this would be the expenditure of funds, loss of wood production, or a permanent restriction on the use of a resource.

Three are no identifiable commitment of resources for this Proposed Action that are irretrievable or irreversible, as determined by the Interdisciplinary Team. Refer to the Forest Plan EIS, pages IV-185, 186, for a more complete discussion of this analysis.

X. OTHER DISCLOSURES

Global Warming:

In relation to national and global petroleum reserves, and to global warming, the energy consumption and emissions for all the alternatives is negligible.

XI. LIST OF CONTRIBUTORS

Name	Title	Time with USFS
Tommy John	Soil scientist	26 years
Jim Gerleman	Forestry Technician	7 years
Ted Dietrich	Forester	26 years
Ed Snook	Hydrologist	9 years
Jeff Tupala	Landscape architect	14 years
Kit Buell	Wildlife biologist	14 years
Steve Kozlowski	Wildlife biologist	13 years
Deana Wood	Archaeologist	18 years
Dean Lebeda	Engineering technician	13 years
Randy Lambert	Engineer	13 years
Larry Lindner	Interdisciplinary Team Leader	27 years
Melissa Martin	Interdisciplinary Team Leader	13 years
Stephen Nielsen	Interdisciplinary Team Leader	29 years
Greg Eaglin	Fisheries biologist	15 years
Chuck Cobb	Forester	24 years
Jeff Wallace	Forester - Recreation staff	23 years
Steve Williams	Data Coordinator	15 years

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APPENDIX A

Best Management Practices

Introduction:

Best Management Practices (BMPs) are those conservation actions, which when properly selected and applied, would result in maintaining the existing beneficial uses of water resources and minimizing adverse effects and water quality degradation. Section 319 of the Clean Water Act requires that states prepare a nonpoint source management plan. The BMPs are an integral part of this plan for Wyoming, and when properly used can effectively minimize water quality degradation and prevent violations of the State water quality standards.

These BMPs are from the publication *Silviculture - Best Management Practices, Wyoming Nonpoint source Management Plan, Final Draft 1992*, published by and available through Wyoming Department of Environmental Quality, Cheyenne, Wyoming.

Road Planning, Design, and Location:

1. Properly locate and design roads and trails with minimum soil and water resource impact.
2. Reduce sedimentation by reducing the chances of road related mass failures including landslide and embankment slumps.
3. Keep temporary roads from unduly damaging streams, disturbing channels or obstructing fish passage.
4. Review available information and consult with professionals as necessary to help evaluate needs and recommend mitigation measures.
5. Design roads and trails to drain naturally by outsloping or insloping with cross drainage and grade changes. Maximize sediment deposition prior to entry into any water resources.

Road Construction:

6. Minimize earth-moving activities when soils appear excessively wet, in order to avoid impacts to fish migration and spawning.
7. Complete or stabilize road sections within the same operating season, ensuring that drainage features are fully functional prior to spring or fall runoff and that major road sections are not left in an unstable condition during winter.
8. Minimize soil erosion from road cuts, fills, and travel surfaces.
9. Place debris, overburden, and other waste materials associated with construction activities in a location to avoid entry into streams. Include these waste areas in soil stabilization planning for the road.
10. Slash and debris generated during construction must be kept out of streams to prevent obstruction. Burning is one method of disposal.

11. Prevent contamination of water from accidental spills of fuels, lubricants and other harmful materials by servicing or fueling vehicles 150 feet from wetlands, riparian areas and stream channels and by using berms to contain spills.
12. Be aware of the potential for gravel pits to contaminate surface water. Take precautions to control drainage and escaping sediment.
13. Minimize erosion and water quality degradation by proper design and construction of drainage systems and control structures.
14. Design and construct roads for minimal water quality degradation.

Road Maintenance:

15. Maintain erosion control features through periodic inspection and maintenance, including cleaning dips and crossdrains, repairing ditches, marking culvert inlets to aid in location, and clearing debris from culverts.
16. Haul all excess material removed by maintenance operations to safe disposal sites and stabilize these sites to prevent erosion. Avoid locations where erosion would carry materials into a stream.

Road Closures:

17. Reduce sediment from temporary roads by obliterating them at the completion of intended use. The drainage system of obliterated roads needs careful thought and attention.

Streamside Management:

18. Riparian areas are not zones of exclusion but should be carefully managed. As a preventative measure, silvicultural activities would be minimized but harvesting may be used to achieve riparian area objectives. Factors such as slope, stream classification, channel stability, and resource condition should also be considered when determining proper buffer zone width. Operations on slopes greater than 40 percent need special consideration and should be coordinated with the appropriate technical agencies.

Slope (%)	Buffer Width (ft.)
0 - 20	0 - 100
20 - 30	100 - 180
30 - 40	180 - 280
40 - 50	280 - 400
50+	400 - 1300

19. Leave the following adjacent to streams: hardwoods, unmerchantable conifers and shrubs, and sufficient shading.
20. Maintain or provide sufficient ground cover to trap sediment.

Wildfire:

Firelines and Roads.

21. Stabilize all areas that have significantly increased erosion potential or drainage patterns altered by suppression activities.

Fire Camps.

22. Protect surface and subsurface water resources from nutrients, bacteria, and chemicals associated with solid waste and sewage disposal.

Burn Areas.

23. Minimize soil and site productivity loss, threats to life and property, and deterioration of water quality both on and off site by:

    a. Seeding grasses or other vegetation to provide a protective cover as soon as possible.

    b. Fertilizing.

    c. Fencing to protect new vegetation.

    d. Clearing debris from stream channels.

    e. Constructing channel stabilization structures and debris retention structures.

Timber Harvest:

24. Use the logging system that best fits the topography, soil type, and season, while minimizing soil disturbance and economically accomplishing silvicultural objectives.

25. Ensure that timber harvest unit design would maintain or improve hydrology by increasing runoff quantity and/or extending the runoff period; maintain water quality and soil productivity; and reduce soil erosion and sedimentation.

26. Identify areas where suspended log yarding is appropriate to protect soil from excessive disturbance and accelerated erosion and to maintain the integrity of riparian and other sensitive watershed areas.

27. Design and locate skid trails and skidding operations to minimize soil disturbance. Using designated skid trails is one means of limiting site disturbance and soil compaction.

28. Locate landings to avoid soil erosion and water quality degradation. Avoid locating landings that require skidding across drainage bottoms.

29. Limit soil damage, turbidity and sediment production due to rutting, compaction, runoff concentration and subsequent erosion by avoiding tractor skidding on unstable or wet soils.

30. Stabilize or reclaim landings to reduce erosion and subsequent sedimentation.

31. Establish vegetative cover on roads, skid trails, landings, and following controlled burns to prevent erosion and sedimentation.

32. Waterbars, back-blading, scattering slash and seeding of skid trails may be needed to minimize erosion and sedimentation.

Slash Treatment and Site Preparation:

33. Hand piling or removal of slash may be necessary in meadows, wetlands, riparian or landslide areas where use of mechanized equipment could degrade water quality.

34. Limit water quality impacts of prescribed fire by constructing waterbars in firelines; not placing slash in drainage channels; and maintaining the streamside management zone. Avoid intense fires unless needed to meet silvicultural goals.

APPENDIX B

Table B-1. Acres of Silvicultural Treatment for Alternatives 2 and 3.			
Unit	**Harvest Prescription**	**Alternative 2, Proposed Action (acres)**	**Alternative 3, Partial Cut Emphasis (acres)**
1	Shelterwood - prep cut	40	40
2	Clearcut	27	0
3	Overstory Removal	0	15
4	Clearcut	9	0
5	Group Selection	38	38
6	Sanitation & Salvage	0	22
7	Overstory Removal	39	39
8	Clearcut	24	0
9	Clearcut	36	0
9A	Clearcut	15	0
11	Group Selection	56	56
12	Sanitation & Salvage	0	110
14	Group Selection	0	30
15	Overstory Removal	27	27
16	Clearcut	9	9
17	Sanitation & Salvage	0	52
18	Group Selection	0	30
19	Clearcut	29	30
20	Clearcut	31	0
21	Clearcut	2	2
22	Clearcut	10	10
24	Clearcut	21	27
25	Clearcut	11	13
26	Commercial Thinning	0	49
27	Commercial Thinning	0	20
28	Shelterwood - prep cut	0	33
29	Clearcut	10	0
30	Commercial Thinning	0	26
31	Commercial Thinning	18	0
32	Clearcut	33	0
33	Commercial Thinning	0	42
TOTAL		485	720

APPENDIX C

Management Indicator Species

Selection of Management Indicator Species

All Management Indicator Species (MIS species) listed in the Forest Plan were reviewed to determine which species would be selected and further analyzed as project specific MIS. The following Table summarizes the full list of Management Indicator Species and applies one of the following 3 categories to each species.

Category A: Certain Forest MIS species were not further analyzed in this project. Pre-field review was adequate to determine that these species were not affected or are extremely unlikely to be affected by the project proposal. One of the following six reasons applies to those MIS species eliminated from further review.

1. The project proposal is outside of the known range of the species and/or the species is not likely to occur.
2. There are no documented records of species occurrence, habitat is generally not provided, and the species is unlikely to be present in the project area.
3. Larger scale evaluations suggest that a strong and viable population of the species exists, and the project is expected to retain habitat in a condition which is suitable to occupancy in the analysis area, and site specific population estimates are not available for the species.
4. Habitat used by the species is different than that being disturbed by the project proposal. Effects/impacts are not expected to occur to individuals within known existing populations.
5. Disturbance to habitat or individuals is marginal, very small in size and/or length of time, thus unlikely to affect species viability.
6. Timing of the project proposal is such that no effects/impacts are expected.

Category B: These species are both Forest MIS species as well as region 2 Forest Service Sensitive Species or Federally Listed or Proposed species. Impacts/Effects were addressed (or dismissed) in the sensitive species portion of this analysis.

Category C: Forest MIS species analyzed in further detail within the wildlife specialist report. Measurable impacts to habitat are expected and some estimates of local habitat, population and/or viability is available.

Species Common Name	Suitable habitat	Category of Analysis (see earlier description)	Remarks
Elk	Forest, shrublands, grasslands	Category C ñ evaluated in wildlife specialist report.	
Mule Deer	Forest, shrublands, grasslands.	Category C ñ evaluated in wildlife specialist report.	
Bighorn Sheep	Shrublands, rock outcrops	A1 ñ Not Selected as an MIS	

Species Common Name	Suitable habitat	Category of Analysis (see earlier description)	Remarks
Turkey	Deciduous and Ponderosa Pine Forest	A1 ñ Not Selected as an MIS	
Bald Eagle	Generally near larger bodies of water,	Category A4, also addressed in Biological Assessment.	No Effect, habitat not impacted.
Peregrine Falcon	Cliff habitat nearby	Category A4 ñ Not Selected as an MIS	
Black-footed Ferret	Prairie-dog towns	Category A1 ñ Not Selected as an MIS	
Pine Marten	Mature conifer forest	Category B ñ Impacts analyzed in biological evaluation. Sensitive Species	
Beaver	Riparian Areas	Category A5 ñ Not Selected as an MIS	
Red-backed Vole	Coniferous forests with downed timber	Category A3 ñ Not Selected as an MIS	
Long-tailed Vole	Wet meadows, riparian, aspen, riparian shrub.	Category A5 ñ Not Selected as an MIS	
Dwarf Shrew	Talus Slopes	Category A5 ñ Not Selected as an MIS	
Western Jumping Mouse	Marshy areas and riparian shrub	Category A5 ñ Not Selected as an MIS	
Osprey	Near Larger bodies of water	Category A5 ñ Not Selected as an MIS	
Goshawk	Mature Forest with open understory. Water nearby.	Category B ñ Impacts analyzed in biological evaluation. Sensitive Species	
White-tailed Ptarmigan	High elevation areas	Category A1 ñ Not Selected as an MIS	
Sage Grouse	Sagebrush flats	Category A1 ñ Not Selected as an MIS	
Blue Grouse	Forested areas	Category A3 ñ Not Selected as an MIS	
Hairy Woodpecker	Aspen Forests	Category A5 ñ Not Selected as an MIS	Aspen not being treated.
Yellow-bellied Sapsucker	Migrant, low elevation woodlands	Category A5 ñ Not Selected as an MIS	

Species Common Name	Suitable habitat	Category of Analysis (see earlier description)	Remarks
Lewis Woodpecker	Open Ponderosa Pine Forests	Category A1 ñ Not Selected as an MIS	
White-crowned Sparrow	Dense thickets of willow, sagebrush, or subalpine fir in the mountains.	Category A4 ñ Not Selected as an MIS	
Ruby-crowned Kinglet	Coniferous Forests.	Category A3ñ Not Selected as an MIS	
Yellow Warbler	Brushy stream-sides, willow	Category A4 ñ Not Selected as an MIS	
Cedar Waxwing	Open Woodlands with berries	Category A5 ñ Not Selected as an MIS	
Sandhill Crane	Large wetlands	Category A1 ñ Not Selected as an MIS	
Boreal Toad	Mountain wetlands	Category B ñ Impacts analyzed in biological evaluation. Sensitive Species	
Wood Frog	Mountain wetlands	Category B ñ Impacts analyzed in biological evaluation. Sensitive Species	
Smooth Green Snake	Lush riparian vegetation in Sierra Madre mtn. Range	Category A1 ñ Not Selected as an MIS	

APPENDIX D

R2 Sensitive Species in the Analysis Area and Federally Listed Species

All species on the Rocky Mountain Regional Sensitive Species List were reviewed.

- Some sensitive species possibly present on the Medicine Bow National Forest were eliminated from detailed review because the pre-field review determined that risk to these sensitive species or their habitat is negligible. Habitat for these species is not present, is or is immeasurably affected by the project proposal. The reason each species was eliminated is documented within the table and is summarized by the following seven categories:

    1. The project proposal is outside of the known range of the species and/or the species is not likely to occur.
    2. There are no documented records of species occurrence, habitat is generally not provided, and the species is unlikely to be present in the project area.
    3. Larger scale evaluations suggest that a strong and viable population of the species exists, and the project is expected to retain habitat in a condition which is suitable to occupancy in the analysis area.
    4. Habitat used by the species is different than that being disturbed by the project proposal. Effects/impacts are not expected to occur to individuals.
    5. Disturbance to habitat or individuals is marginal, very small in size and/or length of time. Effects/impacts are unlikely.
    6. Timing of the project proposal is such that no effects/impacts are expected.
    7. Species is associated with Platte River water depletions and the project proposal does not affect Platte River water supply.

- All remaining Region 2 sensitive species were eliminated from review by earlier Forest Service processes which found that their distribution is such that they are not affected by projects on the Medicine Bow National Forest. Documentation of this review resides in the Forest Supervisors Office in Laramie, Wyoming.

USFS Sensitive Species in the Collins Creek Analysis Area, Including Habitat and Determination of Effect (Rocky Mountain Region List - Revised 3/94)

Species Common Name	Species Scientific Name	Suitable habitat	Species Present	Reason Eliminated from Further Review (see above)	Determination of Impacts for the proposed action
dwarf shrew	*Sorex nanus*	Rocky slopes	Possible	4	No Impact

Species Common Name	***Species Scientific Name***	**Suitable habitat**	**Species Present**	**Reason Eliminated from Further Review (see above)**	**Determination of Impacts for the proposed action**
pygmy shrew	*Microsorex hoyi montanus*	Sphagnum moss/small pond edges	Possible	4	No Impact
fringed-tailed myotis	*Myotis thysanodes pahasapensis*	Caves/mines	Possible	4	No Impact
Townsend's big-eared bat	*Plecotus townsendii*	Caves/mines	Possible	4	No Impact
swift fox	*Vulpes velox*	Prairie, not present	Not known to occur	1	No Impact
ringtail	*Bassariscus astutus*	Arid-rough	Not known to occur	1	No Impact
wolverine	*Gulo gulo luscus*	Conifer forest	Unlikely, none observed	2	No Impact
common loon	*Gavia immer*	Large lakes	Not known to occur	1	No Impact
ferruginous hawk	*Buteo regalis*	Prairie	Not known to occur	1	No Impact
osprey	*Pandion haliaetus*	Lakes-rivers	Not known to occur	2	No Impact
Merlin	*Falco columbarius*	Forest Edge	Unlikely, none observed	2	No Impact
Columbia sharp-tailed grouse	*Tympanuchus phassianellus*	Mountain shrublands	Not known to occur	1	No Impact
American bittern	*Botaurus lentignosus*	Low elev marsh	Not known to occur	1	No Impact

Species Common Name	***Species Scientific Name***	Suitable habitat	Species Present	Reason Eliminated from Further Review (see above)	Determination of Impacts for the proposed action
white-faced ibis	*Plegadis chihi*	Low elev marsh	Not known to occur	1	No Impact
greater sandhill crane	*Grus canadensis*	Ponds/lg lakes	Not known to occur	1	No Impact
mountain plover	*Charadrius monanus*	Marsh/wetland No	Not known to occur	1	No Impact
long-billed curlew	*Numenius americanus*	Marsh/wetland	Not known to occur	7	No Impact
upland sandpiper	*Bartramia longicauda*	Marsh/wetland	Not known to occur	7	No Impact
black tern	*Chlidonias niger*	Marsh/wetland	Not known to occur	1	No Impact
western yellow-billed cuckoo	*Coccyzus americanus*	Large Cottonwood Riparian	Not known to occur	1	No Impact
western burrowing owl	*Athene cunicularia*	Plains-grassland	Not known to occur	1	No Impact
flammulated owl	*Otus flammeolus*	Ponderosa/aspen	Not known to occur	1	No Impact
purple martin	*Progne subis*	Aspen	Unlikely, none observed	2	No Impact
pygmy nuthatch	*Sitta pygmaea*	Ponderosa	Not known to occur	2	No Impact
golden-crowned kinglet	*Regulus satrapa*	Dense spruce-fir	Observed during field surveys	4	No Impact
loggerhead shrike	*Lanius ludovicianus*	Low elev valleys	Not known to occur	2	No Impact

Species Common Name	***Species Scientific Name***	Suitable habitat	Species Present	Reason Eliminated from Further Review (see above)	Determination of Impacts for the proposed action
Baird's sparrow	*Ammodramus bairdii*	Plains	Not known to occur	1	No Impact
fox sparrow	*Passerella iliaca*	Shrubby undergrowth, primarily riparian areas.	Possible, none observed	5	No Impact
Lewis' woodpecker	*Melanerpes lewisi*	Ponderosa pine	1 record on file, unconfirmed identity,	4	No Impact
olive-sided flycatcher	*Contopus borealis*	Mixed conifer with prominent snags	Possible, none observed	5	No Impact
Northern leopard frog	*Rana pipiens*	Wetlands	Unlikely, none observed	1	No Impact
Blackhills red-bellied snake	*Storeria occipitomaculata pahasapae*	Plains	Not known to occur	1	No Impact
pale milk snake	*Lampropeltis triangulum multistrata*	Plains	Not known to occur	1	No Impact

* Denotes that a determination in the BA/BE has been made for these species that the Proposed Action, ì May adversely impact individuals, but is not likely to result in a loss of species viability on the planning area, nor a loss of species viability range-wide.î

Federally Listed Species

A list of species developed by the USFWS (April 2002) representing federally listed T&E species that may occur on the Medicine Bow NF was reviewed during informal technical support with the USFWS. This support included discussion in which the current list of threatened, endangered, proposed, and candidate species was reviewed to develop a revised list of species pertinent to this project. The following tables summarize how we considered the federally listed species which may occur on or near the Medicine Bow National Forest.

Table 1 ñ Federally listed or proposed species possibly present within the project area

Species	Status	Distribution	Habitat and Presence	Analysis of Effects
Canada Lynx *(Lynx canadensis)*	Threatened	Resident in Spruce/Fir Forest Types.	Project proposal is outside of established Lynx Analysis Units. Habitat is more suited for lynx to forage while migrating through to more suitable habitat. No documented records.	No Effect due to project location outside of LAUs, and vegetation disturbance within lynx linkage area does not create a barrier to movement or foraging.

Table 2. Federally listed or proposed species eliminated from further

Species	Status	Distribution	Habitat and Presence	Determination
Black-footed ferret *(Mustela nigripes)*	Endangered	Potential resident in prairie dog colonies.	Outside of known range. Suitable habitat not present.	No Effect
Mountain Plover *(Charadrius montanus)*	Proposed Threatened	Grasslands ñ Statewide	Suitable habitat not present.	No Effect
Prebleís meadow jumping mouse *(Zapus hudsonius preblei)*	Threatened	Riparian Habitats east of Laramie Mountain Range.	Outside of known range. Suitable habitat not present.	No Effect
Ute ladiesí tresses (*Spiranthes diluvialis)*	Threatened	Suitable habitat below 7000 feet	Outside of known range. Suitable habitat not present.	No Effect

Species	Status	Distribution	Habitat and Presence	Determination
Whooping Crane *(Grus americana)*	Experimental, non-essential population in Western Wyoming	Resident in breeding EAson; western Wyoming	Outside of known range. Suitable habitat not present.	No Effect
Wyoming Toad *(Bufo baxteri)*	Endangered	Resident in Laramie River Valley	Outside of known range. Suitable habitat not present.	No Effect
Additional Species Dependant upon Platte River Water			Project activities will have no impact or depletion to Platte River water supply	No Effect