CHAPTER 1. PURPOSE AND NEED

1.1 Introduction

1.1.1 Supplemental Environmental Impact Statement

On March 20, 2001, George T. Buckingham, acting for Colville National Forest Supervisor Nora B. Rasure, the Responsible Official, signed the Record of Decision (ROD) for the Deadman Creek Ecosystem Management Projects Final Environmental Impact Statement (FEIS). Alternative D with Modifications was chosen for implementation in August of 2001. However, in a letter dated September 12, 2001, Nora B. Rasure withdrew the Record of Decision in order to update the analysis. This Supplemental Environmental Impact Statement reflects the new analysis.

More than two years have elapsed between the release of the Deadman Creek Ecosystem Management Projects FEIS and the release of this document. Part of that time was used for appeals, including appeal response and evaluation before the Record of Decision was withdrawn. A review period ensued after that, parallel to additional field work required to update the analysis. Review of the March 2001 FEIS revealed that many of the specialist reports and input had been completed circa 1997. A decision was made to review and update all specialist reports.

In order for the reader to more easily track the changes between the March 2001 FEIS and this SEIS, new text or tables will be denoted by Verdana boldface text, as appears in this paragraph. Table 1 lists changes made to this document.

Table 1. Changes between the FEIS and the SEIS

Report or Area	Changes
Aquatics	**Divided report into two separate reports: fisheries and hydrology. Rewrote both reports to make them more understandable; amended mitigation measures**
Botany	**Reviewed and updated report, making amendments reflecting changes in requirements and classifications for Sensitive Species since 1997**
Cumulative Effects	**Updated management activities completed 1997-2002 and proposed in the foreseeable future on all land ownerships within the Deadman Creek Watershed**
Economics	**Reviewed and updated report based on current costs**
Fire	**Reviewed and updated report**
General	**Added indicators or measures of effects to analysis of Key Issues; added text to aid in description of Purpose and Need statements; changed format of mitigation measures; incorporated specialist report changes into document**
Heritage	**Reviewed and updated report; confirmed findings with State Historic Preservation Office**
Noxious Weeds	**Reviewed and updated report; amended mitigation measures**
Purpose and Need	**Refined purpose and need by breaking each one out as a separate bullet statement rather than the previous paragraph narrative.**

Report or Area	Changes
Range, Minerals	**Reviewed report**
Recreation, Visuals	**Rewrote recreation portion of report**
Roadless Areas	**Rewrote report based on ongoing changes in rules and regulations concerning inventoried roadless areas and other areas of similar character without classified roads.**
Silviculture	**Reviewed and updated report**
Soils	**Conducted additional fieldwork; rewrote report; amended mitigation measures**
Transportation	**Reviewed and updated report based on further reconnaissance of road system; reduced proposed road construction in Alternatives B and D.**
Wildlife	**Reviewed and updated report, making amendments reflecting changes in requirements and classifications for Threatened, Endangered, and Sensitive Species since 1997; confirmed that existing concurrence with US Fish and Wildlife Service was valid.**

1.1.2 Project Overview

The Deadman Creek Ecosystem Management Projects (DCEMP) include numerous management activities that are planned and analyzed in support of identified needs **for forest products and late forest structure**. **Dense stands in early and middle structural forest conditions, and stands with high occurrence of forest pathogens dominate the watershed. The objectives of management activities are to provide forest products and create environmental conditions where these stands would grow toward late structure with less inter-tree competition and reduced risks of catastrophic fire and pathogen events.** The proposed activities for accomplishing these objectives include commercial and precommercial stand thinning, individual tree removal, shelterwood harvests, and stand sanitation treatments. In some alternatives the construction of new classified roads is proposed to facilitate access for stand treatments. Any new roads would be closed after use. A variety of other management activities are proposed to meet objectives including: piling slash, burning slash, planting tree seedlings, using prescribed fire and conducting road maintenance. The application of the Colville National Forest Land and Resource Management Plan, 1988 (Forest Plan) standards and guides, Best Management Practices, and mitigation measures will reduce potential sediment movement, preserve habitat for several species of wildlife, and address noxious weeds.

1.1.3 Location

The Colville National Forest is located in the northeast corner of Washington State. It is bounded on the north by British Columbia, Canada, and on the east by the state of Idaho. The Deadman Creek Watershed is located within Ferry County, approximately thirteen air miles northwest of the town of Kettle Falls, Washington, and west of State Highway 395.

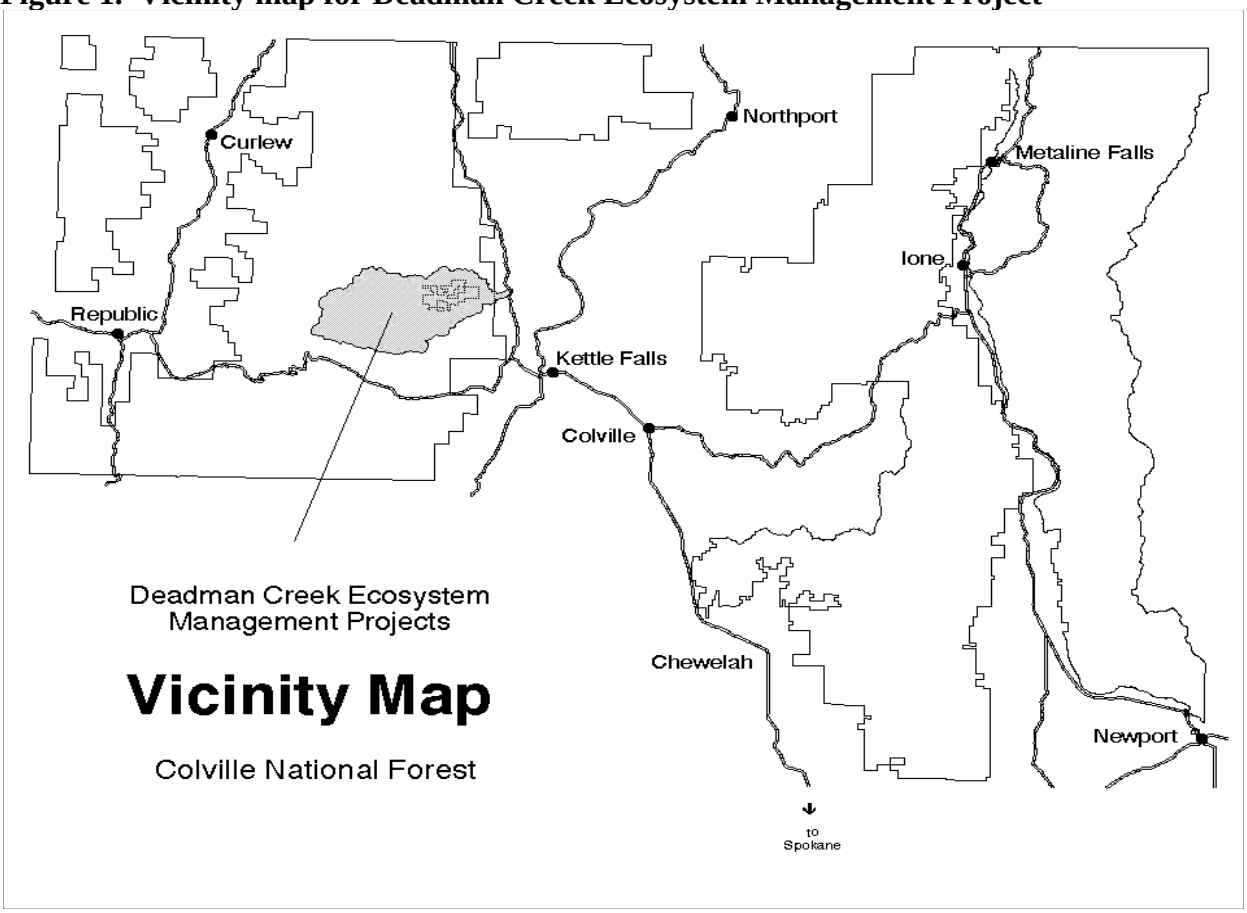
The Deadman Creek Ecosystem Management Projects analysis area consists of the entire 40,792 acres (16,515 hectares) of the Deadman Creek Watershed, which includes all of the Deadman Creek and North Fork Deadman Creek sub-drainages. While the projects will be conducted only on selected parcels of the Colville National Forest within the watershed, the potential effects of conducting these

projects were analyzed across the entire watershed, and in some cases, beyond the watershed boundary. This analysis could support multiple resource management projects, depending on the final alternative chosen in the Record of Decision. The watershed is located within the following land sections.

Table 2. Location of the Deadman Creek project area by legal description

Township and Range	Sections
T. 36 N, R. 35 E.	1-5; 11; 12
T. 36 N, R. 36 E.	1-11
T. 37 N, R. 35 E	1-3; 9-36
T. 37 N., R 37 E.	1-4; 6-35
T. 37 N., R. 37 E.	7; 16-20; 30

Figure 1. Vicinity map for Deadman Creek Ecosystem Management Project



1.1.4 Management Direction

The Land and Resource Management Plan for the Colville National Forest (Forest Plan), December 29, 1988, provides the management direction for the activities proposed in the Deadman Creek Ecosystem Management Projects (DCEMP). The Forest Plan was modified on June 12, 1995 by the revised Interim Management Direction Establishing Riparian, Ecosystem and Wildlife Standards for Timber Sales (known also as the Regional Forester's Plan Amendment #2 and referred to variously as the Screens, the Screening Process, and Screening Direction). The Forest Plan was modified again on July 31, 1995, by the Inland Native Fish Strategy Environmental Assessment (INFISH). The activities proposed in this Supplemental Environmental Impact Statement (SEIS) comply fully with, and are tiered to, the Forest Plan as amended.

The noxious weed management prescription tiers to the Colville National Forest Land and Resource Management Plan FEIS (Forest Plan FEIS), and the Colville National Forest Integrated Noxious Weed Treatment Environmental Assessment (INWT EA). The Forest Plan is incorporated by reference. **The Noxious Weed Treatment Prescription located in the Analysis File is documentation of the requirements of the Mediated Agreement (Northwest Coalition for Alternatives to Pesticides, et al., v Clayton Yeutter, 1989) in regard to noxious weed activities proposed in the Deadman Project Planning Area.**

Table 3. National Forest Management Areas and private land holdings (acres and hectares)

Description	Acres (hectares)
MA1 – Old Growth Dependent Species Habitat	359 (145)
MA3A - Recreation	2,056 (832)
MA5 – Scenic/Timber	3,147 (1,274)
MA6 – Scenic/Winter Range	92 (37)
MA7 - Wood/Forage	20,651 (8,361)
MA8 – Winter Range	2,974 (1,204)
MA10 – Semi-Primitive, Motorized Recreation	3,007 (1,217)
MA11 - Semi-Primitive, Non-Motorized Recreation	4,164 (1,686)
National Forest subtotal	36,450 (14,757)
Non-NF outside NF boundary	3,506 (1,419)
Non-NF inside NF boundary	836 (338)
Other Ownership Subtotal	4,342 (1,758)
Watershed Total	40,792 (16,515)

The proposed activities under this EIS were designed to meet the purpose and need prior to the Forest Service adopting the National Fire Policy. Thus, proposed activities do not reflect all of the strategies for protection of Wildland Urban Interface (WUI) that are currently available. Although none currently scheduled, a future WUI analysis will make proposals and analyze the

effects of fire prevention activities in urban interface areas on the Colville National Forest, including the Deadman Creek area.

The Forest Plan established a zoning strategy that defines and allocates management objectives for all lands of the Colville National Forest. Each parcel of National Forest System land is classified as one of thirteen different management areas (MAs). The Forest Plan prescribes direction and practices for managing each of these. See pages 4-67 through 4-122 of the Forest Plan for complete details of emphasis and activities for each management area. Table 3 shows the acreage of management areas for National Forest System lands and other land ownerships within the Deadman Creek watershed.

1.2 Purpose and Need

Large, intense wildfires during the early 1900s burned across more than 80 percent of the Deadman Creek Watershed. Forest vegetation (mainly trees) that developed after those fires was uniform in age and structure over thousands of acres. Extreme competition between plants for site resources (water, light and nutrients) and an absence of disturbance has resulted in dense stands of relatively small trees with very slow growth rates. Timber harvesting since the fires has further influenced forest structure. In some places timber harvest has moved structure from middle or late structure back to early (regeneration harvesting). In other places harvesting has allowed structure to remain the same or set up the stand to move toward late structure (single tree selection harvest or commercial thinning). In some cases, structure has moved from late back to middle structure (overstory removal harvest)

Many forested stands in the watershed, therefore, are experiencing intense inter-tree competition, and lack a large tree component. Most of the Deadman Creek watershed's biophysical environments are deficient in late structure when compared with their historic range of variability. Other stands that have not been heavily impacted by wildfires have forest health concerns including such pathogens as dwarf mistletoe, bark beetles, and pockets of *Armillaria ostoyae*, a root disease. Recent wind-throw events and lack of fire in some biophysical environments contribute to the spread of these pathogens. Some stands in the watershed exhibit many dead and dying Douglas-fir trees as a result of epidemic levels of bark beetles in the year 2001.

Stevens and Ferry Counties have two of the four lowest employment rates in the State of Washington. Growth and development continues, however, as does the demand for wood and wood products in the United States of America (USA). The Forest Service is directed to provide wood fiber to help meet this demand. With these economic and vegetation conditions serving as a backdrop for the DCEMP area, the Purpose and Need for action is as follows:

Purpose 1: Provide wood fiber for local mills and the US public.
Need 1: The Forest Service has a multiple-resource mission that includes provision for a sustainable supply of wood from the National Forests. The Organic Act of 1897, the Multiple-Use Sustained Yield Act of 1960, and the National Forest Management Act of 1974 reinforce this mission. The Colville National Forest's Forest Plan directs that the Forest provide wood products.

Purpose 2: Maintain late structural stands across the landscape, and enhance the ability of early and middle structural stands to attain late structure.

Need 2: Direction in the Colville National Forest Land and Resource Management Plan is to establish structural stages that reflect the range of variability of structural conditions believed to occur prior to Euro-American settlement (Historic Range of Variability). Only one of the biophysical environments within the Deadman Creek Project Area is within its Historic Range of Variability in terms of the amount of existing late stand structure (section 3.4 Forest Vegetation). There is a silvicultural and wildlife habitat need to conduct treatments to reduce inter-tree competition and/or manipulation of species composition to tree species less prone to pathogens.

Purpose 3: **Decrease the risk of catastrophic pathogen events on National Forest System lands within the Deadman Creek watershed through active management.**

Need 3: Current stand and ecosystem conditions with high inter-tree competition means that trees and stands are stressed and highly susceptible to epidemic insect and disease-caused mortality. Stands in the watershed display epidemic levels of insects and diseases. Management activities would thin dense stands with the objective of reducing stress on the trees and improving their resistance to pathogens. Management activities would remove diseased and dead trees to curtail further expansion of pathogens and manipulate species composition, where feasible, to favor pathogen resistant species.

Purpose 4: Decrease the risk of catastrophic fire events on National Forest System lands within the Deadman Creek watershed.

Need 4: Fire suppression and timber treatments since the early 1900s have left dense stands, some with large amounts of ladder fuels. Management activities are designed in many places to reduce fuels and create stand structures resistant to high severity fire events.

Purpose 5: **Maintain a safe, cost-effective transportation system, while meeting new access needs described in the Proposed Action.**

Need 5: Roads analysis direction (January 2001) requires that during project planning, the Forest must examine the network of roads in the project area in relation to a variety of resource values. Roads analysis has determined that due to resource concerns, there is a need to close roads in the project area that are constructed or reconstructed during project implementation. Additionally, alternatives propose other road maintenance, including road obliterations, in support of the management objectives.

1.3 Proposed Action

The Forest Service proposes to conduct a variety of management activities on National Forest System lands within the Deadman Creek watershed. Implementation of this project is proposed to begin in fiscal year **2005 or 2006**. One tool for implementing these activities would be commercial timber sales. Two or more timber sales would be used to implement the management actions described later in this document. **New roads and road reconstruction would be employed variously in the alternatives to provide access for the activities. All newly constructed roads would be closed after administration needs for the projects are completed (generally 3 years). All alternatives in this SEIS would establish 5 pine marten management requirement areas (MRs) and 2**

pileated woodpecker MRs.

This management direction as originally stated in the scoping letter of October 31, 1996 and in the Notice of Intent published in the Federal Register (November 12, 1996) was changed slightly in the draft Environmental Impact Statement (USDA 2000). The original proposal called for ecosystem management through timber sales covering 4,250 acres (1,721 hectares), and included 17 miles (27.4 kilometers) of new road construction**.** Since the original proposal was mailed out, the Interdisciplinary Team (ID Team) refined the details of the original proposed action based on resource information gathered in the field. Some of the original treatment areas were deleted and some of the original road locations changed. Alternative B, described in Chapter 2, is the alternative that most nearly resembles the original proposed action**. It calls for ecosystem management through timber sales and other activities covering 4,120 acres (1668 hectares), and including 13.9 miles (22.4 kilometers) of new road construction. Entry is proposed into the Twin Sisters Inventoried Roadless Area to remove small diameter timber for the purpose of restoring desirable species composition and structure. This purpose has been reviewed and approved by the Regional Forester following the Final Policy for inventoried roadless areas.**

As a result of the analysis for the draft EIS (USDA Forest Service 2000), former Forest Supervisor Bob Vaught identified either Alternative C or D as preferred. **On March 20, 2001, George T. Buckingham, acting for Colville National Forest Supervisor Nora B. Rasure, the Responsible Official, signed the Record of Decision (ROD) for the Deadman Creek Ecosystem Management Projects Final Environmental Impact Statement (FEIS). Alternative D with Modifications was chosen for implementation in August of 2001. However, in a letter dated September 12, 2001, Nora B. Rasure withdrew the Record of Decision in order to update the analysis. This supplement to the EIS (SEIS) reflects the new analysis. The management direction and proposed actions in this SEIS have sustained only minor changes from the previous draft EIS (USDA Forest Service 2000). Essentially, the proposed action and action alternatives are the same as when the original ROD was signed in 2001. (See Section 2.5.2 Features Common to All Action Alternatives – B, C, D, and E and Section 2.5.3 Alternative B for the details of the Proposed Action).**

1.4 Scoping and Public Involvement

Scoping is the process by which the Forest Service identifies issues associated with a proposed action and from these, identifies the key issues to be analyzed in depth (see section 1.5 Issues, below).

Scoping for the Deadman Creek Ecosystem Management Projects (formerly Deadman Creek Timber Sales Projects) was initiated by soliciting comments from potentially interested members of the public, private organizations, and State and Federal agencies. Table 4 shows the development of this document.

Table 4. Chronology of the Deadman projects

Year	Date	Remarks
1996	Oct. 31	Letter (describing proposed action and requesting comments) mailed to approximately 150 individuals and groups. This begins a 30-day scoping period.
1996	Nov. 6	Public meeting notice published in the Colville Statesman Examiner.
1996	Nov. 12	Notice of Intent published in Federal Register.
1996	Nov. 19	Two public meetings held at Three Rivers Ranger District office in Kettle Falls, WA.
1996	Dec. 12	Held a public-requested meeting at Cavanaugh's River Inn in Spokane, WA.
1999	Feb. 1	Notice of Intent published in the Federal Register, changing project name to "Deadman Creek Ecosystem Management Projects."
2000	Feb. 11	Notice of release of draft EIS (DEIS) appeared in the Federal Register Vol. 65, No. 29.
2000	Mar. 1	DEIS released through a legal notice in the Colville Statesman-Examiner. This begins a 45-day comment period.
2000	Apr. 14	Amended NOI for the release of the DEIS appeared in the Federal Register, Vol. 66, No. 73. This extended the comment period to 28 April, 200.
2001	Mar. 20	Record of Decision (ROD) signed by George Buckingham, acting for Forest Supervisor Nora B. Rasure.
2001	Apr. 4	Final EIS (FEIS) released through a legal notice in the Colville Statesman-Examiner. This begins a 45-day comment period.
2001	May 21	Two appeals were received: one from Mitchell Smith, one from the Kettle Range Conservation Group.
2001	Jun. 4	Forest Supervisor Rasure discussed the appeal with Mitchell Smith via a conference call. No resolution was reached.
2001	Jun. 7	An appeal response was sent to the Pacific Northwest Regional Office (Forest Service R-6) in Portland, OR.
2001	Sep. 7	Letter was mailed notifying M. Smith that the ROD had been withdrawn.
2001	Sep. 12	Letter was mailed notifying the Kettle Range Conservation Group, the Lands Council, and the Washington Wilderness Coalition that the ROD had been withdrawn.
2003	January	The Kettle Range Conservation Group submitted 'Citizens Alternative F' to the Forest Supervisor

Further scoping for this SEIS was not found necessary because the proposed actions have not changed.

1.5 Issues

The ID Team used written and verbal comments received from individuals and organizations to identify issues and concerns**. An issue is an effect (or perceived effect, risk or hazard) on a physical, biological, social, or economic resource. An issue is not an activity; instead, the predicted effects of the activity create the issue**. Some issues with a great deal of public interest had implications for development of ecosystem management projects within the Deadman Creek watershed. These "key" issues were used to generate alternatives that achieve management objectives **and present a range in: (1) numbers, sizes and location of areas considered for treatment; (2) the amount of road constructed for access; (3) types of harvest and post-harvest treatments prescribed; and (4) the number, types and location of other integrated resource projects. Some issues were identified but not considered "key." Many of these other issues are analyzed in the specialists' reports and have associated mitigation measures in Chapter 2, but were not found to merit development of a new alternative. These other issues are listed in section 1.5.2**.

Issues Used to Develop Alternatives (Key Issues)

The key scoping issues identified by the DCEMP IDT are grouped by resource. They all stem from the effects of the following proposed actions:

Entry into inventoried roadless areas or other areas greater than 1,000 acres without classified roads.
Effects of construction of new classified roads.

Entry into inventoried roadless areas or other areas greater than 1,000 acres without classified roads

Inventoried Roadless Areas

The Deadman Creek watershed contains two inventoried roadless areas, Hoodoo and Twin Sisters. These areas were identified in the Forest Plan (Appendix C) (Also see Maps in Appendix F) and are subject to road construction, road reconstruction, and timber harvest restrictions of the final roads policy.

Other Areas Lacking Classified Roads

Though the remaining portions of the watershed without classified roads are not singled out as "unroaded" by the agency, the DCEMP ID team chose to use the term in response to key issues. For this analysis the team defines an "unroaded area" as any area greater than 100 meters (328 feet) from an existing road or past harvest unit. Narrow corridors and bottlenecks of unroaded land less than ½ mile in width were not included in the "unroaded" classification. The intent of setting some criteria for tract of land lacking classified roads was not to establish a boundary or border, but only to attain some information of relative size of area that lacked classified roads, for analysis purposes. For purposes of analysis and action alternative development, areas lacking classified roads were only considered if the individual tracts were greater than 1,000 acres (405 hectares). The use of 1,000 acre areas without classified roads as a minimum area for which to consider effects of proposed activities was used as a result of previous comments received from the public. Currently the construction, reconstruction, or harvest restrictions of the final policy do not apply to these "unroaded" areas.

Current Situation

No alternative proposes new road construction, or road reconstruction, in the watershed's two inventoried roadless areas. No construction is being proposed that would reduce a block of land that does not have classified roads from over 5,000 acres to under 5,000 acres. The implication of this is that no road building activities proposed in the DCEMP would cause a potential wilderness site to fall below the minimum size used for consideration for National Forest Wilderness Area designation (5,000 acres). Alternatives B and E propose treatments in the Twin Sisters Inventoried Roadless Area. These treatments would be conducted in small diameter timber stands with the objective of restoring desirable characteristics of ecosystem composition and structure. The inventoried roadless areas and other areas without classified roads within the watershed were previously reviewed for wilderness designation under the Roadless Area Review and Evaluation (RARE I and RARE II) processes in the late 1970's and early 1980's, but failed to meet the established wilderness criteria under those reviews.

The Issue

Some members of the public have voiced special interests and concerns over any proposed management activities, particularly within inventoried roadless areas, but also within other non-designated areas that lack classified roads. The feeling expressed is that these areas are pristine, lacking signs of human-related activity such as road templates or cut tree stumps. Some individuals, and some groups, would like to see some sort of designation (such as Wilderness) applied to inventoried roadless areas, and larger blocks of unroaded land, that would protect and preserve these areas in their current state. Although some of the inventoried roadless areas are currently in a management area that does not permit regularly scheduled timber harvest, 53 percent of the Twin Sisters and Hoodoo Inventoried Roadless Areas within the project area are in a status that allows some form of timber management. More restrictions upon that management designation exist today than there was when this project was initiated in 1996 (see Current Situation, previously addressed).

Indicator or Measure

- **Acres of harvest treatment in inventoried roadless (RARE II) and in >1000-acre area without classified roads.**
- **Acres affected by harvest treatments in inventoried roadless and in >1000 acre area without classified roads.**
- **Miles of new specified road in inventoried roadless and in >1000 acre area without classified roads.**

Effects on Scenic Vistas, Viewsheds, and Recreation

There are many vistas within the Deadman Creek watershed, some of which still have an unmanaged appearance, while others appear heavily managed, the result of decades of forest activities. The Colville Forest Plan did not analyze scenic vistas differently if they were in inventoried roadless or previously unmanaged areas or not. The Forest Plan analysis of scenic vistas was based upon what can be seen from critical viewing points. Management standards and guidelines were designed to retain those vistas, but allow for modification in other areas that are considered non-critical. Scenic resources in this SEIS were analyzed and will be managed in accordance with the Forest Plan under all alternatives. The projects will be compatible with existing recreational uses.

Indicator or Measure:

- **Proposed treatment acres/type of treatment within inventoried roadless areas and in Forest Plan management areas that have special visual standards and guidelines (for example, Forest Plan Management Areas 3A, 5, 6).**
- **Changes in Recreation Opportunity Spectrum (ROS) within inventoried roadless areas predicted due to proposed activities.**

Effects on Wildlife Habitat

Entry into inventoried roadless and other areas without classified roads would have potential to degrade wildlife habitat, particularly in terms of seclusion that some species require (for example, wolverine). **Proposed management activities in the Twin Sisters Inventoried Roadless Area intended to restore desirable characteristics of ecosystem composition and structure, also would create future high quality lynx foraging areas. Many important wildlife habitat components are protected by**

standards and guides found in the Forest Plan, and the alternatives: (1) may affect but are not likely to lead toward a trend toward federal listing for sensitive species; (2) not likely to adversely affect federally listed threatened, endangered or proposed species; or (3) would be consistent with Forest Plan direction for Management Indicator Species.

Indicator or Measure:
Percent of seclusion habitat (spring-summer/autumn) affected
Acres of future high-quality forage habitat created for lynx in inventoried roadless areas

Construction of new classified roads

New classified roads are proposed to provide access for management treatments **in areas of the Deadman Project Area that currently lack a transportation system, or at least an *effective* transportation system**. Public comments focused on the possible negative effects from adding more roads to the existing system, including effects upon water quality, soil quality, wildlife habitat, and increasing the spread of noxious weeds. **Indicators, or measures of the effects, were developed for each of the areas of concern relating to the issue of construction of new classified roads:**

Effects on Water Quality

Road construction and reconstruction has the potential to affect water quality in adjacent streams. Stream crossings in particular are areas prone to sediment input. Additional access by cattle to riparian areas due to roads may also degrade channel conditions and water quality. Many of the concerns about the effects of silviculture activities on water quality and wetlands were alleviated by inclusion of INFISH guidelines into the Forest Plan in 1995. These guidelines set standards for buffers around riparian areas and wetlands and apply equally to all alternatives (see section 2.2 Existing Management). The Deadman Creek watershed is a drinking source for some downstream residents and provides important habitat for native and introduced fish species. Deadman Creek and other waters in the watershed meet Washington State water quality standards in, and down stream. (see Section 3.7 Hydrology).

Indicator or Measure:
Number of new stream crossings
Miles of new specified roads constructed
Miles of temporary road proposed
Percent increase in sediments over existing conditions

Effects on Soils

Ground disturbing activities like road construction, reconstruction and vegetation treatments have the potential to reduce soil quality and create detrimentally disturbed soils**. Field visits, soils maps and computer software were used to determine locations of soils with the greatest potential to be damaged. Where a susceptible soil type was identified, the treatment prescriptions were modified with mitigation measures designed to minimize negative impacts. All proposed activities under each action alternative would be implemented in compliance with BMPs and Forest Plan standards and guidelines (p. 4-50 to 4-53).**

Indicator or Measure:
Estimated acres of new detrimental soil disturbance resulting from roadwork and ground-based logging.

Effects upon Wildlife Habitat

Construction of new specified roads that will remain on the forest road system have the potential to disrupt or change established wildlife migration/travel routes and provide additional conduits for humans (recreationists, hunters) to venture into established wildlife habitats.

Indicator or Measure:
Percent of seclusion habitat (spring-summer/autumn) affected due to road construction

Costs/benefits of Treatments

The amount of road constructed has a direct bearing on the financial analysis of each alternative. The amount of proposed road construction has a direct affect on the cost of logging systems. Decreased costs of road construction may be offset due to increased use of more expensive helicopter yarding. Road maintenance budgets would be aided by the removal of roads from the National Forest road system. Other costs of road construction include implementation of mitigation measures, including but not limited to, reseeding disturbed areas and building structures to manage livestock movements.

Indicator or Measure:
Cost/benefit ratio
Present net value of project
Miles of road removed from National Forest road system

Effects upon the Spread of Noxious Weeds

Construction of new specified roads has the potential to spread noxious weeds into areas of the forest where they previously didn't exist. **Newly constructed roads that will remain on the forest road system have the potential to change established cattle grazing/travel routes and provide additional conduits for humans (recreationists, hunters) to venture into weed-free areas, which could increase the potential for spread of noxious weeds. Existing roads that will be decommissioned, obliterated, or closed will aid in reducing the potential for spread of weeds.**

Indicator or Measure:
Acres of predicted soil disturbance due to road construction and reconstruction
Miles of existing road to be decommissioned, obliterated, or closed

1.6 Other Concerns Identified During Scoping

The remainder of the concerns had importance, but did not surface as key alternative-driving issues. The reasons the ID team did not carry these concerns forward as key issues pertained to:
Concern was met by adherence to Standards and Guidelines in the Forest Plan.
Concern met in project design in meeting the Purpose and Need for the DCEMP
Concern met through application of Best Management Practices (BMPs)
Concern met by site-specific mitigation (See Chapter 2, Mitigation Measures)
Concern outside of the scope of the project

Many concerns are dealt with in the same manner in each alternative and, as such; do not constitute the need for an additional alternative. For instance, the spread of noxious weeds is a concern. It would be unreasonable to develop some alternatives that address the spread of noxious weeds and others that did not. The following is a list of those other concerns items identified in scoping:

Biodiversity
There is a concern that the proposed actions could affect biodiversity within the watershed and at the global scale. This issue is addressed in the effects analysis. See the effects discussion in Chapter 4.

Even-aged management use

Some comments asserted that uneven-aged management provides for better structure, diversity, and stand resilience. This issue is addressed by the Forest Plan, and in the Forested Vegetation effects section In Chapter 4.

Forest Health
Forest Health is a concern due to overstocked conditions that increase the possibility of insect and disease problems. The Proposed Action and alternatives address this concern to varying degrees (see the effects analysis and comparison of alternatives).

Knutson-Vandenberg Act funding
A concern was raised that KV funds that are generated by this project would not pay for needed mitigation and restoration work. The Forest has multiple options for completing the mitigation and restoration work including KV, the Stewardship authority and appropriated funds. Multiple

Native plant use in revegetation
Many comments were directed toward using only native plants for revegetation purposes.

Protection and Promotion of Large Trees
There is a concern that proposed actions in the DCEMP will further reduce the numbers of large trees in the Deadman Creek watershed. This issue is addressed by project design. Large trees are preserved in all alternatives as described in the effects section. .

Non-market values should be considered.
Some comments suggested that non-market values should be considered in an economic analysis. Non-market values will be considered in the decision (non-market values are represented by the effects discussion for each resource).

A Coordinated Resource Management Plan should be developed
One comment suggested, “A large part of the watershed is in non-National Forest ownership. A Coordinated Resource Management Plan (CRMP) could solve many land use conflicts.” This issue is outside the scope. The purpose and need addresses only National Forest System lands.

Question of reforestation success
A concern was raised about success rates of reforestation efforts on the Three Rivers Ranger

District. This issue is addressed in the Forested Vegetation effects section.

Range management
A concern has been raised over the effects of proposed actions in the DCEMP to grazing. Cattle will have access to areas not previously accessible, some of which may be sensitive such as riparian areas and wetlands. There are an increasing number of complaints from landowners in the Deadman Creek area concerning range cattle grazing on private property. This issue is addressed with site-specific mitigation measures and the effects are evaluated

Scenic vista preservation
During scoping, a concern for the preservation of scenic vistas and viewsheds in the planning area was raised**. This issue was addressed by mitigation measures and the effects are evaluated in Chapter 4.**

Timber harvest is only one aspect of Multiple Use
Some comments stated that "The Multiple Use Sustained Yield Act (MUSY) requires that National Forests be managed for a variety of purposes, only one of which is timber." This issue is outside the scope of the analysis; it is a Forest Plan level issue.

Watershed assessment completion

Some comments voiced a concern that a watershed analysis should have been completed on the Deadman watershed prior to going forward with the DCEMP. This issue is outside the scope of the project. A watershed analysis is not required. The purpose and need can be met without a watershed analysis.

Watershed restoration

There is a concern that past logging and mining have caused damage that could be restored under this project. It was suggested that, "One or more alternatives designed for watershed restoration are needed." This issue is outside the scope of the project.

Wetland protection
The protection of wetlands is a concern for many people and in recent years, this subject has probably elicited more intense discussion than any other issue. This issue is addressed by specific mitigation measures and the effects are evaluated in Chapter 4.

1.7 Existing Special Use Permits

A special use permit was issued to the U.S. Air Force Survival Training organization in 2001. It allows the U.S. Air Force to use an area (referred to as Jackknife) for instructor training. This area encompasses the entire Deadman Creek watershed. The environmental assessment for this activity was completed in 2000.

1.8 The Decision to Be Made

The Responsible Official for this Final Supplemental EIS is the Forest Supervisor of the Colville National Forest. The Forest Supervisor of the Colville National Forest will also be the Deciding Official**. The final decision on this document will be based on the analysis of effects, comments generated during scoping and comment periods, and any new**

information that is received. The scope of the decision to be made is limited to the range of activities presented in the alternatives. This document describes those alternatives and the potential effects of their implementation.

The decision to be made will consist of one of the following:
Do not implement any activities at this time (No Action); or
Implement one of the action alternatives as designed; or
Implement a modification of one alternative or a combination of alternatives.

CHAPTER 2. DESCRIPTIONS OF ALTERNATIVES

2.1 Introduction

This chapter includes descriptions of the no action alternative (Alternative A) and the action alternatives (Alternatives B, C, D and E), and identifies the Responsible Official, and the preferred alternative (Alternative D). It also lists activities common to all action alternatives and the project-specific mitigation measures that were developed during the analysis process. The chapter includes tables that compare the management activities planned under each alternative, and that compare key issues according to alternative. **Existing management with particular relevance to the DCEMP objectives is described in this chapter.** Chapter 2 is intended to provide the public and the decision maker with a clear basis for choice.

As is the case with other Chapters, changes to this document from the March 2001 FEIS, except for minor sentence structure; typographical errors, etc. are denoted by text in Verdana boldface.

The ID Team developed four action alternatives from all of the issues and ideas generated in the scoping process. The effects of entry into roadless and similar areas lacking classified roads, and new road construction, were identified as key issues (Section 1.5) and used as a basis for developing a reasonable range of alternatives with a mix of activities that would **meet the purpose and need for action (Table 6). It was in response to public comment that the Deadman Creek Ecosystem Management Projects (DCEMP) Interdisciplinary team identified as a key issue, areas lacking classified roads with similar characteristics to the inventoried roadless areas identified in the Forest Plan. These areas are not subject to the road construction and reconstruction restrictions of the inventoried roadless areas, but for purposes of this document were used in alternative development. For this analysis the team identified areas lacking classified roads and greater than 1,000 acres (405 hectares) in size and more than 100 meters (328 feet) from an existing road or harvest unit. Narrow corridors or bottlenecks of this land less than one half mile in width were not included in the analysis.**

2.2 Existing Management

Because all the alternatives and their consequences are predicated on the application of the screening process, it is summarized here.

2.2.1 Screening Process (INFISH and Amendment No. 2)

The Regional Forester's Eastside Forest Plan Amendment No.2, Alternative 2, as modified by the Inland Native Fish Strategy (INFISH), also referred to as the screening process or "screens" is common to all alternatives. The screens management guidelines amended the Forest Plan (see Section 1.1.3) taking on the same meaning as other Forest Plan Standards and Guidelines. The screening process is summarized here but details of the direction may be found in the project analysis file. All analyses in this SEIS are predicated on implementation of the screening process guidelines and management directions as well as Forest Plan standards and guides and BMPs.

The screening process has three parts:

- **Riparian Standard (INFISH)**
- **Ecosystem Standard**
- **Wildlife Standard**

2.2.2 Riparian Standard (as Modified by INFISH)

Timber sales would not be planned or located within Riparian Habitat Conservation Areas (RHCAs). This includes: within 300 feet slope distance of perennial and intermittent fish-bearing streams; within 150 feet slope distance of perennial non-fish-bearing streams (or lakes, wetlands, and ponds exceeding one acre in size); or within one-half of a site tree length of intermittent non-fish-bearing streams (or ponds and seeps less than 1 acre in size) or landslide-prone areas.

2.2.3 Ecosystem Standard

In the screening process the acres of stand structural stages in a watershed are compared with their Historic Range of Variability (HRV). The structure of most concern is late/old. Late structural stands are defined as those with eight or more live trees per acre with a diameter at breast height (dbh) of 21 inches or greater.

2.2.4 Wildlife Standard

Future wildlife habitat options would be maintained for old-growth dependent species. Treatment of stands with early and middle structure is allowed if the biophysical environment is below the Historic Range of Variability for late/old structure, if the treatment would move the stand toward a healthy late structure stand.

If the area were within the HRV for late/old structures, all harvest activities would be allowed in late/old structural stands less than 100 acres in size. In stands of late/old structure greater than 100 continuous acres, regeneration harvesting (shelterwood, seed tree, or clearcut treatments) would not be allowed more than 300 feet inside the stand boundary. Harvesting more than 300 feet inside the stand boundary would maintain late structural attributes.

Corridors at least 400 feet wide and with 50 percent canopy cover must be maintained between blocks of late/old structure or special habitat areas (for example marten and pileated woodpecker Management Requirement areas, and designated old growth). Green tree replacements for snags would be maintained at the 100 percent potential population level for primary cavity excavators. Up to 20 pieces per acre of existing downed wood (at least 6 feet long and 12 inches small-end diameter, or larger) would be left on the ground following timber harvest. A total lineal length of large downed logs is also acceptable to meet the standard for downed wood. Additional instructions are listed in the screening direction for special situations such as goshawk nesting sites.

Harvest activities would not cause the amount of late/old structure to fall below the HRV for a given biophysical environment (see section 3.1.2 for description of existing conditions). Harvesting within biophysical environments that are below the HRV for late/old structures would be limited to early and middle structural stands where treatments would alter the stand so it attains late structure more quickly than if no treatment occurred. No trees exceeding 20.9 inches dbh would

be removed from these stands, with the possible exception of Douglas-fir bark beetle insect brood trees and some snags in the same vicinity (See description of Alternative B in section 2.5).

Biophysical environments that are within the HRV for late structure are not off limits to treatments as long as harvesting does not reduce the amount of late structure within this biophysical environment to a level that is below the HRV. The only biophysical environment that is within HRV for all stages of late/old structure in the DCEMP area is the very moist Engelmann spruce/subalpine fir bottoms (see section 3.4.2). Harvesting within this biophysical environment would be subject to restrictions for harvest within Riparian Habitat Conservation Areas and other screens guidelines.

Harvest is also allowed in late/old structure stands if the objective is to move one type of late/old structure that is within the historic range of variability to another type of late old structure that is deficient. In the action alternatives this may occur in some warm dry Douglas-fir/grand fir shrub stands where the existing late structure condition is multi-strata (stage 6) and the biophysical environment is deficient in park-like late structure of a single strata (stage 7). With this objective in mind, the screening process allows for treatments including under-thinning, single-tree selection, salvage, and understory removal in the interior of blocks of late/old structural stage 6 exceeding 100 acres.

2.3 The Development of Alternatives

The ID Team used the scoping process to identify issues associated with the DCEMP (see Section 1.4). Each of the issues was examined to determine its relevance to the project and to determine the method for addressing it through the analysis process. Issues that were determined to be outside the scope of this project were dropped from further consideration. Issues that had been addressed at higher levels of planning (for example, in the Forest Plan) were resolved in the design of each alternative by including some activities, or excluding other activities, or by prescribing mitigation measures.

Identified as "key" issues were the effects of entry into inventoried roadless and areas lacking classified roads greater than 1000 acres in size, and the effects of new road construction on: **water and soil quality, wildlife habitat, cost of treatments, scenic vistas, viewsheds, and recreation opportunities, spread of noxious weeds, and wilderness attributes. These key issues were used to generate alternatives that achieve management objectives and present a range in: (1) numbers, sizes and location of areas considered for treatment; (2) the amount of road constructed for access; (3) types of harvest and post-harvest treatments prescribed; and (4) the number, types and location of other integrated resource projects. Tables 2.3 and 2.4 (end of chapter) shows how the alternatives vary by these criteria.**

2.4 Alternatives Considered but Eliminated from Detailed Study

The following alternatives were considered but not analyzed. Reasons for their elimination are briefly described below.

An alternative was considered that did not harvest any trees, but would implement

restoration activities upon the road system - closures, decommissioning, obliteration, and removal from the system. It was not developed further as it did not fully meet the purpose and need for the project. Specifically, it would not provide wood fiber, enhance the ability of early and middle structure stands to attain late structure, decrease the risk of catastrophic pathogen events, or decrease the risk of catastrophic fire events.

In January 2003, after the IDT had finalized most of the report revisions, a "Citizen's Alternative F" was received from the Kettle Range Conservation Group. This alternative was received over six years after scoping for the project, and approximately 16 months after the initial Record of Decision was withdrawn. The proposal was reviewed for consistency with the purpose and need for the project, policy and laws and compared to the other four existing action alternatives Although the Forest supervisor felt that many of the topics, concerns and issues raised in the alternative were adequately addressed FSEIS, the Citizen's Alternative became a starting point for collaborative dialog between the former appellant, Kettle Range Conservation Group (now part of the Northeast Washington Forestry Coalition) and the Forest Supervisor. Dialog was also initiated with the other appellant. Alternative D – Modified is the result of this informal cooperative resolution process. Only those activities of the Citizen's Alternative that were in common with alternatives B through E in the draft FSEIS were considered. Portions of the Citizen's Alternative that were outside the scope of the project, or would require reanalysis of the DCEMP were deferred to until they could be analyzed in a more appropriate NEPA document.

Alternative D – Modified is discussed in detail in the ROD. The proposal and map is retained in the project record.

2.5 Developed Alternatives

The ID Team developed and analyzed four action alternatives (Alternatives B, C, D, and E) and the no-action alternative (Alternative A). All alternatives were designed to meet State and Federal laws and regulations, and all alternatives are consistent with the Forest Plan as amended. Descriptions of the alternatives follow.

2.5.1 Alternative A: No Action

Under this alternative, routine land management activities and natural processes would occur, but the proposed ecosystem management activities would not. Roads and trails would be maintained. Wildfires would be fought. Livestock would continue to graze. Densely treed forest stands would continue progress toward late and old structure at very slow rates. Insects and diseases would continue to degrade forest health, and forests would be at a high risk of severe outbreak. There would be no timber harvesting; reforestation; or precommercial thinning; and no construction, reconstruction, or obliteration of roads. Wildlife management areas would not be defined. Habitat management projects would not occur. Wildfire fuel reduction projects would be curtailed in the short term, **but treatments are likely in the wildland urban interface under implementation of the National Fire Policy.** Other projects and activities with approved environmental documents or under administrative control would continue on National Forest system lands within the watershed. The desired future conditions of many of the resources as identified in the Forest Plan (pages 4-61 to 4-65) within the project area would not be met.

2.5.2 Features Common to All Action Alternatives (B, C, D, and E)

All mitigation measures as described in the Mitigation Measures section of this chapter and all Best Management Practices (BMPs) included in the analysis file would be incorporated into implementation of this project. Monitoring would be conducted as described in the Monitoring section of this chapter.

Three fencing projects will be implemented to protect *Botrychium* populations that are especially vulnerable to cattle impacts.

Generally all newly constructed, specified roads would be closed after harvest activities are completed. A few of the new specified roads may be left open for a short period to allow firewood to be cut, to allow access for prescribed fire activities, or to allow access for planting. All temporary roads would be closed by the purchaser as soon as they are not needed for harvest access. No temporary roads would be constructed within the inventoried roadless area.

Five pine marten and two pileated woodpecker Management Requirement areas would be identified for habitat management. These are described in the Effects to Management Indicator Species report, which is located in the DCEMP Analysis File, on file at the Three Rivers Ranger District. The effects to wildlife described in Section 4.3 include the designation of these wildlife management areas.

A heritage resource survey of the project area, using both previously documented site records and new findings revealed eight heritage sites within proposed treatment units, all are designated to be managed under prescription 3; protect and preserve as is; current documentation sufficient. Each one of the management class 3 sites will be protected by either a buffer or implementation of winter logging. The size of the buffer will vary based on site-specific circumstances dealing with yarding methods and site vulnerability. With the buffering, each site will be protected. Modified Alternative D complies with Section 106 of the National Historic Preservation Act and the State Historic Preservation Office (SHPO) concurs with these actions.

One of the ecosystem management objectives is to thin stands that are densely stocked with young trees in order to provide growing room for the remaining trees. Some of these stands are composed of trees too small for mill standards, and thinning is proposed by means of two different types of treatments, precommercial thinning for the smallest diameter stands, and post and pole sales for those stands where 4 to 7 inch dbh trees are being removed. About 104 acres are identified as potential post and pole thinning areas. Precommercial thinning will be conducted on approximately 562 acres within the project area. These activities are described in the Silvicultural Report, which is located in the DCEMP Analysis File.

Based on the Roads Analysis Report some segments of existing classified road system are no longer needed either as full-time open roads or as system roads altogether. The Roads Analysis Interdisciplinary Team identified approximately 4.5 miles of open system roads as needing closing and/or obliteration. Approximately 10.1 miles of Forest Service classified roads (open or closed) were identified for possible removal from the road system (See Table 6 and map in Appendix F). Additional replacement and/or maintenance of gate closures on

some classified roads are also proposed. Long-term water quality would be improved through road closures and designed road improvements (See section 4.5 Hydrology). Wildlife seclusion habitat and some recreation opportunities would also be improved through the road closures.

Table 5. Summary of proposed road management from the road analysis report

Proposed Action	Miles
Open Road Proposed for Closure	1.5
Closed Road Proposed for Removal from the System	8.3
Closed Road Proposed for Decommissioning	0.2
Open Road Proposed for Closure, Obliteration, and Removal from System	1.5
Non-system Road Proposed for Closure and Obliteration	0.1
Open Road Proposed for Removal from the System	0.3

For each action alternative it is assumed that some temporary roads will be constructed. The term "Temporary" is a Forest Service Timber Sale Contract term used to define those roads planned to be constructed by the timber purchaser for the sole purpose of aiding in the harvest of a specific unit. Temporary roads are designed to be open only for the amount of time needed to harvest the unit. In many cases the entire road template is within the unit boundary. Most of them are open no longer than it takes to log the unit. Temporary roads will be closed and obliterated following use.

The Colville National Forest Noxious Weed Prevention Guide would be followed under all alternatives and noxious weed treatments would be conducted under the 1998 CNF EA for Integrated Noxious Weed Treatments. Noxious weed treatments in advance of ground disturbing activities and following other management actions would help reduce the conditions created by management activities that favor noxious weed populations (See section 4.2.4 Noxious Weeds). A prescription for noxious weed management is available from the DCEMP Analysis File, on file at the Three Rivers Ranger District.

2.5.3 Alternative B

This alternative evolved from the original proposed action (Federal Register November 12, 1996). It was developed to provide the broadest coverage for ecosystem management projects in the watershed. Treatments were planned to set up the greatest available acreage for development into late structure stands, **and the greatest amount of protection from pathogen and fire events. This alternative also produces the greatest amount of wood fiber and revenue for the local economy of all the alternatives.**

Many forested stands in the DCEMP area have increased in density, and changed in tree species composition toward more shade tolerant species. This has increased their susceptibility to insects, diseases, the effects of drought and catastrophic fire. Additionally, there has been a corresponding decrease in patchiness and forest structural diversity that has reduced habitat for some wildlife species. To increase forest structural diversity, and to reduce threats of forest pathogen outbreaks, Alternative B would treat 4,120 acres so they can grow towards late and old structural stages faster than they would if left alone. This would be accomplished through commercial timber harvest and prescribed fire. To achieve objectives, management activities under this alternative would enter areas that have been roaded, areas

lacking classified roads, and Forest Plan inventoried roadless areas. However, construction of new roads and road reconstruction would only take place outside of Inventoried Roadless Areas) (see Table 7). **Removal of active beetle brood trees, some of which may be larger than 21 inches dbh, could occur in locations where active Douglas-fir beetle outbreaks are encountered inside of, or adjacent to, planned units. Standing dead and existing bark beetle brood trees would be targeted for removal, though snag retention standards would be met; riparian buffers and wildlife corridors would be honored (See section 2.2 Existing Management) and heritage sites protected. No harvest would occur in Management Areas 1, 10 or 11.**

Treatment prescriptions include 373 acres (9 percent) of uneven-age selection treatments, **2,996 acres (73 percent) of commercial thinning, 25 acres (1 percent) of salvage removal treatment,** 214 acres (5 percent) of shelterwood harvest, and 512 acres (12 percent) of combination sanitation/shelterwood harvest (all listed acres approximate). **An unknown amount of infested Douglas-fir trees would also be removed; acreages are not expected to exceed one or two acres in any one location and number of trees not to exceed 1 to 2 percent of the total for the projects. The slash would be piled and burned in these small, scattered treatment areas unless the fuels management specialist determines the post- treatment fuel loadings are within an acceptable range.** Yarding methods would include tractor (56 percent), cable (30 percent), and helicopter (14 percent).

To support the commercial harvest, light road reconstruction would occur on about 7.1 miles; creating drain dips along with light blading and brushing to open existing roadways for safe use by logging traffic. Medium reconstruction would occur on about 6.8 miles. Medium reconstruction is defined as occasional excavation of cutbank and roadbeds for width, spot rocking for erosion control and subgrade strength, and culvert replacement and installation. New specified road construction would occur on a total of about 13.9 miles, creating 13 new stream crossings.

Prescribed fire provides reduction of natural and post-harvest fuel loads, reduces seedling and sapling stocking levels, removes invasive tree species and stimulates forage production for cattle and wildlife. Prescribed fire would occur on about 956 acres. Included is natural fuels reduction (underburning) on approximately 194 acres. Jackpot burning where fuels are grappled and piled, then burned for fuel reduction would occur on about 223 acres. **INFISH downed wood requirements would be met where resources allow.**

Alternative B proposes timber stand management and fuel reduction treatments on approximately 570 acres in the Twin Sisters Inventoried Roadless Area. Small diameter trees dominate the stands proposed for treatment. These treatments would include about 140 acres of regeneration harvest (shelterwood) in 7 units. (See Table 57 for list of prescriptions in areas within inventoried roadless areas). Between 10 and 25 green trees per acre would be left in each shelterwood unit as snag replacements and seed sources.

2.5.4 Alternative C

Alternative C was designed to meet the project purpose of developing late structure stands without adding any new roads to the Forest Road system. No roads would be constructed

inside inventoried roadless areas, areas lacking classified roads that are contiguous to Inventoried Roadless, and other areas greater than 1000 acres in size that lack classified roads**. The alternatives were developed during the time when this was commensurate with USFS interim direction for roadless and other such areas**. No new specified roads would be constructed. No new stream crossings would be built.

Under this alternative about 2,386 acres would be treated. Treatment prescriptions include 194 acres (8 percent) of uneven-age selection treatments, **1,737 acres (73 percent) of commercial thinning, 25 acres of salvage removal treatment (1 percent)** and 430 acres (18 percent) of combination sanitation/shelterwood. (all listed acres approximate). Harvest would not occur within inventoried nor uninventoried roadless areas. **An unknown amount of beetle infested Douglas-fir trees would also be removed; acreages are not expected to exceed one or two acres in any one location and number of trees not to exceed 1 to 2 percent of the total for the projects**. Yarding methods would include tractor (43 percent), cable (27 percent), and helicopter (30 percent). In addition, the activities listed below would be conducted.

To support the commercial treatments, light road reconstruction would occur on about 3.1 miles, creating drain dips along with light blading and brushing to open existing roadways for safe use by logging traffic. Medium reconstruction would occur on about 5.8 miles. Medium reconstruction is defined as the occasional excavation of cutbank and roadbeds for width, spot rocking for erosion control and subgrade strength, and culvert replacement and installation. New specified road construction would not occur.

Prescribed fire provides reduction of natural and treatment fuel loads, reduces seedling and sapling stocking levels, removes invasive tree species and stimulates forage production for wildlife. Prescribed fire would occur on 880 acres. Natural fuels reduction (underburning) would occur on 169 acres. Jackpot burning, where fuels are grappled, piled, and burned to reduce surface fuels would occur on 76 acres (all listed acres approximate).

2.5.5 Alternative D (The Preferred Alternative)

This alternative was designed to provide ecosystem management opportunities in this watershed without entering inventoried roadless areas and areas lacking classified roads that are contiguous with inventoried roadless areas. This alternative was commensurate with USFS interim roadless direction that existed at that time.

Under this alternative about 2,561 acres would be treated. Treatment prescriptions include 204 acres (8 percent) of uneven-age selection treatments**, 1,820 acres (71 percent) of commercial thinning, 25 acres (1 percent) of salvage removal treatment**, and 512 acres (20 percent) of combination sanitation/shelterwood (all listed acres approximate). **An unknown amount of infested Douglas-fir trees would also be removed; acreages are not expected to exceed one or two acres in any one location and number of trees not to exceed 1 to 2 percent of the total for the projects.** Yarding methods would include tractor (73 percent) and cable (27 percent). There would be no helicopter yarding proposed in any units.

To support the commercial harvests, light road reconstruction would occur on about 6.7 miles,

creating drain dips along with light blading and brushing to open existing roadways for safe use by logging traffic. Medium reconstruction would occur on about 6.5 miles. Medium reconstruction is defined as the occasional excavation of cutbank and roadbeds for width, spot rocking for erosion control and subgrade strength, and culvert replacement and installation. New specified road construction would occur on about 7.2 miles, creating five new stream crossings.

Prescribed fire provides reduction of natural and treatment fuel loads, reduces seedling and sapling stocking levels, removes invasive tree species and stimulates forage production for wildlife. Prescribed fire would occur on 956 acres. Natural fuels reduction (underburning) would occur on 169 acres. Jackpot burning where fuels are grappled and piled, then burned to reduce surface fuels would occur on 79 acres (listed acres are approximate).

2.5.6 Alternative E

This alternative was designed to take advantage of most of the ecosystem management opportunities within this watershed, but to accomplish this without constructing any new specified roads. Helicopter yarding would be used to harvest in inventoried roadless areas. Logs would be flown to landings to be established along existing system roads. It would not create any new stream crossings.

> Under this alternative about 3,147 acres would be treated. Treatment prescriptions include 234 acres (7 percent) of uneven-age selection treatment, **2,230 acres (71 percent) of commercial thinning, 146 acres (5 percent) of shelterwood, 25 acres (1 percent) salvage removal treatment**, and 512 acres (16 percent) of combination sanitation/shelterwood (acres listed are approximate). **An unknown amount of infested Douglas-fir trees would also be removed; acreages are not expected to exceed one or two acres in any one location and number of trees not to exceed 1 to 2 percent of those removed during project implementation**. Yarding methods would include tractor (39 percent), cable (23 percent), and helicopter (38 percent). In addition, the activities listed below would be conducted.

To support the commercial treatments, light road reconstruction would occur on about 2.2 miles, creating drain dips along with light blading and brushing to open existing roadways for safe use by logging traffic. Medium reconstruction would occur on about 6.4 miles. Medium reconstruction is defined as occasional excavation of cutbank and roadbeds for width, spot rocking for erosion control and subgrade strength, and culvert replacement and installation. New specified road construction would not occur.

Prescribed fire provides reduction of natural and treatment fuel loads, reduces stocking levels, removes invasive tree species and stimulates forage production for wildlife. Prescribed fire would occur on 956 acres. Natural fuels reduction (underburning) would occur on 194 acres. Jackpot burning for fuel reduction would occur on 223 acres (listed acres are approximate).

Alternative E proposes approximately 324 acres of treatments in the Twin Sisters Inventoried Roadless Area. These treatments would include about 125 acres of regeneration harvest (shelterwood) in 6 units. Similar to Alternative B, these treatments would be conducted in small diameter timber stands with the objective of restoring desirable characteristics of ecosystem composition and structure. (See Table 57 for list of prescriptions in areas within inventoried

roadless areas). Between 10 and 25 green trees per acre would be left in each shelterwood unit as snag replacements and seed sources.

2.6 Mitigation Measures

Mitigation measures are those activities that are taken to avoid, minimize, reduce, eliminate, or rectify the impacts of management activities. The measures listed below are prescribed to mitigate the effects of the proposed actions. These should be considered part of the alternative designs. They are listed here to supplement the descriptions of the action alternatives.

Many measures, which were considered as standard operating practices by the ID Team, are not included here. These include but are not limited to Best Management Practices (BMPs). The BMP process has been certified by the State of Washington as an effective method for protecting water quality and meeting the requirements of the Clean Water Act. The BMPs are prescribed for all action alternatives. See the BMP section in the DCEMP Analysis File for the full text of each BMP.

All alternatives were designed to meet the Standards and Guidelines in Chapter 4 of the Colville Forest Plan and the protection measures as mandated by the Regional Forester's Plan Amendment #2 and the Inland Native Fish Strategy Environmental Assessment. **The mitigation measures have been rearranged into groups representing before, during, and after harvest management activities. Only those mitigation measures that have changed since release of the March 2001 FEIS are listed in boldface.**

2.6.1 Mitigation That Would Take Place before Management Activities

Noxious weeds

1 Treat existing haul routes for noxious weeds at least one season before log-hauling operations to decrease noxious weed spread. [Biological Assessment]

2 Off-road equipment used during the proposed activities will be cleaned of soil and seed prior to initial entry into the Deadman Project Planning Area. This is especially important if equipment was previously used in areas with noxious weed infestations. Cleaning may include washing (but not on National Forest lands) at a washing facility [Noxious Weeds report].

Minerals

3 Notify the claimant in Township 37 N, Range 35 E, Section 10 of proposed activities and request a map of the claims so that corner and discovery monuments can be protected during sale layout and harvest. [Minerals Report]

Heritage

4 Inventoried heritage sites will be protected by either a buffer or implementation of winter logging. [Heritage Report]

5 The limits of disturbance for road construction and reconstruction will be identified by flagging when near inventoried heritage sites. [Heritage Report]

6 Heritage resource technician will flag sites prior to layout. [Heritage Report]

Recreation

7 Units AS and AT - Landing locations and other created openings will be laid out with input from District Recreation specialists for possible dispersed camp site locations. [Scenery and Recreation Report]

2.6.2 Mitigation That Would Take Place during Management Activities

Wildlife habitat

8. New specified roads should be seeded shortly after they are built to reduce noxious weed spread and concomitant habitat loss. Roads should be closed and re-vegetated, using the most effective practicable barriers, as soon as practical after being built. [Biological Evaluation]

9. **CFR road closures will be implemented on gated roads to assist in assuring compliance with seclusion objectives [Biological Assessment]**

10. Minimum clearing limits for rights-of-way will be used on new road construction. [Biological Assessment]

11. Existing hiding cover or buffers will be retained along open roads to reduce poaching potential. [Biological Assessment]

12. The culvert under Forest road 9565-800 at the North Fork Deadman crossing is currently impassable to fish and thereby protects the upstream native redband population from brook trout competition. This barrier is desired and any road reconstruction plans will maintain it. [Fisheries Report]

13. For all action alternatives, treatments in units CL and GC will not occur between April 1st and September 15th because of potential for disrupting Goshawks in nearby nests. [Deadman Wildlife Analysis]

Biodiversity

14. **Limit reconstruction of existing roads to the existing template in the vicinity of sensitive plant populations. [Sensitive Plant Report]**

15. **If any sensitive species is found in the project area while project activities are occurring, a botanist will be consulted as to measures required to protect the species and its habitat. [Sensitive Plant Report**]

16. For commercial harvest activities, a site specific "no activity buffer" based on topographic features and Forest Botanist recommendations will be implemented around

known sensitive plant populations. In absence of specific recommendations a "no activity buffer" of 250 feet in all directions of the periphery of all sensitive plant populations will be established. [Sensitive Plant Report]

17. **For non-commercial harvest activities, a site specific "no activity buffer" based on topographic features and Forest Botanist recommendations will be implemented around known sensitive plant populations. For precommercial thinning activities, a "no activity buffer" of 150 feet in all directions of the periphery of all sensitive plant populations will be established. [Sensitive Plant Report**]

18. **Avoid log landings and tree felling into meadows with sensitive plant populations. [Sensitive Plant Report**]

19. New roads will be located at least 250 feet from sensitive plant populations. [Sensitive Plant Report]

Soil/water quality

20. In addition, the following mitigation measures apply to units where compaction was identified as a management concern and proposed treatments include ground-based yarding system and/or grapple piling. They apply to all or parts of units: AA, AE, AF, AJ, AQ, BD, BF, BI, BQ, BU, BV, BY, CG, CK, CL, CN, CO, CQ, CS, CT, CU, CV, CY, CZ, DC, DD, DE, DF, DG, DH, DI, DJ, DK, DL, DO, DP, DR, DW, DX, EC, EF, EX, EZ, FG, FP, FR, GA, GC.
    a. If winter logging is approved, tractor yarding would occur over snow generally greater than 20 inches deep in the openings and at least 10 inches deep under the canopy or over ground that is frozen to a depth of at least 4 inches.
    c. b. Cut-to-length equipment would operate on slash that is at least 18” deep prior to compacting it for operations, or over snow generally greater than 20 inches deep in the openings and at least 10inches deep under the canopy, or over ground that is frozen to a depth of at least 4 inches.
    d. Mechanical felling equipment such as shears would <u>not</u> be allowed to operate off approved skid trails. [Geology and Soils Report]
21. All new road locations will, to the extent feasible, be at least 100 feet from the edge of isolated seeps, or wet areas with open water, to minimize new cattle access to these sensitive areas. The road designer will ensure that a debris barrier is included in the road construction specifications for road segments within 100 feet of seeps or wet areas where roadway is within 100 feet of open water. [Fisheries Report]

22. Road CEN1 will be constructed during a year when cattle are not in the Betty Cr. pasture. A continuous fence or debris barrier will be constructed between the stream and the road when the road is located within **300’** of North Fork Deadman Cr. to discourage cattle access. The slash closure will be constructed to effectively prevent stock from trailing along the road. **An interdisciplinary plan-in-hand review of road CEN1 will be conducted to ensure that this mitigation is effective due to its potential to affect wet areas.** [Hydrology and Fisheries Reports]

23. **Road segment CCJ1, a small segment of CEJ1, and the end segment CBP1 are on landtypes similar to the recent fill failure on FS Road #9565-360. These locations will be reviewed by a geotechnical/slope stability specialist and/or a hydrologist before the road construction contract is finalized. [Hydrology Report]**

24. The high, eroding cutslopes on Forest road 9565-520 where it crosses High Bridge Creek will be treated with bioengineering erosion control structures to stabilize slopes and minimize the chronic input of sediment to High Bridge Creek. **If this work cannot be accomplished under the road reconstruction package, it will be done using either KV or appropriated watershed improvement funds**. [Hydrology Report]

25. Avoid impacts to Riparian Habitat Conservation Areas and streams and adverse effects on inland native fish from prescribed fire by employing the following methods
    a. **Locate staging areas, helispots, and other centers for activities 300 feet away from waterbodies. Utilization of Air Force Survival School approved helispots is recommended**
    b. **Design fuel treatment and fire suppression strategies, practices and actions so as not to prevent attainment of Riparian Management Objectives and to minimize the disturbance of riparian ground cover and vegetation.**
    c. **Avoid delivery of chemical retardant, foam, or additives to surface waters. An exception may be warranted in situations where overriding immediate safety imperatives exist, or, following a review and recommendation by a fishery biologist or hydrologist, when it is determined an escape fire would cause more long-term damage to fish habitats than chemical delivery to surface waters.**
    d. **Immediately establish a burned area emergency response (BAER) team to develop a rehabilitation treatment plan to attain Riparian Management Objectives and avoid adverse effects on inland native fish whenever RHCAs are significantly damaged by a wildfire or a prescribed fire burning out of the prescription.**
    e. **Allow low severity fire to back in to the RHCAs where preparation to keep the fire out of the riparian areas would cause more damage than letting the fire creep into the RHCA. This is to avoid fire lines that run 300 feet parallel to stream channels, using foam near stream channels, and running hose lays. These activities are more harmful than letting the fire die out in the RHCA. This is only to be used where there would not be more than a 10% mortality of overstory, a greater than 20% loss of large woody debris (>12" dbh), and a detrimental impact to the riparian soil. It is expected that there would be mortality of the shrubs and herbaceous plants; however these species regenerate from roots or seeds quickly after fire, within a week to a month. [Fisheries Report]**

26. A spring supplying domestic water to one household is located in the SW/4, NE/4 S17, on the north slope of lower North Fork Deadman Creek. Road construction and timber harvest (unit DD, all alternatives) would occur immediately uphill of this spring. The road (CDD1, alternatives B and D) would be on gentle ground and would be designed to avoid seriously disrupting either surface or subsurface flow. A 500‘ no harvest buffer will remain between any ground disturbing activity and the water source in the SW1/4,

NE1/4, S17 on the north slope of lower Deadman Creek. [Hydrology Report]

27. Units DC and DD would be harvested only when soil conditions are such that compacted area would be negligible (e.g. frozen, snow-covered ground). [Hydrology Report.]

28. For alternatives B and D enough road length will be obliterated to bring total road density in the High Bridge Creek and Betty Creek watersheds less than or equal to existing road densities. (See also watershed improvement opportunity 8.) Total road density includes trails accommodating jeep traffic but excludes ORV trails. Identification of roads to be obliterated has accomplished by an interdisciplinary team using the Roads Analysis Process. Obliteration may be full or partial but will always entail removal of drainage structures that could become flow blockages, removal of road-induced risks to slope stability, and placement of hard closures to vehicles over 50" wide. [Hydrology Report.]

29. The following mitigation measure applies to all units proposed for ground-based yarding or grapple piling.
    a. When tractor yarding, skid trails would generally be about 130 feet apart, except where converging at landings or to avoid streams, rock outcrops or other features.
    b. To the extent possible, use existing skid trails and landings.
    c. **Mechanical felling equipment such as shears <u>may be</u> allowed to operate off designated skid trails in units where compaction is not an identified problem (See mitigation measure #20). If requested by the purchaser, the Forest Soil Scientist would review the proposal on a case-by-case basis.**
    d. Pile only the portions of units needed to meet fuel treatment objectives. Minimize the acreage treated with piling.
    e. Grapple piling equipment must stay on the existing skid trails.
    f. Pile logging slash when soils are dry (>2 bars moisture tension) or frozen to a depth of at least 4 inches.
    g. Leave as much forest floor material, fine organic debris (<2-inch diameter), litter and duff as possible.
    h. Retain 10-20 tons/acre of larger woody debris (>6-inch diameter).
    i. Tractor and skidder logging would be limited to slopes less than 35%. Short pitches may be steeper. Avoid long steep skid trails. Cut-to-length logging would be limited to slopes less than 35%. Short pitches may be steeper, such as the access from the road. (BMP PT-6) [Geology and Soils Report]

30. **The following applies to units designated for cable, skyline or helicopter yarding systems and compaction was identified as a management concern. This applies to all or parts of units: AB, AG, AM, AP, AU, AV, AW, AZ, BH, BI, BJ, BK, BQ, BT, CG, CJ, CK, CL, CO, CR, CU, CV, CW, CX, CY, DA, DC, DE, DP, DQ, DV, DW, ED, EH, EK, EL, ES, EW, FD, FE, FG, FH, FJ, FL, FM, FN, FP.**
    a. **Mechanical felling equipment such as shears would not generally be allowed. If requested by the purchaser, mechanized felling equipment will be reviewed and considered on a case-by-case basis. That will allow the Forest Service to consider all the pertinent conditions at the time of the request – soil moisture content, the**

exact equipment proposed, slash available, and other mitigating circumstances such as frozen conditions or snow.

b. Limit the extent of grapple piling.

c. If used, keep piling equipment to existing disturbed areas, such as cable corridors. [Geology and Soils Report]

31. **The following applies to tractor units where erosion or displacement was identified as management concerns. These soils are typically very sandy with weak structure. This applies to all or parts of units AF, AQ, AT, BD, BF, BG, BI, BL, BU, BW, BX, BY, CA, CG, CN, CO, CS, CU, DF, DG, DH, DL, DR, DS, EF, EI, GC.**
    a. **Skid trails should generally be limited to slopes of 30% or less. Steeper pitches up to 35% may occur for short distances (i.e. less than 100 feet), especially in rocky areas.**
    b. **Make sure erosion control measures are installed promptly and correctly.**
    c. **Avoid constructing skid trails requiring a cut and/or fill slope Geology and Soils Report]**

32. **The following applies to skyline units where erosion or displacement is identified as management concerns. This applies to all or parts of units BE, BH, BI, BL, BP, BT, CG, CU, DA, DB, DQ, DV, EH, EI, FM.**
    a. **Make sure erosion control measures are installed promptly and correctly.**
    b. **Avoid excessive gouging the soil during cable and skyline operations by requiring suspension of one end of the log. [Geology and Soils Report**].

33. **Portions of unit DX have a high water table in the spring and early summer. This unit should be treated in the late summer, fall or winter under frozen conditions. [Geology and Soils Report]**

34. **Portions of units AE, DP, EC, ES, EX, EZ, and FR include the Gahee soil series. This soil sometimes has an intermittent dense horizon at about 10-20" creating small wet spots or areas of perched water tables in the spring. Harvesting of these units will take place in the late summer, fall or winter. If the purchaser wants to start in the early summer, a soils scientist will check the unit by digging a few holes about 10-20" deep to see if the unit has dried out. [Geology and Soils Report]**

35. **Drainage structures will be designed and placed so that water concentrated by the road prism is effectively dispersed prior to entering stream channels. [Geology and Soils Report]**

36. **FS road 9565-320 from the intersection with 9565 to Merkel Canyon will be improved to reduce road surface erosion. This is to mitigate increased erosion expected from haul on the 9565 and 9565-320. Even though a portion of the 9565-320 will not be used for the sale, correcting drainage will mitigate the overall cumulative effect of the haul use on roads within or affecting riparian areas. [Fisheries Report}**

37. **All roads in RHCAs or contributing areas to be used for haul will be armored**

with aggregate surfacing, unless native materials provide adequate surfacing. Aggregate material shall be of sufficient quality to provide an effective erosion barrier for off-site movement of road sediment. [Geology and Soils Report]

38. **Minimize road cuts and fills on sandy soils (primarily Wapal and Edds) to reduce erosion and minimize revegetation problems. Design roads for the steepest slope ratio for a given soil type that is mechanically stable under dry conditions. Provide for a seedbed that will reliably hold seed on the slope under a given application method. Highly erodible soils will be identified in the pre-construction design phase of the project. [Geology and Soils Report]**

39. **Slash windrows will be utilized on road cut and fill slopes (especially in RHCAs and contributing areas) to reduce the short-term effects of surface erosion until vegetation becomes established. [Geology and Soils Report]**

40. Pile burning: Require small and low piles that produce flame heights of 2-4-foot to reduce burning time and heat intensity. Burn piles when soil moisture in the upper profile is high. [Geology and Soils Report].

41. Burning prescriptions will be designed to minimize severely burned soils and to reduce the risk of erosion. Develop burn plans so that the mineral soil surface is not oxidized to a reddish color and so that some of the forest floor litter and duff layer is retained over most of the burn area. [Geology and Soils Report].

42. **Prepare burn plans so as to avoid large areas of high-intensity fire on the Torboy, Wapal and Pepoon soil series. Retain forest floor and duff on 60-70% of the proposed burn area. These are found in units AE, AF, AP, AQ, AS, AT, AW, BD, BE, BF, BG, BH, BI, BJ, BK, BL, BO, BP, BQ, BR, BT, BU, BW, BX, BY, CA, CG, CL, CN, CO, CP, CS, CU, DA, DB, DF, DG, DH, DL, DQ, DR, DS, EF, EG, EH, EI, EK, FM, GC [Geology and Soils Report].**

43. Where silvicultural prescriptions recommend mineral soil exposure, a site-specific evaluation must be conducted to determine the risk of severely burned soils. [Geology and Soils Report].

44. Retain 12 to 14 tons/acre of larger woody debris (>6” diameter, large end diameter) for long term nutrient cycling and favorable microsites for seedling establishment. (Geology and Soils Report].

Mining

45. Protect all existing or new claim corner monuments, discovery monuments, or active workings during road construction, harvest, fuel reduction, or site preparation. [Minerals Report]

Noxious weeds

46. Revegetation of soil disturbances will be required in the road building specifications. [Noxious Weeds report}

47. **New roads, and existing roads not needed for management or public purposes, will be closed as soon as possible after activities have been completed. [Noxious Weeds report]**

48. Disturbed sites will be seeded prior to the first growing season after disturbance. Certified, noxious weed-free seed mixes will be used. Selection of species will be based on site conditions and the availability of specific native species. [Noxious Weeds report and Biological Assessment]

49. Gravel or fill, when possible, will be from uninfested sites. Fresh crushed rock is more likely to be weed -free than rock from storage pits. [Noxious Weeds report]

50. **Noxious Weed Prevention Guidelines for the Colville National Forest (USDA FS 1999a will be followed**

Scenery and recreation

51. **If a newly created opening begins to get public use and such use conflicts with meeting other resource objectives, steps will be taken to discourage use by barricading the site using boulders or other debris. [Recreation/Visuals Report]**

52. **To meet the objective of Partial Retention, mitigation measures (#54-56) that reduce visual impacts will be accomplished within 1 year of project completion. Units AA, AE, AF, AJ, AS, AT, BE, BF, BG, CA, CE, CK, CL, CN, CO, CQ, CS, CU, DC. [Recreation/Visuals Report]**

53. The edges of cutting and burn units will be feathered, especially those next to continuous canopies on the North, Northwest and Northeast aspects on slopes over 60% to reduce the visual effects. *Units AA, AE, AF, AJ, AS, AT, BE, BF, BG, CA, CE, CK, CL, CN, CO, CQ, CS, CU, DC***.** [Recreation/Visuals Report]

54. Natural forms will be emulated in unit layout, creating openings that are irregular in shape. Where reasonable, Hardwood trees will be retained for diversity of color, and blend vegetation from treated to untreated. *Units AA, AE, AF, AJ, AS, AT, BE, BF, BG, CA, CE, CK, CL, CN, CO, CQ, CS, CU, DC.* [Recreation/Visuals Report]

55. To protect the scenic integrity of listed sensitive travel routes, slash generated should not be evident within the visible foreground. Grapple piling, lopping and scattering slash, yarding tops attached, and/or jackpot burning will be used in visible portions of the following unit to reduce the visual impact. *Units AA, AS, AT, BF, BG, CA, CE, CL, CO, CS, CU, DC***.** [Recreation/Visuals Report]

56. Pull all tags, flags etc. visible for 66 feet from travel routes listed below, significant dispersed sites, and recreation trails listed. No paint should be left visible within 66 feet of these roads, trails, or significant dispersed camping sites. Mitigation applies to **Deadman Creek Road 9565 and C.R. 460, North Fork Deadman Creek Rd. 320, Mack Mountain Trail, and Twin Sisters Trail** [Recreation/Visuals Report]

57. Where landings can be left accessible from the Deadman Creek Road (9565), they will be left in a condition that can be utilized for dispersed camping. This will include disposal of slash and scarification only to the depth necessary for successful seeding. [Recreation/Visuals Report]

58. *Units AZ and EC* - Ground disturbing activities need to protect and maintain the all-terrain vehicle (ATV)/jeep trail. [Recreation/Visuals Report]

59. Any further rock pit development (Alligator Pit, located off 9565-322 Road), will allow continued access to the existing ATV/jeep trail. [Recreation/Visuals Report]

60. Timing of pit operations and stockpiling of surfacing material will be coordinated with District recreation specialists to avoid possible conflicts. [Geology and Soils Report]

Range

61. All existing water developments, fences, or other range improvements will be protected whether or not they are specifically identified in this report. Any improvements that cannot be protected or that are damaged during harvest activities will be repaired or replaced. Use timber sale and construction contract clauses to achieve this. See standards and guidelines on page 4-45, Forest Plan [Range Administration report]

62. Prevent movement of livestock from the Boyds Allotment onto the CC Mountain Allotment during construction of temporary roads TCU1 and TCU2 and harvest of unit CU. Use gates or a cattleguard if necessary. If possible, construct road and harvest units prior to June 1 or after October 30 to avoid the livestock season of use. See standards and guidelines on page 4-45, Forest Plan. [Range Administration report]

Heritage

63. **Heritage Resource mitigation unit BG: Use winter logging to avoid damage to heritage resources. Heritage resource technician will visit site with sale administrator to identify resource for protection. [Heritage Report]**

2.6.3 Mitigation to Take Place After Management Activities

Roads

64. Close all new roads and existing closed roads that have been opened for this project following the completion of harvest activities, including post-sale work. The only exception would be if there is firewood available for public consumption, and can be provided without risk to the resources. Access during the period of active harvest activities would be restricted to that related to timber sale operations and official administrative access. [Forest Plan, p.4-56]

Range

65. Construct fences to facilitate holding livestock on designated pastures where harvest units disrupt the natural boundaries between the Betty, CC, and Mack units of the CC

Mountain Allotment. Monitor livestock movement after harvest of the units to determine if, and where, fences should go. Use BMP RM-3 [Range Administration report]

66. Extend the CC Mountain and Boyds allotment boundary fence to facilitate holding livestock on the designated allotment where harvest units disrupt the natural boundaries. Monitor livestock movement after harvest of the units to determine if, and where, fences should go. Use BMP RM-3. . [Range Administration report]

67. Extend the drift fences on the CC and Mack unit boundaries to facilitate holding livestock on the designated pasture where harvest units disrupt the natural boundaries. Monitor livestock movement after harvest of the units to determine if, and where, fences should go. Use BMP RM- [Range Administration report]

68. **Water developments that have been affected by timber harvest where water flows have been changed or moved will be redeveloped. Use BMP RM-3 [Range Administration report]**

Soil/water quality

69. All erosion control measures must be kept current preceding expected seasonal periods of precipitation or runoff. Skid trails, landings, and temporary roads shall be scarified and reseeded after use. Temporary roads shall be effectively closed after use. Purchaser shall satisfactorily maintain all erosion control structures until released by the Forest Service. [Geology and Soils Report]

Wildlife

70. **To mitigate loss of nesting sites (large snags) in potential great gray owl nesting habitat proposed for harvest, artificial platforms would be constructed and placed in remaining nesting habitat. The number and placement will be determined post-project and depends on the number of large snags felled during harvest activity. [Biological Evaluation]**

71. The loss of cover caused by harvesting in winter range areas will be mitigated by conducting prescribed fires in units CS. CU, CZ, DD, and GA, thereby increasing forage quality. [Biological Evaluation**]**

72. If the number of remaining snags is not sufficient after harvest treatments, the loss due to harvest will be mitigated by creating snags. [Management Indicator Species Report]

2.7 Associated Projects

The following projects have been identified as desirable ecosystem improvement projects. Lack of funding or other constraints make these projects a lower priority than those included in the rest of this EIS. They are listed here to serve as a catalyst for future project planning and funding. They are listed here in random order without reference to priority or relative importance. NEPA analysis has not yet been completed for any of these projects.

A. Decrease road density in lynx range to 1.0 mile/square mile or less by closing roads.

B. On old landings in riparian environments (wetlands or near stream channels), decompact soil, mulch with debris, revegetate, and exclude cattle.
C. Construct a fence or barriers to exclude stock from the downcut old-homestead reach of North Fork Deadman. The objective is to foster recovery of riparian shrub and coniferous vegetation providing shade, woody debris, and root reinforcement to the stream banks which will improve water quality and reestablish riparian habitat.
D. On the last segment of the 075 road (on the east side of upper Merkel Canyon), remove failed culverts, reshape stream crossings and provide adequate drainage for long-term stability. The road is limited by vegetation to foot traffic and the only threat to stability is poor drainage. The work would be done by hand. Per the transportation report, the road will be left on the system so its condition continues to be tracked.
E. Past harvest activity has created gaps in the natural barriers between the Deadman, CC, and Betty pastures of the CC Mountain Allotment. Construction of fencing is necessary to maintain the grazing system to protect the resources of the units that are not to be grazed. Up to 2 miles of fence may be necessary between the Deadman pasture and the CC and Betty pastures. Another 1 mile of fence may be necessary between the CC pasture and the Betty pasture.
F. Provide additional forage or enhance existing forage by seeding 100 acres on the Boyds Allotment with palatable grasses.
G. Provide additional forage by seeding 250 acres on the Deadman pasture of the CC Mountain Allotment.
H. Decrease road density in big game winter range by installing berms or seasonally closed gates on roads that cross the range.
I. Harden the 9565-320 road ford on Merkel creek for use by ORVs. The objective is to minimize this chronic sediment input to North Fork Deadman Creek.
J. **The range conservationist will evaluate all areas accessed by new roads for additional stockwater needs. If new water developments are needed, they will be constructed within 2 years after harvest ends. Maintenance requirements will be incorporated into the annual Allotment Operating Plan. [Hydrology Report] [Range Administration report]**

2.8 Monitoring

If one of the action alternatives were implemented, the following monitoring plan would be used to assure that the intent of the EIS was implemented. The District Planning and Monitoring Assistant will be responsible for insuring that a comprehensive Implementation Plan is established at the completion of NEPA requirements (after appeals).

The Implementation Plan will include a unit-by-unit list which displays logging system and stand attributes needing consideration in layout (stream or sensitive plant buffers, unit boundaries which cannot be changed such as a border against a marten core area or against a MA-11, and all appropriate mitigation measures specifically affecting that unit). Also included in that package will be a map that reflects those same guidelines.

The District Implementation Assistant will be responsible for ensuring that the mitigation measures and guidelines listed previously would be followed, and included in the contract package where applicable. The District Silviculturist would be responsible for ensuring that harvest prescriptions are in compliance with the direction generated in this EIS. The District

Wildlife Biologist would ensure that the necessary monitoring for winter range, snag retention levels, old growth dependent wildlife species, and fish habitat are accomplished. The Forest Hydrologist will ensure that the riparian resource and water quality are protected.

In addition, the Forest Hydrologist and Forest Fisheries Biologist will ensure that a fisheries survey will be done on one station each on North Fork and upper main Deadman Creek and that if alternative B is selected, water quality monitoring will be intensified before, during, and for at least two years after sale activities end. Overall responsibility for the monitoring plan is the responsibility of the District Ranger.

Management standards direct the Forest to maintain viable populations of all sensitive plant species known from the Forest. Populations of sensitive plants are not to decline by more than 15%. If the 15% threshold is not sufficient to maintain viability, this threshold will be adjusted. A plan will be developed and implemented by the Forest Botanist to monitor selected populations of sensitive plants in the analysis area to evaluate the effects of implementation of the project.

The monitoring activities described above would be undertaken in addition to the monitoring needs identified in the Colville Forest Plan. Implementation and monitoring are discussed in Chapter 5 of the Colville Forest Plan.

2.9 Comparison of Alternatives

The following tables present comparisons of the effects of each alternative relative to the DCEMP objectives and key issues used in alternative development. Many of the objectives and key issues have overlapping outputs or indicators. For a full discussion of the effects of the alternatives see Chapter 4, Environmental Consequences.

Table 6. Comparison of alternatives (numbers are approximate).

Objective	Measure	Alternative				
		A	B	C	D	E
Provide wood fiber for local mills and the USA public	MMBF (millions of bd. ft.)	0	23.1	13.5	14.6	18.8
Reduced risk of pathogens outbreak	Total harvest treatment acres	0	4,120	2,386	2,561	3,147

Objective	Measure	Alternative				
		A	B	C	D	E
Reduced risk of catastrophic fire event	Acres natural fuel treatment	0	194	194	194	194
	Acres activity fuel reduction through prescribed fire, incl. wildlife burn	0	499	444	460	499
	Acres activity fuel reduction through yarding tops attached to logs	0	499	144	166	217
	Acres activity fuel reduction through grapple pile and burning, including site preparation	0	501	320	323	435
	Acres activity fuel reduction during site preparation for planting/natural regeneration	0	607	525	607	607
	Total acres fuel reduction treatments	0	2,300	1,627	1,750	1,952
Road safety and management	Miles of new specified road ***constructed*** to meet resource management objectives	0	13.9	0	7.2	0
	Miles of new specified road ***closed*** after proposed management is concluded	0	13.9	0	7.2	0
	Miles of existing road reconstructed to safe standard	0	13.9	8.9	13.9	8.6
	Miles existing open road closed*	0	1.5	1.5	1.5	1.5
	Miles open road closed, obliterated, and removed from system*	0	1.5	1.5	1.5	1.5
	Miles open road removed from system*	0	0.3	0.3	0.3	0.3
	Miles of closed road removed from system*	0	8.3	8.3	8.3	8.3
	Miles of closed road decommissioned*	0	0.2	0.2	0.2	0.2
	Miles of non-system roads closed and obliterated*	0	0.1	0.1	0.1	0.1

*These actions are exclusive of each other. A total of 11.9 miles of existing roads will have some form of closure, obliteration, decommissioning, and/or removal from the CNF system.

Table 7. Key issue #1: comparison of indicators

Key Issues	Measures of Effects	Alternatives[1] A	B	C	D	E
Effects of Entry into Inventoried Roadless Areas (RARE II) and >1000-acre area without classified roads	Total acres of harvest treatment in Inventoried Roadless	0	**570**	0	0	**324**
	Acres affected by harvest treatments in Inventoried Roadless	0	**1569**	0	0	**1301**
	Acres of harvest treatment in >1000 acre area without classified roads	0	**355**	0	**110**	**142**
	Acres affected by harvest treatments in >1000-acre area without classified roads	0	**914**	0	**129**	**163**
Effects of new road construction	Miles of new specified road in Inventoried Roadless	0	0	0	0	0
	Miles of new specified road in >1000 acre area without classified roads	0	0	0	0	0
Effects to visuals and recreation	**Change in ROS ratings due to actions**	**N**	**N**	**N**	**N**	**N**
	Acres single tree selection in visually sensitive management areas	**0**	**10**	**0**	**0**	**10**
Effects to wildlife habitat	**Percent of seclusion habitat (spring-summer/autumn) affected**	**0**	**15/8**	**0**	**10/2**	**0**
	Acres of future high-quality forage habitat created for lynx in Inventoried Roadless Area	**0**	**215**	**0**	**0**	**145**

[1] Numbers approximate

Table 8. Key issue #2: comparison of indicators

Key Issue	Measures of Effects	Alternatives[2] A	B	C	D	E
New Specified Road Construction	Miles of new specified roads constructed	0	13.9	0	7.2	0
Effect on Water Quality	**Miles of temporary road proposed**	**0**	**2.2**	**1.9**	**2.1**	**2.1**
	Number of new stream crossings	**0**	**13**	**0**	**4**	**0**
	Percent increase in sediment over existing conditions	**0**	**18**	**9**	**13**	**10**
Effect on Soils	**Acres removed from the productive landbase due to classified road construction and pit development**	**0**	**68**	**5**	**39**	**5**
Effect on costs/benefits	**Benefit/cost ratio**	**0**	**1.09**	**1.11**	**1.25**	**1.04**
	Present net value of project (thousand dollars)	**0**	**581**	**397**	**863**	**219**
	Miles of road removed from National Forest road system	**0**	**10.1**	**10.1**	**10.1**	**10.1**
Effect on spread of Noxious Weeds	**Acres of predicted soil disturbance due to road construction and reconstruction**	**0**	**68**	**5**	**39**	**5**
	Miles of existing road to be decommissioned, obliterated or closed	**0**	**3.6**	**3.6**	**3.6**	**3.6**

[2] Numbers approximate

CHAPTER 3. AFFECTED ENVIRONMENT

3.1 Introduction

This chapter discusses the resource components of the existing environment **in order to establish a baseline for reference. It describes the resources of the area that would be affected by the alternatives if they were implemented. Despite the use of the word "affected" in the title, this section does not discuss effects. That discussion is covered in Chapter 4, "Environmental Consequences." An assessment of existing conditions is critical to environmental analysis because it both describes the current condition of the project area and provides a basis for comparing the effects of management alternatives.**

As with Chapters 1 and 2, new text, compared to the March 2001 FEIS, is highlighted in Verdana boldface.

3.2 Watershed Description

The Deadman Creek watershed is located east of the Kettle Crest in the middle part of the Three Rivers Ranger District of the Colville National Forest (Figure 1). Deadman Creek flows in a generally easterly direction, and is tributary to the Kettle River. The basin comprises approximately 1.5 percent of the Kettle River's watershed area. The Deadman Creek watershed has its origins on an unnamed ridge system about three-quarters of a mile west of King Mountain. This ridge system connects on the north with a ridge that eventually forms the Twin Sisters Peaks and finally links into Alligator Ridge and Jackknife Mountain (see map in Appendix F). The watershed is cut off from the Kettle Crest by this ridge system and a valley trending north-south in the vicinity of Albion Hill. The south side of the watershed is made up of a long ridge that connects Graves Mountain, Coyote Mountain, and Hoodoo Mountain. Approximately five miles up from the confluence with Kettle River, the North Fork Deadman Creek joins Deadman Creek. Numerous smaller streams empty into both forks above their confluence, and directly into the consolidated main stem. The ridge between the North Fork and Deadman Creek contains CC Mountain, Mack Mountain, and King Mountain, the highest point in the watershed at 6,634 feet. The lowest point in the watershed is at the confluence of Deadman Creek and the Kettle River at approximately 1,320 feet. The terrain is generally mountainous, carved by great glaciers approximately14,000 years ago.

The Deadman Creek watershed occupies an area of 40,792 acres (63.7 square miles). Eighty-nine percent of the watershed (36,450 acres) is within the boundaries of the Colville National Forest (CNF). State and private ownership covers 4,342 acres (11 percent) of the watershed. Most of the state and private lands (3,506 acres) are located in the lower (eastern) portion of the watershed outside the CNF boundary. The Deadman Creek Ecosystem Management Projects (DCEMP) described in Chapter 2 would occur on National Forest lands.

Prevailing westerly winds, the path of storm systems crossing the Pacific Ocean, and the cold air moving south from the Arctic, influences the climate of the watershed. Winters are long and cold, and snow is usually on the ground from November to early April. Cold air from the Arctic region enters the area through the valleys oriented in a north-south direction. Summers are

sunny, hot, and dry. Air from over the continent brings high temperatures and low relative humidity. **Precipitation ranges from approximately 15 inches in the eastern, lowest portion of the watershed, to around 30 inches at the headwaters of the North Fork of Deadman Creek.**

3.3 History of the Area

The Deadman Watershed falls within an area that was historically used by the Colville and the Lakes Indians, and an Indian campsite has been identified in the Deadman Creek watershed. Though not on NFS land, the campsite is within the vicinity of the great salmon fishery at Kettle Falls in which both the Colville and the Lakes Tribes participated. Several references have been found describing an old Indian trail that existed up Deadman Creek. One report describes the trail as starting at the Kettle Falls fishing grounds, proceeding up the Kettle River to the present site of Boyds, and then turning west up Deadman Creek. From there it was said to run north to the saddle between Copper Butte and Midnight Mountain, then west.

The entire Deadman Creek Watershed was part of the North Half of the Colville Indian Reservation when it was created in 1872 and remained such until the North Half was opened to homesteading in 1900. At that time, any land in the North Half of the Colville Indian Reservation that had not already been claimed as an allotment was open to homesteading and to timber and stone act claims. Between 1906 and 1911 over thirty homesteads were established on Sherman Creek and Jackknife Mountain. By 1911 the State Road was becoming lined with little homestead houses, each with a farm averaging about 40 acres in size.

President Theodore Roosevelt created the Colville National Forest on March 1, 1907. It reserved over 700,000 acres of forest lands lying between the Okanogan and Columbia Rivers and between the Colville Indian Reservation and the Canadian border. Temporary to semi-permanent camps were set up throughout the forest from which to administrate this land. Near the intersection of the North Fork and the main Deadman Creek was the location of one of these Forest Service Ranger Stations. Early Forest Service activity in the watershed included lookouts on Graves, Jackknife, and Twin Sisters peaks, and later, on Copper Butte. Benefield Station was a cabin used by Forest Service crews that were working on foot trails and fire suppression efforts.

In response to the dire condition of the national economy, the Civilian Conservation Corps (CCC) was created when Congress passed the Emergency Conservation Work Act in March of 1933. This act authorized the President to enroll unemployed citizens in forest conservation work on public lands. One of the earliest CCC camps to be established on the Colville National Forest was Camp F-4 Togo on Deadman Creek. This camp was short lived and the men stationed there were transferred to western Washington later that same year.

Today, the Colville Confederated Tribes retain 1855 treaty rights within the North Half, including the Deadman Creek watershed. These rights include hunting, fishing, and traditional gathering.

3.4 Vegetation

3.4.1 Introduction

The vegetation of the Deadman Creek watershed and how it relates to objectives and issues of the proposed actions are discussed in this section. It begins with a brief discussion of general existing forest vegetation conditions followed by an analysis of biophysical environments and stand structures. The historic range of variability, as per the screens process (section 2.2), for biophysical environments and stand structures are compared to the existing conditions establishing the need for several of the proposed actions. This is followed by a discussion of forest pathogens and how they relate to the proposed actions. Resource issues of old growth, noxious weeds and biodiversity (sensitive plant species) follow. The following section and the effects analysis in section 4.2.2 was edited from the vegetation report by the project silviculturist. The report can be found in its entirety in the analysis file.

3.4.2 Forest Vegetation

Introduction

The lumber industry arrived in the late 1800s with the westward expansion of railroads. Small operations had existed before this time to provide for the needs of the early settlers, but the arrival of the railroads and the need for railroad ties increased the need for lumber. On the heels of the railroad, electricity and the telephone increased the need for commercial timber. The State Road Sawmill was one of the earliest mills that undoubtedly obtained lumber from accessible stands within the Deadman Creek watershed. The estimated volume of merchantable timber currently growing on National Forest System land within the Deadman Project Planning Area is 320 million board feet (320 MMBF), or 61 million cubic feet (610,000 CCF), using current minimum merchantability standards (7 inches diameter at breast height (DBH), with the exception of lodgepole pine which is 6 inches DBH).

Fire history

The fire history in the DCEMP area is a mixture of fire events of varying size, severity, and frequency. Throughout the landscape, fire has played a fundamental role in affecting the vegetative patterns. The frequency with which fire has occurred is as variable as the biophysical environments (see below). Some biophysical environments are characterized by low-severity fires with return intervals as frequent as 8 to 25 years, while other biophysical environments are characterized by high-severity fires with return interval as great as 150 to 500 years.

Fire statistics for the years 1946 to 1996 show that the Three Rivers Ranger District averages fewer than 13 fires per year. The numbers characterize the area as being in a low frequency/high-intensity fire regime. For the same period, 36 fires occurred on NFS land in the DCEMP area. Twenty-eight percent of these fires were human caused, while the remaining were lightning caused. The majority of the fires were less than one-quarter of an acre in size.

Records show the DCEMP area experienced several large-scale fires from 1909 to 1929. These fires were largely stand-replacing events, and varied in size between

several hundred acres to upwards of 32,000 acres. A fire area of 500 acres burned in 1910 again burned as part of the larger Dollar Mountain fire in 1929. Generally, fires create mosaics of burned areas and unburned areas as a result of fire severity and/or intensity.

Non-lethal underburning occurs when low-severity fires burn principally in surface fuels, consuming the litter, herbaceous material, foliage and small diameter woody fuels. Though some torching occurs, few overstory trees are killed. The Dollar Mountain fire was the result of several factors acting in concert, not least of which were drying periods (drought) and a fuels matrix that was available for consumption. While higher fire intensities were the norm for these stand-replacement fires, some variation in fire intensity occurred. These changes in intensity would have taken place during cooler burning periods which occurred at night or when fire was backing downslope.

The Dollar Mountain Fire of 1929 burned approximately 70 percent of the watershed. Many stands that developed after this wildfire are now densely stocked due to a combination of a well-prepared seedbed and some heavy and, perhaps, drought-induced seed crops. In the higher elevations of the watershed, lodgepole pine and western larch, both pioneer species, dominate the landscape. Lower in the watershed, Douglas-fir is more prevalent, though typically mixed with western larch and ponderosa pine. Western redcedar is found in many riparian areas, though at upper elevations fires burned so hot that the natural climax riparian vegetation has not yet fully recovered.

Biophysical environments

Biophysical environments are a classification tool used to divide landscapes into areas with similar environmental conditions, disturbance regimes and site potentials. They are named for dominant tree species and for the general environmental conditions that would allow them to grow. The assumption is made that the historic vegetation (the vegetation that existed before EuroAmerican intervention), is the potential natural vegetation; what the site is naturally capable of producing. Because the classification is tied to potential natural vegetation, the name for a biophysical environment may not reflect the existing vegetation. For example, 70 percent of the Deadman Creek watershed was burned in the late 1920s. Much of that area is believed to have supported a natural vegetation of subalpine fir with a shrub understory. Because of fire, the area where the subalpine fir, shrub type existed is now dense larch and lodgepole pine stands. The existing vegetation is different from the historic, but because it is in the same landscape position, and the environment is assumed to be relatively constant, it retains the potential to return to that historic type. The term biophysical environment, therefore, reflects the historic (potential natural) vegetation types, and the climate and disturbance regimes that allow that vegetation types and structure to form on the landscape. Biophysical environments are used as a benchmark against which the existing condition is measured.

There are seven biophysical environments within the analysis area[3]:

1. Very moist western redcedar/western hemlock bottoms - 976 acres (2%)

[3] Acres listed are for all land ownerships within the Deadman Creek watershed.

The large-tree component of western redcedar biophysical environments is a mixture of western redcedar, western larch, grand fir, Douglas-fir, and occasional Engelmann spruce. Understory vegetation may include pachistima, twinflower, big huckleberry, honeysuckle, baldhip rose, violet, queencup beadlilly, Oregon grape and other species. While not open-grown or park-like in appearance, late structural stands in these biophysical environments are shady, wet places with a number of cohorts and strata of trees represented. **Stands on these sites may go for many centuries without a stand-replacing fire (Cooper and others, 1991). The average interval between stand-replacing fires may be about 400 years. Most stand-replacing fires probably do not originate in the stand but move in from other drier sites.**

2. Very moist Engelmann spruce/subalpine fir bottoms - 811 acres (2%)

This biophysical environment generally exists at higher elevations than the very moist western redcedar/western hemlock type, though similarities in moisture regimes and landforms result in many of the same understory plants. Some additional moist site forbs may include reedgrass, horsetail, oak fern, twistedstalk, lady-fern, and false bugbane. Dogwoods, currents, and alder tend to dominate the shrub layer. The large trees within this biophysical environment tend to be Engelmann spruce, subalpine fir, and western larch. While not open-grown or park-like in appearance, late structural stands in these biophysical environments are shady, wet places with a number of cohorts and strata of trees represented.

Like the drier subalpine sites, this biophysical environment burned mostly in stand-replacing fires during pre-EuroAmerican times. Very moist or wet site are difficult to burn except during very dry conditions. While these moist sites may be somewhat small and narrow, they are vulnerable to crown fires moving in from adjacent slopes. Historic fire-free intervals for moist subalpine stands, although variable, tend to be longer than those for dry subalpine sites. The range for fire-free intervals is around 130-170 years.

3. Cold dry subalpine fir shrub - 12,403 acres (30%)

At climax conditions, this biophysical environment is dominated by subalpine fir, but western larch and Douglas-fir may be present as older relics in the stands. Very little of this biophysical environment is in climax or even late structure today due to past fire events. Many of these stands are now dominated by small lodgepole pine and western larch, 5 to 8 inches diameter at breast height (dbh). Where water is present for all or part of the year (streams, ponds, seeps) the stands have recovered more quickly, and may have subalpine fir in the understory. On the drier sites, the floor of the forest shows very few young trees. Shrubs such as big huckleberry, pachistima, prince's pine, spirea, and honeysuckle dominant the shrub component. Pinegrass, violet, and white hawkweed are some of the dominate herbs. The downed woody component seems to be limited to large old logs, many of which are snags that formed as a result of the last big fire. The last fire was severe enough to virtually destroy all previously existing ground wood. **A history of stand-replacing fire is almost universal in subalpine stands, but historic fires were variable in extent and behavior. Barret and Arno (1991) found that large stand replacing fires in this type burned through thousands of acres at average intervals ranging from 117 years to more than 150 years. Although variable, the frequency of stand-replacing fire tended to decrease as the elevation increases because trees grow more slowly and fuels accumulate more slowly due to shorter growing seasons.**

4. Warm dry Douglas-fir/grand fir shrub - 15,917 acres (39%)
The larger trees in the Douglas-fir biophysical environment are generally Douglas-fir, western larch, and in the lower elevations, ponderosa pine. Understory vegetation including ninebark, serviceberry, spirea, Oregon grape, oceanspray, snowberry, pinegrass, strawberry, and heartleaf arnica are among the most common. These stands were maintained in generally park-like conditions by frequent ground fires of low intensity. The average fire-free interval was 22 years and ranged from 4 to 95 years; fires burned a few hundred to a few thousand acres. The non-lethal underburns in most stands controlled overstory species composition and density. Frequent underburns favored ponderosa pine and western larch. Longer intervals (and the current fire suppression policy) favored Douglas-fir and grand fir. Even though one or more cohorts of trees may have been present, an understory layer of trees was likely absent. Large and medium-sized trees would dominate the landscape.

Occasionally, high intensity wind-driven fires would occur that would destroy even the largest trees. Stands in the cooler and moister parts of this biophysical environment may take on some of the characteristics of the more mesic environments, showing a tendency away from park-like conditions and toward multi-strata stands. This is probably a function of longer fire return intervals linked to moisture and topography**. Presently, most of the stands classified as late structure in this biophysical environment have understories of smaller-diameter Douglas-fir which has ingrown during the past 50 years or so. Few stands could be classified as "park-like", but many have potential to be "park-like" if the understory tree component could be thinned or removed.**

5. Cool mesic Douglas-fir/grand fir forb-shrub - ***4,866 acres (12%)***
The dominant overstory trees in this biophysical environment are the Douglas-fir. Grand fir dominates in only a small elevation band within the watershed, but is present throughout this environment, along with western larch. Lodgepole pine may dominate some early successional stands that have had steady reoccurrences of catastrophic fire. Common understory plants include pachistima, spirea, twinflower, serviceberry, pinegrass, hawkweed, strawberry, oceanspray, and baldhip rose. Only a few late successional stands of this biophysical environment exist within the watershed, mostly due to catastrophic fire in the 1920s. It may be that the average fire return interval for this biophysical environment has been shorter than the time it takes for stands to regenerate and grow to late structure. The successional pathways for this environment seems to include a time where dense lodgepole pine/western larch stands exist on these sites, making them highly susceptible to extreme damage from mountain pine beetle and fire for many years. **Before the time of effective fire suppression, this fire group burned in both stand-replacing fires and underburns. This pattern resulted in a patchwork of even-aged stands with occasional large, old trees and various species regenerating. In ecosystems with frequent underburns, typical fires probably burned a few hundred to a few thousand acres. In areas with less underburning and more frequent stand-replacement fire, some fires were probably larger. Stand replacement fires occurred at intervals ranging from less than 100 years to 150 years (Barrett and Arno, 1991).**

6. Cold mesic subalpine fir forb-shrub - 1,734 acres (4%)
The five main overstory species found in this biophysical environment are lodgepole pine, subalpine fir, western larch, Engelmann spruce and Douglas-fir. These stands may have limited understories due to dense shade that is created by the canopy, particularly in spruce dominated

stands. Understory shrubs and herbs typically found include sidebells pyrola, twinflower, pachistima, bearberry, serviceberry, pinegrass, beadlilly, and honeysuckle. Fire intervals shorter than 200 years may result in lodgepole or larch dominated stands. This is thought to be the case over part of the Deadman Creek watershed.

7. Cool mesic western redcedar/western hemlock forb-shrub - 4084 acres (10%)
Generally these are upland or terrestrial cedar sites as opposed to the wet riparian types. These sites contain the driest land capable of supporting western redcedar which in late succession dominates. Many of the upland sites in the DCEMP area have been burned within this century. Thus western larch, lodgepole pine, grand fir, and Douglas-fir are in a dominant position in these stands. Most frequently found shrubs and herbs are big huckleberry, pachistima, baldhip rose, twinflower, Oregon grape, honeysuckle, and round-leaved violet. Like so many of the other environments in this watershed, fire has played a key role in determination of the present stand composition. **Many sites appear to be recovering from past fires, as western redcedar or western hemlock has begun to regenerate in the understory. The historic fire regimes and fire effects in this type are variable due to structural complexity and diversity of species. Intervals between stand replacing fires range between 150 and 500 years, though the average is about 200 years.**

Forest stand structure

Biophysical environments are also described in terms of historic stand structure and the percent of acres believed to have existed in each structural class. As with the species composition descriptions above, the historic structure is used as a benchmark against which the existing conditions are measured. There are seven structural classes as defined by the screens process, each describing the basic size and arrangement of trees in a stand. An analysis of the current condition of structural stages within the Deadman Creek watershed reveals that approximately ten percent of the forested area exhibits late structure (8 or more large trees per acre); fifty-five percent is in middle structural stages (large trees uncommon); and thirty-four percent is in early structural stages (dominated by small and medium diameter trees, no large trees). Historically, stands with late structure are believed to have occupied at least 30 percent of the forested area.

The Colville National Forest defines a late structural stand as having eight or more trees per acre equal to or greater than 21 inches in diameter at breast height. The screening process directs the Colville National Forest to protect late and old stands, and to conduct silviculture treatments that will not reduce their acreage below the minimum historic value.

The amount of late structure believed to have occurred prior to EuroAmerican management (historic) varies with biophysical environment. Typically, the minimum value in the Deadman Creek watershed is 30 to 35 percent of the forested area. **Although stand replacing fires ravaged large portions of the analysis area in the 1910s and 1920s, it could be argued that fires are part of the natural disturbance regime and should fit within the Historic Range of Variability (maximum and minimum values believed to historically occur). However, as in other parts of the Three Rivers Ranger District, the fires of the 1920s seem larger and more intense than average, as were their effects. Indeed, the majority of existing stand structure (stocking) in the watershed dates from these fires. Other changes in stand structure resulted from several decades of regeneration and other harvesting in accessible, high-**

volume stands. Harvest activities occurred on approximately 4,000 acres before 1995 (See Table 22). Today, an objective of the Deadman Creek Ecosystem Management Project is to use silvicultural tools to maintain or enhance late structural conditions, as needed, for a given biophysical environment.

Late structural stands are remnants of stands that survived numerous fire and pathogen events. Within the perimeter of the 1929 Dollar Mountain Fire the only remnant late structural stands that exist are in riparian areas, or on steep hillsides where tractor logging was not practiced. Outside of the Dollar Mountain Fire perimeter late structural stands survived from the Betty Creek area east to Davis Lake. However, the Davis Lake Fire of the early 1960s destroyed a large patch of forest that undoubtedly contained some late structural stands. Harvesting to the east of Merkel Canyon reverted many middle and late structural stands to early structure. The largest remaining amount of late structure in the drainage resides in parcels within the Betty Creek sub-watershed, though small patches are scattered throughout the DCEMP area. According to the Screens structural stages classification, the vast majority of these stands are classified as multi-stratum with large trees (group 6), as opposed to single stratum with large trees (group 7). Large early seral trees are slowly disappearing from the landscape, dying from old age, diseases, and insects, while replacement trees are growing too slowly to stabilize the population.

Forested stands with *middle structure* cover a variety of conditions and locations. Some are stands that were burned over in the 1920s and have slowly regenerated back to the understory re-initiation stage. The majority are stands where at least the overstory component survived the fires, and were subsequently selectively logged. This process generally removed the largest trees from the stands which opened up the canopy greatly, causing the initiation of a new crop of regeneration. These stands may be either in the understory re-initiation stage or the multi-stratum without large tree stage. The acreage of stands with middle structure is generally above the historic range of variability. These stands will continue to grow slowly toward late structure, but can be enhanced by intermediate stand treatments, such as thinnings. Early Seral species such as western larch and ponderosa pine are present, either as naturals that came in after fires, or as a result of planting. Understory re-initiation is almost universally composed of shade tolerant species like subalpine fir, Englemann spruce and western redcedar.

Forested stands with *early structure* are generally of two types; planted stands and stands that were burned over. Stands that were planted between 1972 and 1992 generally are in the stand initiation stage. Precommercial thinning of some stands has moved them ahead to a stem-exclusion, open-canopy stage. Some fire generated stands grew slowly and were very dense from their initiation (particularly lodgepole pine/western larch stands). These stands are in the stem-exclusion, closed-canopy stage. Early structural stages are within historic ranges, indicating that harvesting has moved stands toward early structures at about the same rate as historic disturbance regimes. The future trend is toward less early structure, because less harvesting is for regeneration purposes. A catastrophic fire event could reverse this trend.

Historic range of variability

In the screening process the acres of late and old structural stages in a biophysical environment are compared with the Historic Range of Variability (HRV) of acres for that stage. The structure of most concern in the Deadman Creek watershed is

late/old. Late structural stands are those with eight or more live trees per acre over 20.9 inches in diameter at breast height (dbh). Stands have at least 8 trees older than 150 years. Screening direction is that harvest activities will not cause the amount of late/old structure to fall below the HRV for any biophysical environment (section 2.4.2).

For the purposes of screening, forested National Forest System Lands within the entire Deadman Creek watershed were classified using stand exams, field visits, and aerial photo interpretation. Private land within the Deadman Creek watershed was classified, but is excluded from this analysis.[4] The area of HRV analysis within the watershed is 36,450 acres, of which 30,520 acres are forested. The remainder acres are nonforest or water. Five of the seven biophysical environments were found to be below the HRV for late structure (Table 9).

One objective of the Deadman Creek Ecosystem Management Projects is to increase the ability of stands in middle and early structure to achieve late structure through application of silviculture and other treatments.

Table 9. Historic range of variability and existing acres of late structure on forested National Forest System lands, by biophysical environment[5]

Biophysical Environment	Total Forested acres*	Existing acres* of late/old structure	Percent of forested acres in late/old structure	
			Historic Range of Variability (minimum value)	Existing
Very moist western redcedar/western hemlock, bottoms	787	68	30	9
Very moist Englemann spruce/subalpine fir bottoms	810	232	15	29
Cold dry subalpine fir, shrub	11,083	569	10	5
Warm dry Douglas-fir/grand fir, shrub (stage 6)	9,754	1,461	5	15
Warm dry Douglas-fir/grand fir, shrub (stage 7 only)		0	30	0
Cool mesic Douglas-fir/grand fir, forb-shrub	4,354	418	20	10
Cold mesic subalpine fir, forb-shrub	1,642	147	30	9
Cool mesic western redcedar/western hemlock, forb-shrub	2,090	216	30	10
Total Forested Acres*	30,520	3,111	N/A	10%

*Approximate acres.

[4] As per Regional Office direction documented in a field visit to the Colville National Forest in 1998.
[5] National Forest System lands only.

Old growth

Effect of the alternatives on old growth within the DCEMP area was not identified in scoping as an issue, but because of the indirect effects of old growth management on wildlife species, it is included here. No alternative will directly impact old growth stands in the DCEMP planning area, and no management activities are planned in old growth stands. About 23 percent of the forested acreage on National Forest System (NFS) land in the Deadman Project Planning Area was formally examined. Exams were located in stands that appeared to be most in need of treatment based on forest condition parameters (age of stand, known insect and disease problems, stand density, species composition). Some stands were selected as "sample" stands to represent similar appearing stands nearby. Aerial photo interpretation and knowledge of the area were used to delineate and assign exam areas. Stands that appeared to have attributes of large, older trees were intentionally inventoried to determine if they met standards for old growth or late structure. Eighteen out of the 123 stands examined (a total of approximately 982 acres) qualified under North Idaho Zone Definitions (NIZOG) as old growth. More old growth might exist in the Deadman Creek watershed, as some areas were not inventoried. It is unknown whether any old growth stands exist on other ownerships.

There are many more late structural stands than those that qualify as NIZOG old growth. Many unaltered late structural stands do not qualify as old growth because they lack enough trees that are over 150 years old. The general trend is that there are fewer old growth stands in the analysis area now than previously existed due to fire and past management practices (Table 9).

Some of the stands that could be classified as "untouched" by fire or logging approach the condition of old growth. They are comprised of large Douglas-fir, western larch, and occasional ponderosa pine or Engelmann spruce. An intermediate (80 to 100 year old) tree layer exists, generally western larch, Douglas-fir, grand fir, or Engelmann spruce. Understory trees are usually shade tolerant species such as western redcedar or Engelmann spruce. These areas may provide a glimpse of past vegetation within several of the biophysical environments in the analysis area. Untouched stands within the warm dry Douglas-fir environment show large ponderosa pine, Douglas-fir, and a few western larch trees. Many of these stands were undoubtedly park-like in nature (stage 6). Most of these stands today have a proliferation of Douglas-fir in the understory.

Forest insects and diseases (pathogens)

The most recent bark beetle outbreaks began after the winter storms of 1996/1997. These storms created a significant amount of fresh, downed Douglas-fir across northeast Washington and northern Idaho, of a tree diameter sufficient to create prime breeding material for Douglas-fir beetles. Additional breeding materials were provided by storms in subsequent winters (Flanagan 2000). In eastern Washington, Douglas-fir beetle outbreaks that begin from "one-time" events such as fire or blowdown last on average about four years. Bark beetle outbreaks are energized and prolonged by additional blowdown, drought, fire injury or severe insect caused defoliation. In this case an outbreak that may have tapered off in 2001 may now last a couple of additional years, or even longer if yet more suitable breeding material is produced. There has been some blowdown and

breakage reported in scattered areas across the Colville National Forest due to heavy ice formation during the winter of 1996-97. Blowdown has not been identified as a problem within the Deadman Creek Analysis Area, although every spring some trees fall to the ground. The last major windstorm event in 2002 and the winter of 2001-2002 did result in patches of mass blowdown, and the loss of scattered trees throughout the watershed.

As a result of this outbreak, there is a considerable amount of beetle-killed Douglas-fir of medium and large diameter on the Three Rivers Ranger District. In the planning area, many of these standing dead trees from the outbreak are now providing snag habitat for wildlife species. However, some standing dead trees with green crowns, a condition that persists for up to a year following beetle kill in Douglas-fir, are present in the Deadman Creek watershed. This could provide wood fiber where snag and downed woody debris retention standards are already met. In some cases these trees are greater than 20.9 inches dbh. The "sceening" committee visited the Three Rivers Ranger District in 1999 and determined that salvage of some of these standing dead trees would leave behind a more resilient forest (Flanagan 1999).

Early Seral species, like ponderosa pine, western larch and to some extent Douglas-fir are more resistant to pathogens than climax species like grand fir and subalpine fir. If, through removal of some large standing dead trees, the stand could be opened up for these early seral and shade intolerant species to grow, late seral forest structure would be more likely to be reached than if shade tolerant species dominated the regeneration layer.

Mistletoe

Presence of mistletoe is patchy within the planning area. Mistletoe is most notable on the Douglas-fir and western larch species. A great deal of mistletoe-laden overstory has been removed over the past 30 years; however, a legacy of smaller infected trees has been left behind. A large concentration of Douglas-fir mistletoe is found in the area south of Jackknife Mountain and just north of private land in T. 37 N., R. 36 E., sections 16 and 17. Western larch mistletoe is sporadic, but present wherever larch is a major component to the stand.

3.4.3 Noxious Weeds

This section, and the effects analysis in section 4.2.4, was edited from a noxious weed report by the Management Specialist. The report can be found in its entirety in the analysis file. Spread and eradication of noxious weeds was identified as an issue in public and internal agency scoping. It is not considered a key issue, however, because noxious weed management would be approached similarly in all action alternatives. Noxious weeds can affect many other resources such as habitat for big game, livestock, and fisheries. Relationships to these resources are described in those sections and are not repeated in the noxious weed discussion below. A complete discussion of noxious weeds can be found in the Vegetation and Noxious Weeds section of the DCEMP Analysis File, which is maintained at the Three Rivers Ranger District office.

This noxious weed section is divided into two parts:

- **Existing noxious weeds - the existing conditions in regard to the weeds themselves, their status and trends.**
- **Integrated noxious weed management is a discussion of the integrated noxious weed treatments described in the Noxious Weed Management Prescription for Deadman Project Planning Area (2002). The prescription tiers to the Forest Plan and the Colville National Forest Environmental Assessment for Integrated Noxious Weed Management (Weed Treatment EA, 1998).**

Existing noxious weeds

The noxious weed status classifications used in Table 10 are taken relationship to the DCEMP area. These weeds may have a different status other places on the Three Rivers Ranger District or Colville National Forest.

Table 10. Noxious weeds found in or near the Deadman Project Planning Area during field surveys and their status in the Deadman Creek watershed

Species	Scientific Name	Status in Deadman Creek Watershed
Bull thistle	*Cirsium vulgare*	Invader
Canada thistle	*Cirsium arvense*	Invader
Common tansy	*Tanecetum vulgare*	Invader
Dalmatian toadflax	*Linaria genistifolia*	Invader
Diffuse knapweed	*Centaurea diffusa*	Invader; Established in places
Goatweed (St. John's wort)	*Hypericum perforatum*	Invader; Established in places
Hounds tongue	*Cynoglossum officinale*	Invader; Established in places
Mullen	*Verbascum thapsus*	Invader
Plumeless thistle	*Carduus acanthoides*	Invader
Tansy ragwort	*Senicio jacobaea*	Potential invader
Yellow hawkweed	*Hieracium pratense*	Potential invader

The primary locations of noxious weeds within and surrounding the DCEMP area are along county and NFS travel corridors, in previously harvested units at landings and on skid trails, at recreation sites such as trailheads and dispersed camping sites, and homestead meadows. Private property also is infested with a variety of these noxious weeds.

The damage threshold for a noxious weed occurs at the point when it is out-competing desirable vegetation on a given site. It is also the point when a significant amount of wildlife and livestock forage is being lost. In Management Areas that emphasize recreation such as MA 3A, or at other recreation sites, the damage threshold may be the point where the noxious weed is creating a negative visual image; i.e. the plants are actually degrading the recreational experience, or pose the threat of being transported to a new site. Damage thresholds are not being exceeded within most of the DCEMP area. However, on the lower elevation areas, and on private lands, the threshold has been crossed by diffuse knapweed. This includes the dry slopes in the Tie Camp Creek drainage, north towards Matsen Creek, and west towards North Fork of Deadman Creek. The first plumeless thistle in Ferry County was found adjacent the Trout Creek road just south of

the Deadman Creek watershed.

Integrated noxious weed management

The Noxious Weed Management Prescription for the Deadman Project Planning Area (2002) prescribes prevention of noxious weed infestations through the use of methods and mitigation measures. These methods and mitigation measures are to be used during road construction, harvesting, vegetation management, fuels management, and restoration treatments to keep noxious weed seed from entering the area, to reduce soil disturbance, and to revegetate disturbed sites. It also prescribes management of existing noxious weed populations by various early treatment and maintenance methods. Long-term management of noxious weeds within the area is covered in the Colville National Forest Environmental Assessment for Integrated Noxious Weed Treatment (1998).

Before the 1984 Injunction, and the subsequent development of the Managing Competing and Unwanted Vegetation Final Environmental Impact Statement (1989), some noxious weed treatments took place along NFS roads within the DCEMP area. Between the years 1984 and 1992, the Forest Service used no herbicide treatment. During that time, a few biological agents were released along the South Fork Deadman Creek to treat diffuse knapweed. Plumeless thistle and an isolated patch of tansy ragwort were hand pulled. Since the lifting of the injunction on herbicide spraying, a limited amount of spraying has occurred on NFS land within the DCEMP area. These chemical treatments targeted diffuse knapweed along the roads in the Matsen Creek, Davis Lake, and Jackknife Mountain areas. Chemical treatment of an isolated patch of yellow hawkweed occurred on the Alligator Ridge road.

Noxious weed management on private lands varies. A few landowners treat their noxious weeds, including the use of herbicides, biological agents, mowing, and hand pulling. Many landowners do nothing about the noxious weeds upon their lands. Many activities on private lands contribute to the seed source and spread of noxious weeds within the DCEMP area. Private land owners that are interested in controlling or eliminated noxious weeds on their properties are directed to Ferry County Weed Board, in Republic, Washington.

3.4.4 Sensitive Plant Species

The issue of biodiversity was raised during public scoping, but was not considered a key issue because retention and enhancement of biodiversity is common to all action alternatives. No federally listed threatened or endangered plants or plants proposed for federal listing are known to occur in the analysis area (USFWS 1999, 2001). Forty-five plant species listed on the Regional Forester's Sensitive Species List (USDA 1999) are either documented or suspected to occur on the Colville National Forest. Of these, twenty-seven species are either documented or suspected to occur in the DCEMP area.

Surveys were conducted for 18 of the 27 sensitive plant species, plus an additional 16 species formerly considered sensitive, but dropped from the Regional Forester's list in 1999. Potential habitat exists in the project area for eight species added to the 1999 Sensitive Species Plant List. These plants were not on the 1991 Sensitive Species Plant List when surveys were conducted and were not included in the biological evaluation for the Deadman Creek Ecosystem Management

Projects FEIS (2001). However, surveys conducted for the DCEMP FEIS included habitat in which these species would occur. The habitats these species occupy are wetlands protected by the INFISH wetland buffers (USDA 1995).

The areas selected for reconnaissance were limited to potential habitat within, adjacent, or near proposed project areas where ground disturbing activities could affect sensitive plant species. Potential habitat for sensitive plants within the Deadman Creek Watershed is located primarily within stream side zones, adjacent deep woods, wetland/hardwood stands, isolated small ponds, old homestead meadows, and scattered rock outcrops.

Sensitive plant surveys were conducted in the Deadman Creek Watershed during the appropriate blooming periods beginning in the summer of 1992. Follow-up surveys were conducted from May through October during the years 1993-1996. The results of these surveys were used to assist in the design of each of the action alternatives for this project and were used to design and prescribe mitigation measures for all action alternatives. The survey results are summarized in the Biological Evaluation report which is filed at the Three Rivers Ranger District office.

Three sensitive plant species distributed in 13 populations are documented from the project area: *Botrychium ascendens* (two populations), *B. crenulatum* (ten populations), and *B. lineare* (one population). The populations are found along intermittent streams, perennial streams, seeps, springs, and wetland-hardwood stands. A very small population of *Botrychium lineare* was found in the watershed. This finding constitutes a range extension for the species. This section and the effects analysis in section 4.2.3 was edited from a sensitive plant report by the project botanist. The report can be found in its entirety in the analysis file.

3.5 Wildlife

3.5.1 Introduction

The effects to wildlife habitat from entry into inventoried roadless areas and other areas lacking classified roads and from new road construction were key issues identified in scoping (section 1.4). The measures of these effects differ between species because habitat components differ. For example, some species are susceptible to loss of seclusion habitat while others may benefit from regeneration harvest, even in inventoried roadless areas. The discussions that follow speak to the issues and objectives that relate to habitat components for each species.

The occurrence of threatened, endangered, and sensitive species in the Deadman Creek Watershed was based on records from the offices of the United States Fish and Wildlife Service, the Colville National Forest and the Three Rivers Ranger District. The information used in the analysis was gathered from aerial photos and other remotely sensed information, stand exams, field reconnaissance, and interviews. Habitat conditions (stand structures) were determined separate from forest vegetation conditions by using aerial photography and a unit-by-unit analysis with a computerized mapping system (GIS). **The GIS computer software provides acreage values which were rounded to the closest whole number.**

This section is organized first by listed status and second by species (Table 11). Each species write up includes references to relevant proposed actions, objectives and resource issues identified in Chapter 1. In some cases inclusion of habitat

components not considered key issues were necessary for quantifying effects to species in Chapter 4. Section 3.5 and the effects analysis in section 4.3 was edited from a report by Chris Loggers, a Three Rivers District Wildlife Biologist. His report can be found in its entirety in the analysis file.

Table 11. Wildlife species listed in the following sections

Section and Species Classification	Species
3.5.2 Sensitive Species	California wolverine Pacific fisher Townsend's (Pacific Western) big-eared bat American peregrine falcon Great grey owl
3.5.3 Threatened and Endangered Species	Grizzly bear Woodland caribou Wolf Canada lynx Bald eagle
3.5.4 Management Indicator Species	Big game (mule deer) American pine marten Beaver Blue grouse Franklin's grouse Northern three-toed woodpecker Pileated woodpecker Other woodpeckers Barred owl Large raptors Neotropical migratory land birds

Trapping was one of the first commercial enterprises in this part of the country and one that continued well into the 20th century. There is unverified evidence of trapping within the DCEMP area both in the historical record and the physical record. The Confederated Tribes of the Colville retain 1855 treaty rights within the North Half, including the Deadman Creek watershed. These rights include hunting, fishing, and traditional gathering.

3.5.2 Sensitive Species

The Forest Service established direction (Forest Service Manual 2670) to guide habitat management for sensitive species to ensure that these species receive full consideration in the decision making process. That direction established the process, objectives and standards for conducting a Biological Evaluation (BE). The BE for the Deadman Creek Ecosystem Management Projects may be found in the Analysis Files located at the Three Rivers Ranger District office. The BE analyzes in depth the effect of the proposed projects on Forest Service sensitive species.

The most recent Regional Forester's list of sensitive animal species for the Pacific

Northwest Region is dated November 2000, though updates have been made for individual species. There would be no effect to the species listed below from the implementation of any of the DCEMP alternatives, therefore, these species will not be further addressed in this document.

- **Northern leopard frogs have been documented on the CNF only from the Pend Oreille Valley and surveys in 2000, 2001 and 2002 on Three Rivers District did not encounter them;**
- **Common loons, Clark's grebes and eared grebes nest on large bodies of water, which do not occur in the watershed;**
- **Ferruginous hawks and sandhill cranes migrate through open country and do not nest in the area;**
- **The area does not contain large lakes that pygmy whitefish occupy.**

Habitat does exist for west slope cutthroat trout, interior redband trout, American peregrine falcon, great gray owl, Townsend's big-eared bat, California wolverine, and Pacific fisher. Existing conditions for the wildlife species follows. Existing conditions for fish species are included in the Fisheries section.

California wolverine (Gulo gulo)

The Forest Plan provides no specific standards and guidelines or management direction applicable to wolverines. Wolverines are rare in northeastern Washington, but may be found throughout the Colville National Forest, including the Deadman Creek Watershed. Wolverine frequent boreal woodlands but may be found in almost any habitat type.

The wolverine is a highly mobile animal that requires a large territory. Estimates of home range size vary from area to area, ranging to over 1,200 square miles for individual males (Krantz et al. 1991). Females generally have smaller home ranges (150 to 200 square miles). **Wolverine are considered opportunistic scavengers that will consume a wide variety of plant and animal food, with carrion (especially big game animals) serving as the mainstay of the winter diet. Remote country with limited human activity appears essential to maintain viable wolverine populations (Hornocker and Hash 1981)**

Reports of wolverine sightings have come from the Kettle Crest on the west side of the Deadman Creek Watershed. Because of the occurrence of sightings, the wolverine's large territorial requirements, and the presence of unroaded forest habitat, the Deadman Creek Watershed provides suitable wolverine habitat.

Proposed actions in Alternatives B and E include entry into Inventoried Roadless Areas and in Alternatives B and D include new road construction. Both these activities could affect seclusion habitat. This was identified as a "key" issue during public scoping. Also, wolverines require a diversity of successional stages, so the proposed actions of conducting silviculture treatments to increase the rate at which late structure grows is relevant for all action alternatives.

Wolverine habitat components include:
(1) Successional stage diversity (acres).
(2) Habitat for prey populations (big game habitat components).
(3) Travel corridors (number compromised).
(4) Undisturbed natal den sites (none in watershed) and seclusion habitat (square miles).

Diversity of successional stages

Successional stage diversity is discussed in the Forested Vegetation section. More than half the forested stands in the watershed are dense multistoried stands of medium sized trees or dense stands of even-aged small and medium sized trees. This is above historic range of variability for acres of stands with middle structure. Large tree dominated stands are well below the historic range of variability for most biophysical environments. It is one purpose of the proposed actions to maintain late structural stands across the landscape and enhance the ability of early and middle structural stands to attain late structure thus returning the watershed to a more historic distribution of structural stages (section 1.2 Purpose and Need).

Prey species habitat

The most important prey species in the Deadman Creek watershed for wolverine are big game. A detailed discussion of existing conditions for big game is included in section 3.5.4 Management Indicator Species. In general, the amount of effective habitat, the transition zone between foraging and hiding areas, is lower than desired in the 7,400 acres of big game winter range (Management Areas 6 and 8). Cover is also low on big game winter range. Summer range (which includes the entire watershed) effective habitat is considered to be at moderate levels, but because of lack of disturbance, forage value of woody species is generally poor in these areas (see Big Game discussion for link to proposed actions and issues). The greatest threat to big game forage quality that would result from the proposed actions is invasion of noxious weeds.

Travel corridors

Travel corridors were delineated for the Deadman Creek Planning Area according to guidelines in the Forest Plan screening process. Current live tree densities over most of the area provide sufficient cover to serve as corridors during winter when vegetative cover is least. To date, travel corridors have not been compromised by previous management activities, although the corridor at the top of Betty Creek subwatershed has been narrowed. The need to not compromise wildlife travel corridors and habitat connectivity were issues brought up in scoping but not considered key because the proposed actions would not affect them.

Seclusion habitat

Seclusion habitat (also called core area habitat) was delineated in the Deadman Creek watershed by creating buffers of 0.31 miles (500 meters) around existing open roads. Habitat located further than this distance from a road is considered seclusion habitat (IGBC 1994), the quality of which increases with the distance from an open road. During spring and summer, about 30 square miles, or 45 percent of the watershed provides seclusion habitat. Less than one square mile of this is off NFS land. The amount of seclusion habitat decreases in autumn to 23.4 square miles as more roads are opened. The watershed does not contain suitable natal den sites: snow covered, high elevation talus slopes.

Pacific fisher (Martes pennanti pacifica)

The Colville National Forest Plan does not contain specific standards and guidelines or management direction pertaining to fishers. The Forest Service added fisher to the Region 6 sensitive species list in 2000.

Washington probably does not support a viable population of fishers (Lewis and Stinson 1998), though fishers have been documented from the Colville National Forest. One sighting, in western Ferry County southwest of Curlew but not near the Kettle Crest, was a detailed visual sighting by an observer of known qualifications (Aubry and Houston 1992). The Forest Service and the Washington Department of Fish and Wildlife have conducted generalized winter track surveys and camera surveys in the area of the Kettle Crest, but have not documented fisher. Though the Deadman watershed does provide fisher habitat, fishers probably do not occupy the watershed.

In the western part of their range, fishers seem to prefer older coniferous forests that contain a diversity of habitat types and successional stages interspersed with openings and riparian areas (Banci 1989, Jones 1991, Heinemeyer and Jones 1994). Structural characteristics that provide foraging, resting, and denning sites and affect snow depth and density might be more important to fishers than stand age (Buskirk and Powell 1994, Powell and Zielinski 1994). Fishers use a variety of structures as resting sites: hollow logs, snags, live-tree canopies, mistletoe platforms and brush piles (Jones 1991). They locate denning sites in cavities high in large-diameter live trees or snags (Powell and Zielinski 1994). Fishers also use younger forests, especially as foraging habitat (Jones 1991, Roy 1991, Jones and Garton 1994 and Weir 1995 *in* Lewis and Stinson 1998) but tend to avoid areas with low canopy cover, natural or created (Jones 1991, Buskirk and Powell 1994, Jones and Garton 1994). Fishers are generalist predators that feed on a variety of small- to medium-sized birds, mammals, and carrion.

Habitat components for fisher analyzed in this SEIS include late structure or mature forest, and snags and down wood.

About 75 percent of the watershed could support fisher habitat (about 30,150 acres, of which about 27,700 acres is NFS land). The remainder consists of naturally open areas (lightly forested, not forested, water, etc.) that probably would not serve as fisher habitat.

Late Structure or Mature Forest

In the 1920s stand-replacing fires eliminated a considerable portion of the older forests in the Deadman watershed. Newly established stands were dense and slow growing. Many of the stands with small-diameter trees on the west (upper) portion of the watershed remain in this condition. Since the early 1960s, about 7,310 acres (about 26 percent) of potential fisher habitat on NFS land have been harvested under a variety of harvest prescriptions (Table 22). Harvest method and conditions varied to create a mix of unsuitable habitat and habitat in low-to-moderate quality due to loss of overstory and/or dead wood.

The existing conditions for fisher are listed in Table 12.

Snags and Down Wood

Large snags and down wood are uncommon on about 20 percent of the potential fisher habitat in the planning area because of past fire, past harvest and firewood cutting. The stand-replacement fires of the 1920s consumed most of the large snags and down wood in large areas of the watershed. Where the fire burned with less intensity, it also created snags, most of which have since fallen. Large snags

and down wood are uncommon in old regeneration harvest units and non-regeneration harvests prior to the "screens". Most standing large snags are harvested for firewood within 200 feet of an open road in general forest management areas. With about 73.3 miles of open road in the watershed, about 3,500 acres probably have few large snags on them.

Table 12. Condition of fisher habitat on National Forest System land in the Deadman Creek watershed.

Condition of fisher habitat	Acres	% of potential habitat on NFS land
Unsuitable condition	2,000	7%
Fair habitat: harvested in past	5,300	19%
Moderate habitat	7,600	27%
Good habitat	12,800	46%
Acres of potential fisher habitat	27,700	

Townsend's (Pacific Western) big-eared bat (Coyrnorhinus townsendii)

The Forest Plan does not contain specific standards and guidelines or management direction pertaining to Townsend's (pacific western) big-eared bats. Townsend's big-eared bat may occupy almost any type of habitat, from grasslands to mixed conifer forest. This bat roosts and hibernates in caves or mine shafts.

A bat survey conducted in 1988 on the Three Rivers District documented one Townsend's big-eared bat location. This site is about 8 miles from the watershed boundary. No caves or mine shafts longer than 50 feet are known to be in the watershed so the area does not contain high-quality Townsend's big-eared bat wintering habitat. It might contain roosting or reproductive habitat. **None of the issues identified in public scoping or proposed actions relate to Townsend's big-eared bats or their habitat components.**

Peregrine falcon (Falco peregrinus)

Peregrine Falcons were downlisted on August 25, 1999 from Endangered (Federal) to Sensitive (USFS Pacific Northwest Region list). Forest Plan direction is to monitor possible peregrine falcon nest sites for activities and support recovery plans and efforts (Forest Plan p. 4-42). As described in the Recovery Plan for Peregrine Falcon (USFWS 1982) two suitable nesting cliffs were identified from aerial photos and during field surveys of the watershed. One of the sites is located along the Albion Hill road, just south of the Deadman Creek Watershed. The second site is located in Hoodoo Canyon. Both sites were monitored from 1993 to 1996 during the nesting period. No active or old nest sites were located, and no birds were observed. Overall, habitat suitability is judged to be low at the Albion Hill road site and moderate at the Hoodoo Canyon site. **No issues raised during scoping or proposed actions related to peregrine falcons or their habitat components.**

Great gray owl (Strix nebulosa)

The Forest Plan does not contain specific standards and guidelines or management direction pertaining to great gray owls. This species was added to the updated Region 6 (R-6) sensitive species list late in 2000.

The great gray owl mainly occupies boreal forests but ranges south into the northern Rocky and Sierra Nevada mountains. It feeds primarily on small rodents (Johnsgard 1988). Great gray owls nest in and occupy forested habitats (Hayward and Verner 1994). In the north, they are reported from more mesic areas. At the southern end of their range (including the western US) they have been reported from a variety of montane habitats, most being warmer and drier than in the north (Bull and Henjum 1990). In north central Washington, just west of the Colville NF, Stepniewski and Woodruff (1997) found great gray owls in forest/grassland margins between 1,000 m and 1,350 m (3,280 feet and 4,430 feet) elevation. Woodruff (pers. comm.) noted that they seem to be associated with aspens, if available, and openings, either created or natural, and that their habitat in Idaho and Oregon seems similar to that in north central Washington. One record of great gray owls exists from the northwestern border of watershed from August 1998. No specific surveys for great gray owls have been conducted for this project but no great gray owls were found during 3 seasons of surveys conducted for this project, including surveys in each stand proposed for harvest.

Habitat components analyzed for the DCEMP include prey populations, nesting habitat, nesting sites (including artificial platforms), perches, and standing dead wood.

Prey Populations

During spring and summer, great gray owls in northeastern Oregon ate mainly pocket gophers and Microtine voles (Bull and Henjum 1990). Hayward and Verner (1994) reviewed several studies and reported that diets varied by area, which indicates plasticity dependent on prey availability, but noted that Microtine voles dominate their diet over the worldwide range of the great gray owl.

Surveys were not conducted for prey densities in the watershed. Habitat of the voles and pocket gophers eaten by great gray owls consists of natural or created openings and thinly forested stands. Past harvest records indicate that about 6,800 acres have been harvested in the watershed (19 percent of the watershed, but not all in great gray owl habitat). Of this, about 60 percent consisted of regeneration harvest prescription, which would have created great gray owl foraging habitat.

Nesting Habitat

Bull and Henjum (1990) reported that nesting great gray owls preferred unlogged stands but did nest in harvested stands (though at a level far less than this habitat was available). Nesting in either harvested or unharvested stands did not occur in stands where trees were less than about 12 inches dbh (Bull and Henjum 1990). Currently, about 2,580 acres of large diameter, closed-canopy stands that could provide great gray owl nesting habitat exist in the watershed (about 6 percent of the area).

Nest Sites (Including Artificial Platforms)

Great gray owls do not build their own nests but use stick platforms (nests of other large birds or dwarf mistletoe brooms), broken-topped trees or artificial platforms and don't appear very selective (Stepniewski and Woodruff 1997, Bull and Henjum 1990, Hayward and Verner 1994). They will frequently use the same nest for several years.

The Forest Service has not installed artificial nest platforms in the watershed. Large snags within 200 feet of open roads are rare or absent due to firewood cutting. Stands harvested prior to about the mid 1990s, especially regeneration-harvest stands, contain few if any large snags. Recent outbreaks of Douglas-fir bark beetle have increased the number of potential nest snags because the bark beetle attacks large trees.

Perches and Standing Deadwood

Snags and large dead wood are important habitat components because they are used for hunting perches when near openings and as escape routes for juveniles who climb them to avoid predators. Stands harvested prior to about the mid 1990s, especially regeneration-harvest stands, contain few perches or other standing dead wood.

3.5.3 Threatened and Endangered Species

A complete discussion of Threatened and Endangered Species is contained in the Biological Assessment (BA) that is included in the Deadman Creek Ecosystem Management Analysis File at the Three Rivers Ranger District office. Section 7 of the Endangered Species Act of 1973, as amended, requires federal agencies to "ensure" that actions authorized, funded, or carried out by them are not likely to jeopardize the continued existence of endangered (E), threatened (T) or species proposed (P) for Federal listing, or result in the destruction or adverse modification of their critical habitats. In addition, the Forest Service established direction (Forest Service Manual 2670) to guide habitat management for endangered, threatened, and proposed species to ensure that these species receive full consideration in the decision-making process. That direction establishes the process, objectives, and standards for conducting a Biological Assessment (BA).

This section is organized by species in the order listed in Table 11. Each species description begins with a summarization of current management and current populations, where known. This is followed by a listing of the habitat components important to the species and describing how they relate to the identified issues and objectives from Chapter 1.

Grizzly bear (Ursus arctos)

The Grizzly Bear Recovery Plan identifies "grizzly bear ecosystems" which contain specific recovery areas (USDI Fish and Wildlife Service 1993a). Individual grizzly bears that live outside specified recovery areas are protected, but not managed. The nearest recovery area to the Deadman Creek watershed is the Selkirk Mountain Grizzly Bear Recovery Area in the northeast corner of Washington. This area is separated from the Deadman Creek watershed by about 40 miles, the Kettle, Columbia and Pend Oreille Rivers, and the mountain ranges that separate the rivers. Transient grizzly bears might infrequently occupy the watershed, but no verified grizzly sightings have occurred in or near the watershed.

The Natural Heritage Program Database lists one verified grizzly sighting near the Three Rivers Ranger District, in the 1950s, on the Colville Indian Reservation, about 12 miles from the southwest corner of the Deadman Creek watershed. A verified sighting in 1995 came from about 15 miles east of the planning area, across the Columbia River and more recent sightings (including 2002) have

occurred east of that location, in the Pend Oreille Valley. About 25 miles northeast of the watershed in Canada, up to 7 bears occupy spring emergence habitat but disperse from this site by late June. In spring of 2002, the Forest Service conducted, along with Washington Department of Fish and Wildlife, Washington Department of Natural Resources and Boise Cascade Corporation, a hair snagging effort to determine if these bears cross into the US. Of the more than 90 hair samples collected on the US side, all were genetically or morphologically identified as black bear (Letter from D. Paetkau to Chris Loggers, Oct. 9, 2001).

Grizzly bear habitat components include travel corridors and hiding cover, forage, densities of motorized roads and trails, and seclusion habitat. Effects to seclusion habitat due to entry for silviculture treatments and new road construction were identified as a key issue in public scoping.

Travel Corridors and Hiding Cover

Travel corridors consist of vegetation and physical features that grizzly bears use to move across a landscape. These areas provide for either ease of travel or secure habitat or both. Examples of physical travel corridors are ridges, saddles and riparian areas. Vegetation on travel corridors ranges from open subalpine meadows to dense forests. Hiding cover consists of areas that an animal uses for security or to escape from danger. The USDA Forest Service frequently defines it as habitat capable of hiding most of an animal at some distance from an observer (for example, habitat that can hide 80 percent of a bear at 200 feet). Therefore, areas that probably do not provide hiding cover are past regeneration harvest units less than about 15 years old and natural and other created openings, like agricultural fields.

In the Deadman watershed, about 5 percent of the watershed consists of regeneration harvest units less than 15 years old and about 2 percent consists of agricultural land. None of this currently provides hiding cover but the regeneration harvest units should within the next 10 years (no regeneration harvest occurred on NFS lands in the past 5 years). Additionally, about 30 percent of the watershed consists of natural openings or open stands that provide limited or no hiding cover. On these areas, environmental factors limit or prevent development of hiding cover. About half of the natural openings lie in warm, dry biophysical environments and another quarter consist of open areas in cold, dry higher-elevation habitats.

Forage

Diets of grizzly bears shift seasonally as different food sources become available. Both shrub fields that provide berry crops and habitat for big game are important. To date, management in the DCEMP areas has not targeted the creation of shrub fields to produce berry crops. The watershed contains patches of high densities of huckleberries (Vaccinium sp.). Existing conditions for big game in the DCEMP area are discussed in section 3.5.4 Management Indicator Species, Big Game.

Densities of Motorized Roads and Trails

Densities of motorized roads and trails were determined using moving window analysis (Ake 1995). To calculate the total motorized route density, open roads (capable of standard car or pickup traffic), other roads not meeting all restricted or obliterated criteria, and open motorized trails were included. Road densities in both spring/summer and autumn were calculated because in autumn some roads

are opened that were closed during the spring and summer. Also, breaching of road closures is more common in the autumn. During spring and summer, about one quarter of the area (16.1 square miles) has a road density of 0 and another quarter has a road density of between 0.01 and 1 mile of road per square mile. The areas of no road density might not be areas that do not contain roads or trails, rather, they are areas in which the roads have been closed or have grown impassable.

Seclusion Habitat

We determined the amount of seclusion (core area) habitat that lies farther than 0.31 miles (500 m) from an open road or motorized trail using criteria outlined in Interagency Grizzly Bear Committee (IGBC) Task Force report (1994) on grizzly bear and motorized access management. During summer, about 30 square miles (miles2), or 45 percent of the watershed, provides seclusion habitat (less than 1 mile2 of this is on non-NFS land). In autumn, the amount of seclusion habitat decreases to about 23.4 miles2. Much of the seclusion habitat lies on the south side of the watershed, on the north face of the ridge that separates the Deadman Creek and the Sherman watersheds. Another large section lies between the 2 motorized trails that access Mack/King and Twin Sisters mountains.

Woodland caribou (Rangifer tarandus)

The woodland caribou is being managed under a recovery plan approved by the United States Fish and Wildlife Service in 1993. The only recovery area identified in the State of Washington is east of the Pend Oreille River in the northeast corner of the Selkirk Ecosystem (USDI Fish and Wildlife Service 1993b). At present, woodland caribou within the Selkirk Ecosystem exist only in the extreme northeastern corner of the State, separated from the Deadman Creek watershed by the Pend Oreille and Columbia Rivers and the mountains separating the rivers.

Gray wolf (Canis lupus)

The Northern Rocky Mountain Wolf Recovery Plan identifies three areas for wolf recovery. These are Yellowstone, northwest Montana, and central Idaho. Washington State does not contain any wolf recovery areas. Under the recovery plan any wolves found outside recovery areas receive federal protection, though the areas they inhabit are not managed to provide wolf habitat. The Forest Plan calls for wolf monitoring by recording location and determining validity of reported sightings.

Records of wolf sightings on the Colville National Forest date from 1914. During the 1980s, a confirmed sighting was made about 10 miles northeast of the Deadman Creek Watershed boundary, across the Kettle River. Howling surveys were conducted within the watershed in 1991, 1992 and 1993, but no wolves responded. Wolf packs have not been located on the Three Rivers Ranger District. During the late 1990s several people report seeing wolves within the boundary of the district, though we have yet to positively confirm a sighting**. Based on interviews, the USFWS concludes that many of these sightings are probably wolves.**

Habitat components important for gray wolf populations include the ungulate prey base, denning and rendezvous sites, and seclusion habitat. **The effects of new road construction and entry into the inventoried roadless areas on wildlife habitat were identified as key issues in public scoping.**

Ungulate Prey Base

Within the northern Rocky Mountains, wolves depend on big game as a year-round food source. On a biomass basis, ungulates comprise more than 90 percent of wolves' diets. We examined current conditions within the NFS lands in the DCEMP area and cumulatively on all lands within the Deadman Creek watershed. Both contain fawning areas and summer and winter range for deer, thus providing prey for wolves the entire year. Much of the summer range exists in poor condition because the flush of woody browse caused by earlier disturbances (mainly fire) has grown out of reach of big game, and because dense coniferous stands limit light reaching the ground and thus herb productivity. Existing conditions for big game in the DCEMP area are discussed in section 3.5.4 Management Indicator Species, Big Game

Denning and Rendezvous Sites

Denning sites in the northern Rocky Mountains are characteristically located on southerly aspects of moderately steep slopes in well-drained soils. The sites are usually within 0.25 mile of surface water and at an elevation overlooking surrounding low-lying areas. In some areas, wolf packs are sensitive to human disturbance near den sites and may abandon the den as a result of disturbance. However, recent information suggests that wolves are becoming more adapted to human activities. Wolves in southeastern British Columbia denned in railroad grades and near restricted roads (M. Jimenez, pers. comm.).

Rendezvous sites usually consist of complexes of meadows and adjacent hillside timber with surface water nearby (stream corridors, bogs, abandoned and overgrown old beaver ponds). The size of these areas may vary, but most are about 1 acre. The location of the rendezvous site will move during the summer as the pups grow. Both den and rendezvous sites may be used for several years. Wolves may be less affected by human disturbance at later rendezvous sites than they are at the first one.

Because recent information suggests that sensitivity to human disturbance may be less than previously thought, potential habitat for denning sites was not specifically identified for analysis. Screening criteria restricts harvest near most bodies of water; so no attempt was made to identify potential rendezvous sites. No denning or rendezvous sites were found during field reconnaissance from 1991 to1995.

Seclusion Habitat

The degree of seclusion for wildlife (lack of exposure to humans) within an area depends on the road and trail network within that area. From a management perspective, core area habitat to wildlife are provided by restricting motorized vehicle traffic within an area, and we control motorized use by managing open road densities. Exposure to humans increases when new roads enter areas lacking roads. Even when these roads are closed until they grow closed with vegetation, they continue to provide entryways to people on foot, ATVs or horses, and increase the chance of illegal entry.

We examined core area habitat in the Deadman Creek watershed by creating buffers of 0.31 miles (500 m) around existing open roads. Habitat lying further than these distances from a road is considered core area habitat (IGBC 1994), the quality of which increases with the distance from an open road. Depending on the season, between about 1/3 and 1/2 of the watershed

provides seclusion habitat.

Canada lynx (Lynx canadensis)

The Washington Department of Fish and Wildlife described lynx range within the State of Washington as consisting of six zones. One of these, the Kettle Range Zone, consists of 223,000 acres along both sides of the Kettle Crest and encompasses a portion of the Deadman Creek Watershed. Zones have been further subdivided along watershed boundaries into Lynx Analysis Units, each the approximate size of a female home range. That portion of the Kettle Range Zone that lies within the Deadman Creek Watershed consists of approximately 26,000 acres and constitutes a single Lynx Analysis Unit (LAU).

In the late 1960s and the 1970s, about 30 to 40 years after the Dollar Mountain fire, the Kettle Range Zone supported a large population of lynx with the highest density occurring north of the Sherman Highway. Population estimates from 1993 were between 11 and 23 individuals (Washington Department of Fish and Wildlife 1993). The most recent record of lynx breeding in the watershed was a female with kittens seen in 1993/1994. Lynx were verified in the watershed in 1998 by genetic testing of hair samples, **however, samples were contaminated in the laboratory compromising the verification. No subsequent surveys for lynx have been conducted.**

The 2000 Canada Lynx Conservation Assessment and Strategy (Ruediger et al. 2000) categorized lynx habitat according to five habitat components: (1) non-lynx habitat within an LAU, (2) travel corridors, (3) foraging habitat, (4) denning habitat, and (5) unsuitable habitat (which could at some point support lynx habitat, but currently does not). For purposes of this analysis and because of the key issues identified in scoping, human access was added as a sixth category, measured in miles of roads per square mile.

Non-Lynx Habitat

Non-lynx habitat consists of warm, dry biophysical environments or permanent openings. Approximately 25 percent of acres in the LAU are considered non-lynx habitat, the remaining 75 percent are considered capable of supporting lynx now or in the future. Management standards established by Brittell et al. (1989) and the Okanogan management meetings (1992/1993) recommended that non-lynx habitat within the LAU should not exceed 30 percent. Non-lynx habitat (like rocky openings) is a function of the environmental conditions and is not influenced by management.

Travel Corridors

Travel corridors were delineated for the DCEMP area according to guidelines in the Forest Plan screening process. Current live tree densities over most of the area provide sufficient cover to serve as corridors during winter when vegetative cover is least. The 25 percent of the LAU considered non-lynx habitat was classified as travel habitat. To date, no travel corridors in the LAU have been eliminated by previous management activities, though the corridor at the upper portion of Betty Creek has been reduced. The need to not compromise wildlife travel corridors and habitat connectivity were issues brought up in public scoping but not considered key because corridors are not affected by the proposed actions.

Foraging Habitat

Lynx prey mainly on snowshoe hare, and the well being of lynx populations seems correlated with snowshoe hare populations. On the western side of the Colville National Forest, the most dense snowshoe hare populations seem to occur in young (30 to 50 year old) dense stands of lodgepole pine, true fir and spruce; young forests that arise from stand replacing fire or regeneration harvest[6]. Though foraging habitat is plentiful in the watershed, high quality foraging habitat, habitat that supports high populations of hares, is lacking. This is mostly because of the lack of stand regenerating fire within the last 40 years. About 35 percent of the lynx habitat within the LAU contains dense, even-aged forest. Much of this consists of lodgepole pine stands that provided high quality forage habitat until their lower limbs grew above the reach of snowshoe hare in winter. Currently about 220 acres of past harvest provide high quality forage habitat.

One objective of the Deadman Creek Watershed Ecosystem Projects is to increase the ability of early and middle structural stands to reach late structural conditions. In some cases this may require introduction of a different tree species to an area. For example, where dense stands of even-aged lodgepole pine now grow, some of these areas could be enhanced by the proposed action of regeneration harvests and replanting with larch or ponderosa pine. Lodgepole pine, at the age of around 80 years and at the size of about 8 inches DBH, becomes highly susceptible to beetle kill. Stands with these characteristics typically experience high levels of mortality[7]. These additional disease resistant species mixed in with the lodgepole pine would provide the source for large trees of the future. In the short term, the lodgepole pine that regenerates naturally in these stands would provide snowshoe hare habitat and high quality lynx forage areas. Some units in the proposed action are within the Twin Sisters Inventoried Roadless Area and so relate to the key issue of entry into these areas.

Denning Habitat

Denning habitat for lynx is generally comprised of larger-diameter stands on mesic, cooler sites with high densities of down logs. About 3,940 acres (18 percent) of the LAU within the Deadman Creek watershed contains an overstory of the type that lynx denned in on the Okanogan National Forest (Koehler 1990). A survey of several stands of larger trees yielded only one plot that contained enough down wood to be considered good denning cover. Recommendations in Ruediger et al. (2000) are for denning habitat to exceed 10 percent of a lynx analysis unit. Recent windthrow events have likely improved the abundance of down wood in some areas, but subsequent surveys have not been conducted for lynx denning habitat.

Unsuitable Lynx Habitat

Unsuitable lynx habitat consists of open areas that at some point could support lynx habitat, but currently do not. Nearly 25 percent of the lynx habitat within the LAU is considered unsuitable. **About 25 percent of this (6 to 7 percent of the LAU) is the result of past harvest and should grow into good foraging habitat in the next 15 to 20 years.**

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[6] Quinn and Parker, 1987

[7] Amman, Gene D., Mark D. McGregor, and Robert E. Dolph, Jr., *Mountain Pine Beetle,* USDA- Forest Service, Forest Insect and Disease Leaflet #2, Reprinted 1990

Human Access

A key issue identified in scoping was the effect of new road construction on wildlife habitat. Current information suggests that lynx might not directly avoid or be displaced by most low-use forest roads[8] The most recent science contained in the 2000 Canada Lynx Conservation Assessment and Strategy (Ruediger et al. 2000) downplays the necessity for seclusion habitat and the negative effects of forest roads to lynx. However, roads could indirectly affect lynx by allowing human disturbance in denning habitat and increasing access for incidental or illegal hunting or trapping. During the denning season, in spring and summer, about 60 miles of motorized road and trail exists within the LAU for an open road density of 1.5 miles per square mile.

Bald eagle (Haliaeetus leucocephalus)

The Pacific States Bald Eagle Recovery Plan (USFWS 1986), provide management direction for bald eagles on the Colville National Forest. Bald eagle habitat on the Three Rivers Ranger District consists of nest sites and winter roost sites.

Field crews did not find any bald eagle nest sites during reconnaissance conducted in 1993, 1994 and 1995. The nearest known nest is along the Columbia River within a mile of the Deadman Creek confluence with the Columbia River. Within the watershed, none of the streams are considered to be large enough for foraging by bald eagles and no lakes exist. Though the Deadman Creek watershed does contain forest stands with the large tree component required for winter roost sites, these areas are not considered potential roost sites for concentrations of wintering birds because of their remoteness from the Columbia River and fish-bearing lakes. The planning area may provide intermittent roost sites for a few eagles. **No site-specific surveys were conducted for winter roost sites.**

3.5.4 Management Indicator Species

The complete analysis of management indicator species is contained in the Effects to Management Indicator Species report that is included in the Deadman Creek Ecosystem Management Projects Analysis File that is on file at the Three Rivers Ranger District office.

Of the 14 Management Indicator Species listed in the Forest Plan (pages 4-38 to 4-40), 13 might be found within the Deadman Creek Watershed. Two of these, grizzly bear and woodland caribou, are covered in section 3.5.3 Threatened and Endangered Species. The effects to great blue herons were dropped from discussion because no great blue heron rookeries or nest sites were found in the watershed during field reconnaissance. The habitat capability objectives listed in the Forest Plan (page 4-13) are based on 1980 populations. Because the Forest Service manages habitat and the State of Washington manages wildlife populations, the Forest Service objective is to provide habitat capable of supporting the desired population of each Management Indicator Species.

Big game

The primary big game species in the Forest Plan are elk, mule deer and white-tailed deer, with management in MA6 and MA8 emphasizing big game winter

[8] Ruggiero et al. Chapter 12, 2000, USDI BLM et al. 1999).

range for these species (Forest Plan Pgs 4-98 and 4-106). Throughout the east side of the Kettle Range, mule deer have decreased dramatically, but white-tailed deer have increased their distribution. Big game management west of the Columbia River focuses on management of mule deer habitat.

The DCEMP area contains summer range and winter range, both of which are required to produce desired deer population levels. The effects of alternatives on summer and winter range are evaluated using effects to cover and forage areas. Additional modeling can be found in the Analysis File. These areas are discussed below and in Chapter 4 Environmental Consequences by their components: (1) quantity, (2) quality and (3) distribution (effective habitat). Road density was added as a fourth component, though it does not factor into the models listed above.

The proposed actions of silviculture treatments (including sanitation) and fuel treatments affect big game habitat components because they manipulate cover and forage. No key issue was directed specifically at big game, though the effects of new road construction are considered relevant to forage quantity and quality. Effects to big game may have secondary effects to wolverine (section 3.5.2), grizzly bear and wolves (section 3.5.3) because these species eat big game or big game carrion.

Winter range

The Forest Plan designates 3,065 acres in the Deadman Creek watershed for management of big game winter range (Management Areas 6 and 8). These MAs are generally located adjacent to private and State managed lands at the eastern side of the watershed (see maps in Appendix F). In addition, the watershed contains winter range habitat in other management areas, on private land, and on land managed by the State of Washington (Table 13). Small pockets, less than 4 acres, of winter range are also scattered throughout the watershed, especially on more open slopes with southerly or westerly aspects. Most of these small pockets are located in higher elevations and on the ridges between watersheds where they provide winter range for mule deer rather than white-tailed deer, which tend to winter at lower elevations.

Table 13. Cover and forage on winter range areas within the Deadman watershed

Land designation	Acres of winter range	Percent of each land designation					
		Cover			Non-cover (forage)		
		Fair	Marginal	Total	Forested*	Open	Total
MA6 and MA8	3,065	16	4	20	46	34	80
Private/State/Other NFS	4,334	14	4	18	34	49	83
Total	7,399	14	4	19	39	42	81

***Note: About a third of the forested non-cover actually provides cover, but the Forest Plan requirement that cover patch size exceed 4 acres precludes these areas from being considered thermal cover.**

Quantity of Cover and Forage areas

Cover in winter range consists of those stands in which canopy closure exceeds 60 percent. Snow–intercept cover (SI cover) provides the best cover; it consists of several tree canopy layers that catch and trap snow before it falls to the ground.

Little of the existing big game winter range contains SI cover. The Forest Plan desired acreage for "thermal cover" (an outdated term replaced here with "cover") and forage area is a ratio of 50 percent cover to 50 percent forage (50:50), all in blocks 3 acres or more. The existing cover to forage acreage ratio, in MA 6 and MA 8, in the Deadman Creek watershed is 20 percent cover to 80 percent forage areas. If small patches of cover, less than 4 acres in size, are included in cover totals, the ratio is slightly better at 35 percent cover to 65 percent forage areas. In total, including small patches, private, State and other NFS lands, the ratio is about 32 percent cover to 68 percent forage. All action alternatives propose silviculture treatments in deer winter range.

Quality of Cover and Forage

Much of the cover acreage is in poor condition due to root rot, beetle kill, or mistletoe in tree species. Though these pathogens create conditions that benefit other wildlife (like logs and snags), they reduce a stand's potential for providing big game cover in the long term. Root rot and bark beetle infestations ultimately remove overstory species and mistletoe may prevent small trees from becoming part of the canopy. Much of the existing cover is vulnerable to these pathogens. It is one objective of the proposed actions for all action alternatives to reduce the susceptibility of stands to insects and diseases (see Forest Pathogens under section 3.4.2.).

Forage types for big game animals can be divided into woody forage (shrubs) and herbaceous or grassy forage. Woody forage covers much of the area, though most has grown beyond the reach of big game, thus is of poor quality. Historically, fire would regenerate the understory woody vegetation and maintain its accessibility to big game. Due to fire suppression activities, little natural fire has occurred in the watershed in recent times. However, during the winter of 1996/1997 parts of two proposed units in deer winter range were blown down. These units were subsequently salvaged and then under burned to regenerate woody forage. Other harvest activities in the drainage have also helped maintain forage quality, though largely not in deer winter range. All action alternatives propose prescribed fire, natural fuels treatments (under burning) and silviculture treatments in deer winter range.

Noxious weeds constitute the greatest threat to herbaceous and grassy forage area quality. Knapweed and goatweed (St. Johnswort) cover large areas of the ranger district, and are particularly abundant at low elevations in the watershed (see Section 3.4.3 Noxious Weeds). The major vectors that transfer weed seeds are vehicles, and the greatest density of noxious weeds in winter range can be found along roads. Proposed actions for alternatives B and D include construction of new roads. All action alternatives propose reconstruction of varying distances of existing roads and other road management activities (Section 4.11 Transportation).

Effective Habitat

The arrangement of cover amid the forage areas is another important aspect of deer winter range so that animals do not expend excess energy traveling between stands of forage and cover. The interface between these two areas, or the ecotone, is called "effective" habitat. Because of the lack of cover within the watershed, the extent of this "effective" habitat is poor, only 37 percent of the 3,065 acres in MA6 and MA8.

New Road Construction

The effects of new road construction (Alternatives B and D) on wildlife habitat are key issues (section 2.3). Roads cause direct and indirect effects to big game and big game habitat. Direct effects are the near-permanent loss of habitat caused by the road construction. Nearly 55 acres in MA6 and MA8 and an additional 75 acres of other winter range areas are currently in roads. **The greatest indirect effects are the potential for noxious weed spread (permanent loss of forage), increased cattle access along roads (access to areas formerly lightly grazed or not grazed, resulting in seasonal loss of forage), and increased vehicular traffic (disturbance, poaching potential).**

The Forest Plan directs using road density during season of use as a measure of direct road effects. Though the trend for ORVs is for increased use (Heflick et al. 2002), at this time road density is below the Forest Plan's road density for winter ranges in Ferry County (0.4 miles per square mile). **NFS roads within winter range are not plowed in winter, which also limits vehicular traffic during season of use. All of the state and several of the county and private roads in other winter range areas (outside MAs 6 and 8) are plowed during winter.**

Summer range

The entire watershed can be considered summer range, **though no specific management area is set aside for big game summer range on the Colville National Forest. Similar to winter range, habitat quantity, quality and distribution are important components. Roads also play a part because of the direct and indirect effects they have on habitat, particularly as corridors for noxious weed spread.** The more important components of summer range are sites with cooler microclimates and areas near water.

Quantity of Cover and Forage Areas

The current cover to forage area ratio of 63 to 36 in the watershed and 66 to 34 on NFS lands is higher in cover than the 50:50 level considered optimal (Thomas 1979). The ratio misleads somewhat, because in several conifer stands labeled as forage there are patches of trees that provide cover.

Quality of Cover and Forage

Few fires have recently burned the area so, aside from past harvest, only limited shrub regeneration has occurred. Many of the woody forage species are becoming stagnant or have grown out of the reach of deer. Since the 1970s, about 4,100 acres have been harvested on National Forest System lands within the watershed. About half of these acres probably provide good summer forage.

Noxious weeds constitute a threat to forage diversity and abundance throughout deer summer range, due mainly to competitive exclusion of native forage. Knapweed and goatweed (St. Johnswort) are the most common noxious weed species in dry, more open habitats, especially along road corridors.

Effective Cover

Distribution of cover areas in relation to forage areas are important for deer populations so that animals don't expend excess energy traveling between forage and cover. For summer range in the Deadman Creek watershed, interspersion of forage and cover stands is considered moderate. Approximately 55 percent of the summer range is classified as effective cover.

New Road Construction

Road densities and road miles are important measures for summer range because of the direct removal of land from the forage base, but also for indirect effects. The effects of new road construction on wildlife habitat is a key issue identified in scoping. Increased traffic and poaching potential, risk of noxious weed spread, and increased cattle access to forage areas are indirect effects. An estimated 200 acres of good forage areas have been converted to roads in the DCEMP area. About 149 miles of road and motorized trail cross the Deadman Creek Watershed. About 50 miles are closed to most motorized vehicles. Nearly 87 percent of the open roads and motorized trails exist on NFS lands providing corridors for the spread of noxious weeds.

American pine marten

The Forest Service selected American pine marten as an indicator of mature and old growth mesic coniferous forests with an abundant down log component. The habitat capability objective requires habitat of appropriate size, quality, and distribution to maintain a viable population. Forest Plan standard and guideline 4-40 (k) states that marten Management Requirement areas (MRs) shall be distributed every 2 to 2.5 miles and be a minimum of 160 acres in size. It also specifies that these areas will be composed of conifers in old growth or mature successional stages with crown closure of 50 to 100 percent. As with other species with MRs, a complete narrative on required habitat conditions is included in Appendix K of the Forest Plan Final Environmental Impact Statement.

Of the seven biophysical environments within the Deadman Creek Watershed, all but the warm dry Douglas-fir/grand fir type could support marten habitat. These 25,000 acres of potential habitat lie mainly on northerly aspects or at higher elevations. Marten habitat is described and analyzed by examining the following:(1) mesic large tree and old growth stands; (2) marten and pileated woodpecker MRs; (3) MA1 areas (Old Growth Dependent Species Habitat), and (4) travel corridors.

Mesic Stands Dominated by Large Trees

Marten generally occupy older, mesic, forested stands with late structure. These stands typically contain multiple stories of trees and abundant down wood. They mainly locate dens in which they give birth in holes in down or standing trees, the entrance of which usually lies beneath the snow. Because of the fires that swept the watershed in the late 1920s and early 1930s and the subsequent logging that removed portions of the remaining large tree component in the watershed, much of the potential marten habitat does not currently qualify as good habitat. Additionally, down wood is somewhat scarce in the watershed, so much of the fair and marginal areas also do not qualify as marten habitat. Today, many of the larger trees are larch, a species that does not provide good marten habitat in winter.

Based on the characteristics of the overstory only, about 8,600 acres (35 percent of potential marten habitat) are classified as good or fair and an additional 7,100 acres are classified as poor habitat. Large-tree-dominated, late structure stands are lower than the historic range of variability for all biophysical environments that could support marten habitat except very moist Engelmann spruce/subalpine fir (a minor but important component of marten habitat generally

restricted to riparian areas in this watershed) (See section 3.4.2 Forested Vegetation). Of this, approximately 670 acres of old growth (NIZOG) has been identified in biophysical environments that could support marten habitat. More old growth might exist in the watershed, as some areas were not inventoried (see old growth under section under 3.4.2). **Maintenance of old growth and late seral areas are objectives of the proposed actions as is the enhancement of growth of middle structure stands to late structure.**

Marten and Pileated Woodpecker Management Requirements

The Forest Plan strategy of placing marten management requirement (MR) areas on a grid system does not always allow for these to be placed in the best available habitat. Five marten MRs and one pileated woodpecker MR have been established in the watershed. About 50 percent of the core and dedicated areas lie in biophysical environments that could support marten habitat. Nearly all of this consists of good or fair marten habitat. This habitat component ties to the objective of maintaining old growth and late seral stands because of the proposed action to delineate five marten MRs and two pileated woodpecker MRs.

MA1 Areas

One MA1 area of 364 acres exists in the watershed. This area is smaller than the Forest Plan standard for MA1 areas. Nearly 85% of the area could support marten habitat, but currently about 30% of the MA1 contains good or fair marten habitat. However, down wood densities are low throughout most of the MA1, and many of the larger overstory trees are larch, which do not provide much canopy cover in winter. No harvest has been recorded in the MA1.

Travel Corridors

Travel corridors were delineated for the Deadman Creek Planning Area according to guidelines in the Forest Plan screening process. Current live tree densities over most of the area provide sufficient cover to serve as corridors during winter when vegetation cover is least. Additionally, most riparian areas support more dense understories than the surrounding upland and so supplement delineated travel corridors for marten. **To date, travel corridors have not been compromised by previous management activities. Not compromising wildlife travel corridors and habitat connectivity were issues brought up in scoping but not considered key because they are not affected by the proposed actions.**

Beaver

The Forest Service selected beaver as indicators of riparian areas dominated by aspen or willow. The habitat capability objective is to improve habitat from 1980 conditions. The Forest Plan standard and guideline 4-40 (g) specifies that beaver habitat will be maintained or enhanced. The major drainages in the Deadman watershed are Main and North Fork Deadman Creeks. Beaver inhabit both creeks and several tributaries. Aspen, willow and cottonwood trees do not dominate overstories along most of the banks of the creeks, though several sections contain good stands of these trees and shrubs.

Blue grouse

The Forest Service selected blue grouse as a management indicator species due to its dependence on mature “limby” trees or clumps of trees along ridge-tops for winter roost habitat, and its use of open meadows or shrub areas for nesting habitat. The habitat capability objective is maintenance of blue grouse roosting and nesting habitat quality and quantity. Forest Plan

standard and guideline 4-40 (e) states that blue grouse habitat should be managed by providing a minimum of eight mature, “limby” Douglas-fir or subalpine fir trees per acre on or near ridge-tops in park-like or open timber stands. It also states that hiding cover around at least 50 percent of the perimeter of springs or other water sources should be maintained with no break in cover exceeding 600 lineal feet along the waters edge. The Forest Plan states that potential habitat consists of the upper third of ridges that contain both open areas for nesting and dense, “wolfy” conifer stands for roosting.

Using aerial photos, topographical maps, field surveys and hunter information, there are approximately 9,075 acres of potential blue grouse habitat on National Forest System lands, and another 1,450 acres on other lands were identified in the watershed. **All action alternatives propose to remove infested mistletoe trees from some areas of the watershed.**

Franklin's grouse

The Forest Service selected Franklin's grouse as an indicator species to represent lodgepole pine-dependent species. The habitat capability objective is to approximate 1980 Franklin's grouse habitat conditions. Franklin's grouse habitat is described as large stands of young lodgepole pine, often the result of stand-replacing fires. The Forest Plan (page 4-40) directs that large areas dominated by lodgepole pine stands be managed to maintain 20 percent in young age classes.

About 12,890 acres of smaller tree, even-aged stands of lodgepole pine or mixed lodgepole pine/larch exist in the watershed, most of it on NFS land. About 65 percent of these stands are fairly dense. About 10 percent of the existing stands are between 15 and 30 years old. Another 15 percent of the stands will provide habitat within the next 15 years as stands harvested since 1977 grow into denser habitat. **Similar to Canada lynx foraging habitat needs, a lack of stand replacing fires and regeneration harvests would lead toward reduced habitat for Franklin’s Grouse. See Canada lynx foraging habitat for a discussion of objectives and issues (section 3.5.3 Canada Lynx).**

Northern three-toed woodpecker

The Forest Service selected trends in northern three-toed woodpecker populations to indicate changes to mature lodgepole pine and subalpine fir stands. The habitat capability objective is to maintain habitat of sufficient size and quality to support a viable population. Forest Plan standard 4-39 (b) states that 75 acres of lodgepole pine or subalpine fir in old growth or mature successional stages will be maintained for the northern three-toed woodpecker and distributed every two miles. During the forest planning process, the MR area requirements for northern three-toed woodpeckers were assumed to be met by the marten MR areas (page F-17 and K-24 FEIS Appendices). Additional old growth habitat is also expected to be provided in other non-harvested areas (MA1, MA10, MA11).

Late Structure and Old Growth Lodgepole Pine and Subalpine Fir

The issues raised by the public during scoping of old growth and large tree preservation are linked to northern three-toed woodpecker habitat because the birds require large tree dominated stands with large snags. While these were not identified as key issues, they tie to the objective of protecting old growth and late structure. The proposed action to establish additional marten and pileated woodpecker MRs is common to all action alternatives. About 17,300 acres of potential habitat, either subalpine fir biophysical

environments or larger even-aged lodgepole pine stands, exist in the Deadman Creek watershed. Of this, about 4,150 acres (24 percent of potential) were classified as containing larger trees and thus serve as actual northern three-toed woodpecker habitat. About 360 acres of old growth occur in subalpine fir biophysical environments.

Marten and Pileated Woodpecker Management Requirements

Management Requirement areas established for marten and pileated woodpeckers also potentially provide habitat for Northern three-toed woodpeckers. There are five marten and one pileated woodpecker MRs in the watershed. The Forest Plan strategy of placing marten MR areas on a grid system does not always allow for these to be placed in the best available habitat. **About 50 percent of the MRs occur in biophysical environments that could support Northern three-toed woodpecker habitat. Nearly all of this is classified as good or fair habitat.**

Snag Habitat

Large snags are scarce in the watershed, mainly due to intense fires in the 1920s and 1930s. Also, past harvest practices removed snags to reduce the risk of lightning strikes. Therefore, the 6,260 acres of past harvest in the watershed, much of it on unburned areas, are not likely to support any large snags**. The recent trend of less regeneration harvesting has resulted in more retained snags. All action alternatives propose to remove standing dead Douglas-fir to eliminate bark beetle brood trees, some of which may be large.**

Pileated woodpecker

The Forest Service selected pileated woodpeckers as indicators for Douglas-fir and cedar/hemlock old growth-dependent species. The habitat capability objective listed in Appendix K of the Forest Plan is to maintain habitat capable of supporting a viable population. Forest Plan standard 4-39 (a) states that pileated Management Requirement areas (MRs) shall be distributed every five miles and that 300 acres of conifers in old growth or mature successional stages should be maintained for reproductive habitat with an additional 300 acres maintained for foraging. Maintenance of suitable habitat is also to be accomplished within other management areas (MA1, MA10 and MA11).

The issues of old growth and large tree preservation were raised by the public during scoping. They are linked to pileated woodpecker habitat because of the species' dependence on stands that provide large snags. While these were not identified as key issues, the objective of protecting old growth and late structure and the proposed action to establish additional MRs is relevant.

Marten and Pileated Woodpecker Management Requirements

There is one pileated woodpecker MR in the Deadman Creek watershed. An additional five marten MRs also provide pileated woodpecker habitat (see Section on American pine marten). About 50 percent of the core and dedicated areas of the six MRs lie in biophysical environments that could support pileated woodpecker habitat. Nearly all of this consists of good or fair habitat for the species.

Old Growth

Management Areas 1, 10 and 11 have potential to supply old growth stands and so could provide habitat for pileated woodpeckers. Of the 7,170 acres in MA10 and MA11 in the watershed, 23

percent contains larger, multistoried trees in Douglas-fir/grand fir or cedar/hemlock biophysical environments. Management Area 1 contains about 125 acres of pileated woodpecker habitat.

About 295 acres of old growth occurring in 26 stands have been identified in cool-mesic and very moist biophysical environments including the very moist, western redcedar/western hemlock bottoms type.

Snag Habitat

Snag levels, especially levels of large snags, are very low due to intense fires and harvest history (see previous snag discussion for northern three-toed woodpecker). However, in many cases in the Douglas-fir/grand fir and redcedar/hemlock biophysical environments, riparian areas burned less intensely than surrounding uplands and contain adequate amounts of snags and large down woody debris to support pileated woodpeckers. About 52 percent of the mesic or moist portions of Douglas-fir/grand fir and redcedar/hemlock biophysical environments contain stands of larger trees that may support the larger snags required by pileated woodpeckers for feeding and nesting.

Recent beetle kill in the Warm dry Douglas-fir/grand fir, shrub biophysical environment has increased numbers of snags in localized areas. Subsequent snag surveys have not been completed. The screening process amendment to the Forest Plan increased the number of snags to retain during treatments (see following discussion). All action alternatives propose to remove some standing dead Douglas-fir to eliminate bark beetle brood trees, some of which may be greater than 21 inches dbh.

Other woodpeckers

The Forest Service selected the category of "other woodpeckers" because of their dependence on snag habitat. The habitat capability objective cited in the Screens is to provide sufficient snags to support 100 percent of potential woodpecker populations in all areas. This is an increase from the Forest Plan FEIS (pg 5-12) goal of sufficient snags to support 60 percent of potential woodpecker populations. Forest Plan standard and guideline 4-39 (c) specifies that green replacement trees shall be retained to provide for 100 percent population levels over a full rotation.

Stand exams in proposed harvest units indicate that snags greater than 8 inches dbh in middle to late structural stands within the analysis area average 5 to 7 per acre. In early structural stands proposed for treatment, there are less than two snags per acre. Past harvest records indicate that about 6,260 acres of NFS lands have been harvested in the Deadman Creek watershed. The harvesting techniques of the past decades followed guidelines for cutting down snags to decrease the risk of lightning caused fires. Less than 25 percent of these old harvest units might contain enough snags to meet Forest Plan standards. Current Operational Safety and Hazard Administration (OSHA) guidelines are for snags to be cut down if they are in any way a hazard to the safety of the logging operation. Snag removal for safety purposes is generally more prevalent with helicopter yarding than with tractor yarding. Snag levels on state and private lands are not known.

Recent beetle kill in the warm Douglas fir/grand fir biophysical environment and winter storms of 1996/1997 have increased numbers of snags in localized areas. Subsequent snag surveys have not been completed, though the recent trend of

less regeneration harvest has resulted in more snags remaining after harvest. Proposed actions of silviculture treatments and stand sanitations to reduce forest pathogens could effect snag populations within and adjacent to treatment units. Harvest yarding methods using helicopters result in more snags being felled than when tractor or cable yarding methods are used. Proposed actions for silviculture treatments are common to all action alternatives; however, Alternative D is the only alternative that does not include helicopter yarding.

Barred owl

The Forest Service selected the barred owl as an indicator of low elevation mature and old growth forests. The habitat capability objective listed in the Forest Plan is for sufficient suitable habitat to sustain a viable population. The Forest Plan also has a forest-wide goal of 73 pairs for the first decade of the plan, including habitat capable of supporting a pair of barred owls and their young within each MA1.

During scoping, the issues of old growth and large tree preservation were identified. Both link to barred owl habitat because of the bird's dependence on stands with late and/or old structure (see Section 1.5.1). While these are not "key" issues, one objective of the Ecosystem Management projects is to protect existing stands of old growth and late structure. Another objective is to increase the rate at which stands with mid and early structure reach late structure. Both these objectives support barred owl habitat needs.

Old Growth

The best barred owl habitat probably lies in the warmer or moister biophysical environments. The cold subalpine fir biophysical environment provides poorer barred owl habitat and was not considered in the analysis of barred owl habitat. About 1,600 acres (6 percent) of potential barred owl habitat consists of large-sized trees that are suitable for barred owl habitat, and another 11,500 acres (44 percent) contain medium-sized trees that provide poorer habitat. Approximately 605 total acres of old growth in lower elevation forests were identified within the watershed**. For a discussion of stands with late structure by biophysical environment see section 3.4 Forested Vegetation. Proposed actions in all alternatives are for silviculture treatments that would assist middle and early structured stands to grow into late structure stands at an increased rate.**

Management Area 1

Management Area 1 (MA1) is managed to provide habitat for wildlife species that require old growth forest components. There is currently one MA1 in the Deadman Creek watershed. It is comprised of 359 acres; smaller than the 600 acre minimum prescribed in the Forest Plan (page 4-7). All biophysical environments represented in the MA1 support barred owl habitat. About 37 percent of the existing MA1 consists of larger tree habitats. No old growth exists in the MA1. The MA1 was not monitored for the presence of barred owls.

Large raptors

The Forest Service selected large raptors as indicator species to monitor effects to nest trees and nesting habitat. The habitat capability objective is the protection of existing nest locations and maintenance of at least 75 percent of 1980 nesting habitat. Forest Plan standard 4-40 (f) states that nest sites and surrounding areas will be managed to ensure their continued usefulness.

The Accipiter hawks (sharp-shinned, Cooper's and goshawk) are interpreted as being the species most likely to be affected by management activities. Harvest impacts to nesting habitat are used to evaluate alternatives. Each species tends to prefer specific stand types. Goshawks most often nest in mature tree stands. Few nests are found above 4,000 feet for goshawk, and therefore, subalpine fir biophysical environments that generally lie above this level were not analyzed. Cooper's and sharp-shinned hawks prefer to nest in overstocked sapling, pole, and small tree stands.

Approximately 1,630 acres of good and 8,535 acres of fair potential goshawk nesting habitat were identified in the watershed from aerial photos, stand exams and field observations. In addition, about 8,480 acres of good and 4,790 acres of fair Cooper's and sharp-shinned hawk potential nesting habitat were identified. Some of these habitat types overlap. Nesting surveys were done in 1995 through 1998. In 1997 one goshawk nest was found and another location likely used as a post-fledging area was identified. **The site was monitored in subsequent years, and in 2002, the nest blew out of the tree. It is likely that the adults will re-nest somewhere in the area. No Cooper's hawk or sharp-shinned hawk nests were found.**

3.5.5 Neotropical Migratory Landbirds

In North America, populations of several neotropical migratory bird species have declined. These declines are most apparent for some grassland species and eastern forest-dwelling species. Concern grew for these species to the point that, in September 2000, the USDA Forest Service issued the Landbird Strategic Plan. With this plan came direction to assess and disclose the effects of management action on landbirds in NEPA documents. On January 10, 2001, President Clinton signed an executive order that outlined responsibilities of Federal agencies in protecting migratory birds. A Memorandum of Understanding between USDA Forest Service and USDI Fish and Wildlife Service (January 17, 2001) was also signed. These documents call for the incorporation of migratory bird habitat and population management objectives and recommendations into agency planning processes. They state that the Forest Service will strive to protect, restore, enhance, and manage habitats of migratory birds, and prevent the further loss or degradation of habitats on National Forest system lands.

Forest management, including fire, affects nearly all of the migratory birds that occur on or near the Colville National Forest at some time of the year. Management affects each species differently and at different levels (individual, population, community and landscape), the response being driven by the interaction of the activity's timing, intensity and extent with each individual's mobility and escape strategies and a species' population size and habitat requirements. Thus, management activities set the stage to create, enhance or destroy habitat, depending on the species considered.

Long-term monitoring of migratory birds in the western US indicates that the main area of concern relating to forest management is habitat fragmentation. Related to forest management is habitat alteration or loss due to exotic species invasions, and habitat alteration due to fire suppression. The proposed project will not include pesticide application and will not significantly change the predator suite. A study investigating cowbird parasitism, conducted in similar habitats about 20 miles east of the project area, indicated that cowbird parasitism to be insignificant

(Beutler 2000). These factors will not be further addressed.

The Deadman project area contains a diversity of habitats, from open water in small ponds to very dry rock outcrops, and from non-forested and early-successional to late-successional forest stands. Neotropical migratory birds occupy all these habitat types. The bird communities found within the analysis area are typical of those present throughout much of the Colville National Forest and this portion of northeast Washington (Vial and Loggers 2000). None of the species have experienced dramatic population declines.

Past fire and fire suppression along with timber harvest has created a condition of less late-structural-stage habitat than was present historically and large tracts of single-strata younger stands. Many of the single-strata younger stands are crowded with small trees and have a reduced shrub component because less sunlight penetrates the coniferous canopy. The simplified structure of these single-strata stands provides fewer habitats for fewer species than stands with more complex structure. Impacts to migratory birds will be assessed based on an alternative's effect to overall habitat conditions due to timber harvest, road building, and prescribed fire on NFS lands affected by the DCEMP.

3.6 Fire, Fuels, and Air Quality

3.6.1 Fire and Fuels

The complete fire and fuels management analysis report for the DCEMP is located in the DCEMP Analysis File, on file at the Three Rivers Ranger District. Section 4.4 was also edited from the original report. One purpose of the DCEMP is to decrease the risk of catastrophic fire events on NFS land within the watershed**. Eighty percent of stand treatment prescriptions call for thinning or single-tree selection. Post-sale slash and natural dead-down material is treated on fifty percent of the units.** Treatments are designed to:

- *Increase height to live crown*: **A longer flame length would be required to begin burning trees. Less individual trees that are lit decreases the risk of spread from tree-to-tree and catastrophic fire. The disadvantage is that it opens up the understory and may allow fire generated surface winds to increase**.
- *Decrease crown density*: **This makes tree-to-tree crown fire spread less probable and reduces crown fire potential. The disadvantage is surface winds may increase and surface fuels may become drier.**
- *Favor fire tolerant tree species where possible*: **This would improve vegetation tolerance to low- and mixed-severity fires.**
- *Reduce surface fuels*: **This reduces potential flame length and decreases the resistance to control**.

Current management

Current direction is to suppress all wildfires on NFS land in the DCEMP area. With respect to fuels treatment, the forest-wide standards and guidelines call for an evaluation of alternative methods of treatment for logging slash at the project level, and for selecting a method

commensurate with resource management objectives. Some woody debris is to remain on-site to benefit resources such as soil, water, and wildlife.

Fuel treatments are intended to conform to air quality guidelines. **This can be accomplished by treating slash using specialized harvest methods that minimize logging residues (whole-tree yarding, leave top attached yarding, yarding un-utilized material), prescribed fire, rearranging fuel profiles, increasing utilization of woody fiber, or selecting alternative methods that minimize contiguous harvest blocks. There are some units where not treating some slash is an option.**

Prescribed fire activities consuming more than 100 tons of fuel within a 24-hour period requires individual approval from the State of Washington. The State considers ignition methods, timing, air quality, weather, and dispersion potential.

National Fire Plan

The DCEMP was initiated before the National Fire Plan (NFP) came into effect and was not analyzed to meet NFP objectives. However the DCEMP does propose to treat stands in critical areas that would share objectives with the NFP. There is 29.5 miles of private and NFS interface boundary within the DCEMP area, which translates into 13,467 acres of wildland urban interface. The Colville National Forest is currently proposing a NFP Environmental Analysis, under which the interface boundary within the Deadman Creek project would be analyzed for further NFP-type treatments. **There is also private land including year-around residences within the Colville National Forest administration boundary.**

All stand treatments that are occurring immediately adjacent to private lands would have post harvest fuels treatment. Fuels treatments include yarding timber with tops and branches attached, grapple piling, and jackpot and underburning. These treatments would have an impact in reducing fire severity around private lands as well as reducing the resistance to control should a wildfire occur.

There are also four natural fuels treatment units proposed in the project. Two of these units are adjacent to private land. There is no commercial harvest associated with these; the objective is to reduce natural dead and down material decreasing the risk of catastrophic fire. The natural fuels units adjacent to private land would meet NFP objectives and also assist in reducing fire severity.

Assumptions

A desired fuels condition for residues generated from timber harvest is to lower or maintain the level of risk of damage from wildfire at the level which existed prior to harvest. It is assumed that treatment of slash in selected units would maintain or lower the risk of resource damage from wildfire in and adjacent to these units. In the event of a wildfire occurring in an area that has been treated for slash abatement, a lower intensity fire with lesser rates of spread would be anticipated. The risk of high intensity fire would be diminished the longer un-treated fuels are left to decompose without incurring a wildfire.

In the quantitative sense, it is the volume and arrangement of fine woody fuels that are most responsive to fire spread and resistance to control: a lower volume

of fine fuels, unevenly distributed, can produce the lower severity non-lethal surface fire. Fire behavior has been defined in part as a function of the interaction of fuels, weather, and topography; resource managers can influence the fuels profile by modifying the fuels component on the landscape.

History

Woody debris across the landscape has probably gone through "boom or bust" periods. Catastrophic fires resulted in blackened landscapes where woody debris was at a minimum. The amount of wood on the ground increased thereafter as a result of falling snags. Once most of the snags had fallen, there was a time of stability in the amount of ground wood, until the next fire or possibly insect epidemic killed more trees. Most of the snags resulting from the fires of the 1920s have fallen, and for the most part, are decomposing and being incorporated into the soil as organic matter. Much of the logging that has taken place in the last 20 years was regeneration harvesting, where heavy fuel beds were put on the ground. This type of logging necessitated broadcast burning of the harvested areas, in order to prepare the site for planting.

Existing condition

The existing fuel loading within the proposed harvest units is approximately 13.5 tons per acre. Natural fuels in the watershed are considered moderate and probably within historic conditions except in places of insect and disease outbreaks and storm damaged areas (like wind-throw areas). Overall, the analysis area is slightly below what is generally regarded as necessary ground wood for long-term site-productivity maintenance. The trend, when viewed over a long period of time, shows gradual improvement in this situation. Activity fuels would create a fire hazard in areas of heavier natural loadings in some units. These areas have been identified and prescribed a post harvest treatment to reduce both natural and activity fuels.

Criteria for evaluating whether or not to treat harvest slash, and the method of treatment, was based on several factors including but not limited to: forest-wide standards and guidelines, management area prescriptions, silvicultural prescriptions, slope and aspect, fuel loadings, leave-tree species, soils, accumulated fuel loading (existing/created/total), proximity of harvest units to one another, and cost of treatments. For a full list of units and proposed post-harvest treatments see Appendix C, silviculture treatment tables.

3.6.2 Air Quality

Current management of sensitive areas

The Federal Clean Air Act, as revised in 1991, is a legal mandate designed to protect human health and welfare from air pollution. The act defines National Ambient Air Quality Standards (NAAQS) as levels of pollutant above which detrimental effects on human health and welfare could occur. An area that is found to be in violation of NAAQS is called a non-attainment area. Pollution sources in these areas are subject to tighter restrictions.

The Deadman Project Planning Area is not located in a non-attainment area. The city of Spokane, located approximately 90 miles to the southeast, is considered a non-attainment area. Prescribed fire operations on days where weather conditions are conducive to smoke intrusion into the city of Spokane are not permitted by the State of Washington (Department of Ecology and Department of Natural resources).

The Clean Air Act also contains a provision called the Prevention of Significant Deterioration (PSD). This provision was designed to prevent areas that currently have very clean air from being polluted up to the maximum point established by the NAAQS. Three air quality classes (I, II, and III) were established. Class I airsheds are subject to the tightest restrictions. The closest Class I airshed is the Pasayton Wilderness, on the Okanagon National Forest, approximately 75 miles west of the project area. **The risk of smoke intrusion into the Pasayton Wilderness airshed from any prescribed fire operations in the project area would be minimal due to distance and prevailing winds.**

Smoke intrusion from a large wildfire, however, is possible in the aforementioned areas under the right atmospheric conditions.

Current management of particulates

Particulate standards were originally defined in terms of Total Suspended Particulate (TSP). Recently, the Environmental Protection Agency (EPA) has changed the particulate standard to apply to small particulates less than 10 microns in diameter (PM10). This change was made because PM10 is too small to be effectively filtered by the human respiratory system and much of it penetrates deep into the lungs.

The size class distribution for wood smoke particles is such that about 82 percent of the particles range between 0.01 and 0.99 microns, 10 percent range between 1.0 and 4.99 microns and 8 percent range between 5.0 and 15.0 microns. The most efficient particle sizes for scattering light, and thus reducing visibility, range between 0.3 and 0.7 microns, the range of wavelengths for light in the visible spectrum. The majority of particulate emissions from wood combustion (82 percent) are in the size range that most efficiently reduces visibility.

PM10 has been established as a primary air quality parameter because of adverse human health effects. When inhaled these small particulates can cause respiratory problems, especially in smoke sensitive portions individuals such as the young, elderly or those predisposed to respiratory ailments.

Existing condition

The Deadman Project Planning Area is located in the middle area of the Three Rivers Ranger District on the Colville National Forest. Air quality in this area is generally considered very good. Occasional impacts occur due to smoke from wildfires and debris/waste burning.

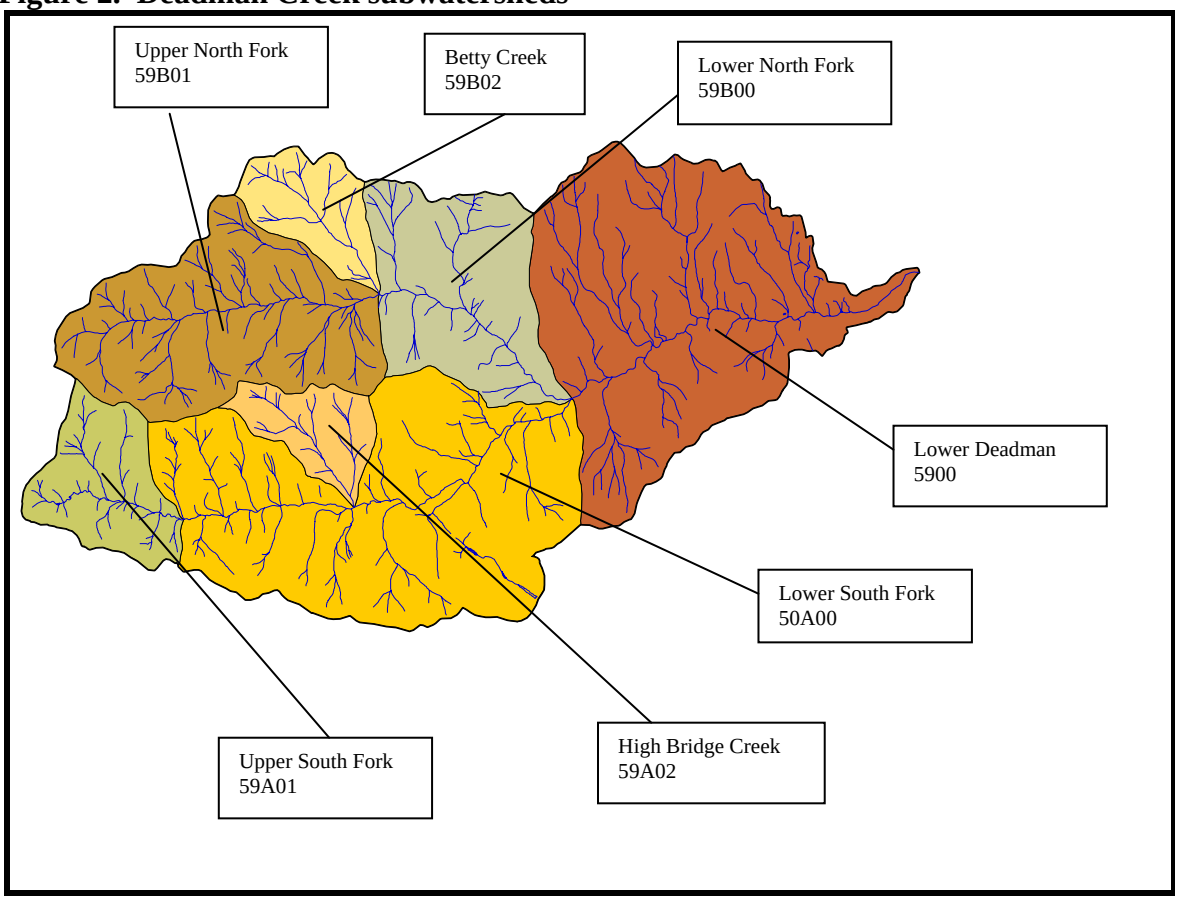
Air quality monitoring stations have not been established in this area. Consequently, existing air quality data does not exist. Generally a short-term degradation in air quality is associated with prescribed fire activities. No known record of adverse impact of air quality has ever been filed due to prescribed fire activities on the Three Rivers Ranger District.

Generally, wind patterns in this area fluctuate on a diurnal and seasonal pattern. Daytime ridge top winds are generally southwest during the summer and fall. This prevailing wind usually pushes smoke particulates to the northeast. Nighttime winds are generally light and a downslope/down valley direction, which may allow particulates to move down the Deadman Creek drainage. There is an area along the lower reaches of Deadman Creek where several

residences are located. **Many are year-round residences occupied by families with children, as well as retired and semi-retired citizens.** Smoke emissions during prescribed fire operations could reside in this localized area due to wind-drifted smoke. **This effect (should it occur) would be anticipated to last approximately 24 hours.** It is noteworthy that during past prescribed fire operations in at least the past decade, there has been no record of air quality impacts to this locale.

3.7 Hydrology

Figure 2. Deadman Creek subwatersheds



3.7.1 Introduction

The following section and the effects analysis in section 4.5 was prepared from resource reports prepared by the project hydrologists.

Deadman Creek is a mostly forested watershed located in the northeastern portion of Ferry County, Washington. It covers approximately 1.5 percent of the larger Kettle River watershed and drains into the Kettle River and Lake Roosevelt northwest of the town of Kettle Falls, Washington (population approximately 1,300). This portion of the Kettle River is under the influence of the backwaters behind Grand Coulee Dam on the Columbia River. The confluence of the Kettle and Columbia Rivers (Lake Roosevelt) is approximately 3 river miles downstream from the mouth of Deadman Creek. Deadman Creek is a fifth-order (Leopold et al. 1964), east flowing, Class II stream. It is fed by several smaller 3rd and 4th order

subwatersheds including Betty Creek (a tributary of the North Fork), and High Bridge Creek (a tributary of the South Fork).

The analysis area for hydrology is the Deadman Creek watershed boundaries (see Appendix F).
Dominant stream valleys are either U-shaped or narrow and deeply incised. The watershed is moderately dissected and characterized by heavily forested mountainous terrain of modest elevation. Valley slopes rise steeply, but rarely precipitously, to the mountains.

3.7.2 Landscape Features and Erosion Processes

The eastern part of the watershed (lower Deadman Creek) is composed of steep mountain slopes. Soils are thin and are intermixed with abundant "rockland". Deadman Creek is confined in a deep V-shaped valley incised as deeply as 160 feet below a high terrace composed of medium to coarse textured glacial drift. Slopes on both sides of the stream channel frequently exceed 60 percent, and are subject to debris slides and gully erosion. Deadman Creek County Road 460 crosses this landform and contains cutslopes and fillslopes up to 80 feet high. These road features are actively eroding with sheet, rill, and gully erosion as well as debris torrents and rotational slumps. Concentrated surface runoff from the road travelway is creating fillslope gullies. These gullies carry sidecast material from road maintenance blading off-site.

The next section of the watershed extends upstream from the junction of County Roads 460 and 465 to the junction of the North and South Forks of Deadman Creek, the latter of which is also referred to as "Deadman Creek". A broad outwash terrace occupies most of the valley in this area. The stream is less confined than the lower section, and the valley floor is flat and up to 300 feet wide. Most of the land in the valley is privately owned and is utilized either for rural residential dwellings or as ranchland for pasture, grains, and hay. Prior to settlement, sheet and rill erosion probably dominated the natural erosional processes of this area. Road and livestock generated sediments currently add to natural background levels of erosion. Stream densities, especially on the south aspects are lower than in the rest of the watershed, and flows from several streams infiltrate the valley terrace during most of the year. This means that they are not directly connected with the main stem of Deadman Creek except during periods of peak flows. North-facing slopes in this area are mapped as steep, glacial drift-mantled mountain slopes and breaklands where extensive rock outcrops are mixed with shallow soils. There are very few roads on this side of the basin and the rates of sediment production have probably not changed from baseline levels. Soil creep is the dominant erosional process in this part of the basin.

The basins of the North and South Forks of Deadman Creek are similar in size (approximately 24.5 square miles and 21 square miles, respectively). These subwatersheds are characterized by moderate to steep glaciated mountain slopes and are underlain by granitic and gneissic rock. Areas of deep soils on glacial drift are intermixed with scoured rock and shallow soil complexes. Scar and Togo soils are characteristic of the north-facing slopes, and are found on south-facing slopes at the top of the watershed as well. The high permeability of these deeper soils is expected to buffer any tendency toward flashy runoff in these basins. Prior to EuroAmerican settlement, erosion processes were probably dominated by soil creep on the north-facing slopes. Debris

torrents occurred infrequently except after large fires. Sheet and rill erosion commonly occurred on the more open south-facing slopes especially after fires, however soil creep probably dominated as the primary erosion process in the watershed.

Deadman Creek (South Fork) flows through a valley of medium width (usually less than 300 feet) with large areas of glacial outwash terraces and ice-margin depositional features. In some areas, the tributaries of the main stem end in alluvial fans and lose their surface flow before reaching the main stem. Beaver ponds and wetlands exist in these areas also. Valley soils are primarily derived from glacial outwash and are very coarse-textured. Because of this, subsurface flow is an important part of the hydrologic regime, and the system is therefore somewhat protected against flashy high flows. **This would seem to indicate that low flows might play an important role in limiting fish habitat; however this does not correlate with field observations. Although they constitute only 0.6% of the watershed, wetlands are apparently helping to sustain low flows as well as moderating high flows, especially during periods of drought.**

An even larger proportion of the North Fork subwatershed is covered by deep, coarse-textured, glacial outwash soils. These soils are on high terraces that border and confine the main valley to a comparatively narrow width in most reaches (usually less than 150 feet). These coarse-textured soils are responsible for the loss of surface flows in some of the smaller tributaries before they reach the main stem of the North Fork. The exception to this generalization is the reach of the main stem above Merkel Canyon. **Steep, outwash terrace escarpments that are prone to various forms of mass erosion tightly confine it. Merkel Canyon is a glacial melt-water feature with little or no water storage capacity except in the wetlands at the head of the canyon**. However, most of the North Fork subwatersheds have good infiltration rates and transmit water through the soil rather than on the surface, thus having fairly well modulated high flows.

3.7.3 Historic Influences on Hydrology

Fire has dominated the natural disturbance regime of the Deadman Creek watershed. At least three large fires have occurred within the boundaries of the analysis area since 1900. The largest of these was the Dollar Mountain fire in 1929. **This fire originated two drainages south of Deadman Creek in Barnaby Creek and moved northward covering most of the Sherman Creek and Deadman Creek watersheds.**

These fires probably caused an increase in both water yield and sediment production to the main valleys in the decades following the fires. These fire effects, however, were probably moderated since annual precipitation remained below average for several years. **Flow data from the Colville River indicates that floods did not occur until 1938.** Downfall timber from these fires, combined with the continued drought and low flows, may have resulted in drainages storing sediment rather than flushing it through the system. **This may have resulted in an increase of water-detaining wetlands. If wetland riparian vegetation had recovered rapidly, this would have encouraged beaver occupancy, further enhancing both water and sediment storage.**

Large-scale timber harvest probably began in the analysis area as soon as timber stands began to reach full hydrologic recovery (approximately 30 years after the fires). **The development of a road system to access timber stands also began during the same time. Logging in**

both the North Fork and South Fork subwatersheds began in the 1960s, and reached a peak during the 1980s. Overall, logging has been more intensive in the North Fork. Based on aerial photo interpretation and the database of silviculture activities maintained on the Three Rivers Ranger District, approximately 13,740 acres of timber harvest and road construction has occurred within the Deadman Creek watershed. This includes timber harvest on private ownership within the analysis area. Approximately 4,212 acres of created openings currently exist in the watershed. The difference between the total acres of harvest and roads and the area currently in created openings is due to the hydrologic recovery that has taken place (also see section 3.7.9, ECA).

Large-scale timber harvest and road development did not begin until the early 1980s in Betty Creek. Road densities in the Betty Creek basin average (4.5 mi/mi2). Road construction and logging began on a relatively small scale in High Bridge Creek in the late 1970s. Larger scale clear-cutting occurred in High Bridge Creek in 1993 and 1994. Road densities in the High Bridge basin average 4.7 mi/mi2. Management activities in both Betty and High Bridge Creeks may have occurred at a level great enough to increase the risk of channel-forming peak flows.

3.7.4 Management

The Colville National Forest Land and Resource Management Plan (CNF LRMP) states that all management activities will:

- **Maintain water quantity and quality within natural variability and Washington State water quality standards;**
- **Manage for riparian plant communities that maintain a high level of riparian dependent resources;**
- **Maintain or restore stream channel dynamic equilibrium and full linkage between channels and their associated riparian areas;**
- **Provide a diversity of high quality aquatic habitats to support viable populations of fish.**
- **Minimum standards for accomplishment of these goals are included in the Forest Plan with amendments. These amendments include the Inland Native Fish Strategy (INFISH), which outlines specific objectives such as pools per mile, water temperature, amount of woody debris, and others. In November 1996, the Chief of the Forest Service adopted the "Process for Assessing Proper Functioning Condition" as the minimum standard for evaluating riparian condition assessment (TR 1737-9 1993, USDI, BLM). The desired future condition for soil, water, and riparian conditions are those that sustain diverse and desired biological communities and other beneficial uses of water under normal climatic conditions. They are also resilient when subjected to extreme climatic events or other disturbances, so that biological communities and other beneficial uses are minimally disrupted**

3.7.5 Hydrology Issues

Two key issues were identified in the DCEMP analysis from public and internal agency scoping. These issues were the effects to resources (including water quality) of entry into roadless and other similar areas lacking classified roads, and new road construction. Public comments focused on the potential impacts from timber management activities and associated road construction. The issues that relate to water resources include:

- Forest management activities may disrupt natural hydrologic patterns and affect surface

and ground water flows (stream flow regime and created openings);

- Forest management activities may affect water quality in streams and wetlands by removing natural barriers and increasing cattle access to riparian areas (water quality, coliform).
- Forest management activities may cause erosion and sedimentation that degrades aquatic habitat and violates state water quality standards (sedimentation).

3.7.6 Streamflow Regime

The hydrology of the Northern Glaciated Mountains Ecological Reporting Unit, in which Deadman Creek watershed is located, is best characterized as snow-pack dominated (USDA Forest Service 1997, ICBEMP). More than half the annual runoff is estimated to be snowmelt influenced, about a third by snow and rain, and about 10 percent by groundwater. Peak discharge generally occurs from May through June. Periodic rain-on-snow events, however, can cause elevated streamflow during winter months and cause runoff damage from peak flows. There are 11,536 acres (28 percent) of the analysis area, generally at the lower elevations, that would be considered at-risk of such an occurrence. Late spring, rain-on-snow events and/or Chinook wind events are more common, but they are usually confined to the higher elevations and resulting peak flows are localized and usually not excessive (ICBEMP, USDA Forest Service1997). Generally, base flow in the summer is maintained by groundwater and is relatively unaffected by precipitation, although precipitation in the form of infrequent showers or occasional storms may cause minor streamflow increases. Precipitation ranges from about 15 inches at the lowest elevations to around 30 inches in the higher portions of the North Fork.

Peak flows

Near bankfull flows measured at three sites on the North Fork of Deadman Creek in April 1996 varied between 2.1 and 2.6 cubic feet per second per square mile (cfs/mi2). The highest measured flow in the Colville National Forest database on the South Fork of Deadman Creek is 3.1 cfs/mi2. The runoff regime in the upper basins of the Deadman Creek watershed appear to be snowmelt dominated, and best characterized as peaking in April and May. Weekly spring flow measurements were taken with a velocity head rod on the North Fork of Deadman Creek in the late 1960s shortly after large-scale timber harvest began in the lower North Fork basin. These records show the highest flows occurring in early to mid-May. Earlier snowmelt undoubtedly occurs in the lower part of the watershed, especially on the large south-facing slopes. Mid-winter melt events caused by rain and/or warm temperatures probably occur in the lower areas. **Under frozen ground conditions this could cause mid-winter peak flows in the low order tributaries of these south slopes (Clarkin 1997). Cumulative effects to peak flows are modeled using the Colville National Forest Equivalent Clearcut Acres model (see section 3.7.9).**

Low flows

Late summer, low flow measurements at the South Fork monitoring station near the bridge at the junction of FS Roads 9565.360 and 9565 ranged between 0.16 and 0.3 cfs/mi2. On a drainage area average, same-day flows measured in August 1994 on Deadman Creek were consistently at least double those of Sherman Creek (the next large drainage to the south on the east side of the Kettle Range) (Clarkin 1997).

3.7.7 Water Quality

Monthly water quality samples were taken on the South Fork of Deadman Creek from 1991 through 1995. No additional water quality samples have been taken since 1995. Total Dissolved Solids (TDS), pH, water temperature, and fecal coliform were among the parameters sampled. TDS concentrations range between 25 and 125 milligrams per liter (mg/L) and averaged 83 mg/L. These readings are similar to TDS results in Sherman Creek. Measured water temperatures have not exceeded 15 degrees Celsius (59 degrees Fahrenheit), and pH values are alkaline (averaging 8.3 with a range between 7.5 to 8.4). Fecal coliforms were sampled because livestock in the watershed congregate in riparian areas and may adversely affect water quality. The geometric means for the sample sets from 1991 through 1995 are all less than 14 colonies/100 milliliters (ml). "Fecal coliform organism levels shall both not exceed a geometric mean value of 50 colonies/100 ml and not have more than 10 percent of all samples obtained for calculating the geometric mean value exceeding 100 colonies/100ml" (WAC 173-201A 1997). Only one sample out of 33 exceeded 100 colonies/100ml. State water quality standards have been maintained for all the parameters tested on Deadman Creek. The North Fork of Deadman Creek has not been sampled, but there is no reason to believe that the results would be substantially different from the South Fork except possibly for turbidity.

- **The chemical constituents of Deadman Creek water fully support beneficial uses and meet Washington State water quality standards. Limitations to beneficial uses appear to be related to channel conditions discussed in section 3.8 Fisheries.**

3.7.8 Sedimentation

Sediment delivery from roads has been documented in the past and is clearly observable now. Management activities have introduced sediment to the North Fork from the 1970s (or earlier) through the present. Riparian roads parallel for much of their length both the North and South Forks of Deadman Creek. About 17 percent (23 miles) of the roads within the Deadman Creek watershed are classified as "riparian roads". Riparian roads are defined here as classified roads located within Riparian Habitat Conservation Areas (RHCAs).

Model and assumptions

Sedimentation from the Deadman Creek watershed road system was modeled using the Washington State Timber Fish and Wildlife procedure (Washington Forest Practices Board, 1993). The methodology used by the model considers both mass wasting and surface erosion as factors; however, on a watershed scale mass wasting does not appear to play a major role in the erosional processes within the Deadman Creek watershed. This assumption was verified through subsequent field observations and aerial photo interpretation. As a result, mass wasting was dropped from further analysis in this model. The model also divides surface erosion into two factors: hillslope erosion and erosion from roads. Hillslope erosion is dependent on the proximity of the erosion source to streams, slope angle, soil texture, and areas where overland flows occur. Hillslope erosion was also eliminated from further consideration under this model because field evidence within the planning area indicates that overland flows (not related to roads) are not reaching streams and/or were not occurring at all. Road erosion was identified as the only agent likely to influence sediment delivery to streams,

and therefore, was the only factor considered for further analysis in this model. Several additional model assumptions need to be stated for clarification:

- **Surface erosion occurs from nearly all roads, however sediment delivery to streams normally occurs:**
  1. **When ditches or culverts drain near a stream channel (within 200 feet) sediment delivery ratio is assumed to be 100 percent within this zone.**
  2. **Within a 200-foot buffer distance from the stream at other locations, delivery is based on the probability of down slope sediment transport. Outside the buffer zone, sediment supply to streams is assumed inconsequential because of the low probability of delivery.**
- **During wet weather, heavily trafficked roads produce substantially more sediment than do abandoned or low use roads.**
- **Most road construction sediment is produced within the first three years of life of the road, but sedimentation may continue at a reduced rate for longer periods.**
- **Ridge-top and other roads not draining to defined channels are considered non-contributing.**

Based on these assumptions, the model uses road construction types, geologic parent material, stream class, road width, road segment length within 200 feet of the stream, vegetative cover on cut and fill slopes, road surfacing material, and traffic levels to arrive at an estimate of sediment delivered to streams in tons per square mile per year (tons/mi2/yr). Most roads within the analysis area were surveyed to determine contributing lengths, geologic parent material and other factors. This actual field data was used in the model calculations rather than general estimates.

Existing conditions

Baseline natural sediment delivery and road sediment delivery are displayed in Figure 3. Natural sediment delivery rates range from approximately 24 tons per square mile per year (tons/mi2/yr) in the Upper South Fork to a high of about 29 tons/mi2/yr in the High Bridge Creek subbasin. The average natural sediment delivery in the entire Deadman Creek watershed is about 23 tons/mi2/yr. Natural delivery rates are likely much higher following stand replacing fires like the Dollar Mountain fire of 1929. Road sediment delivery is highest in the High Bridge Creek subbasin with approximately 17 tons/mi2/yr, and lowest on the Upper North Fork with about 1 ton/mi2/yr.

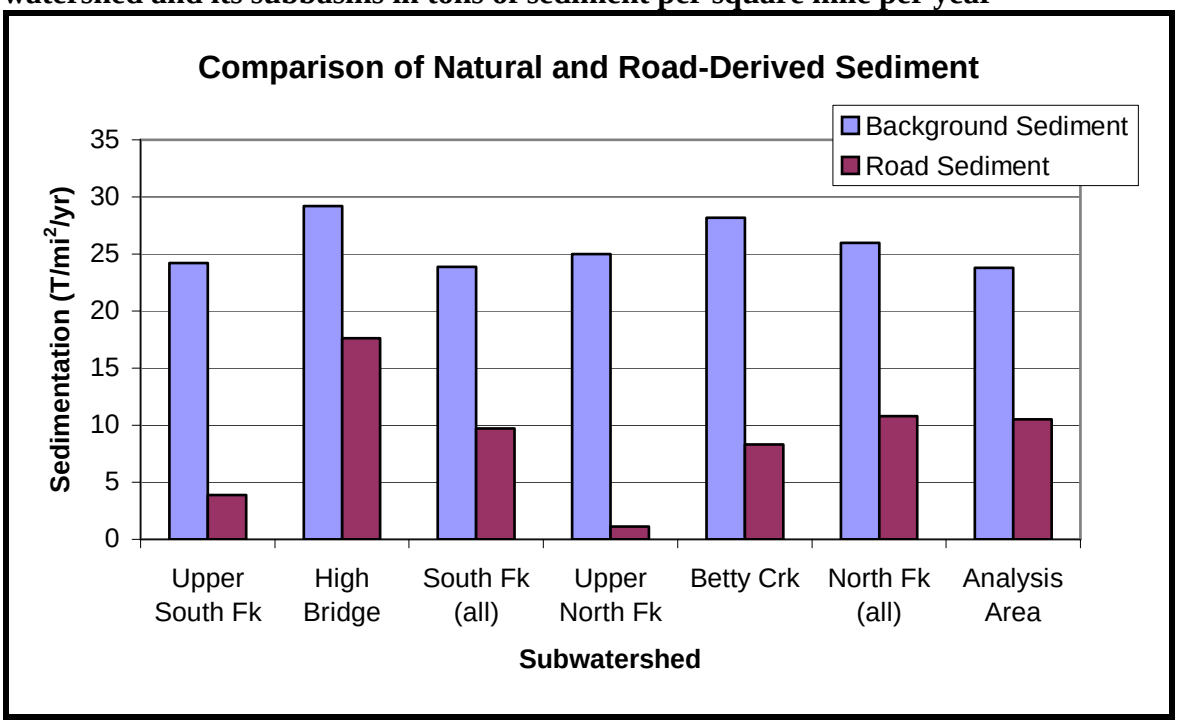
3.7.9 Equivalent Clearcut Area

Model and assumptions

The equivalent clearcut area (ECA) model (Wasson et al. 1992) is used to express the percentage of hydrologic openings in a watershed and accounts for vegetative recovery occurring since the initial disturbance. The ECA analysis for the existing condition consists of adding ECAs of roads, harvest units, and wildfires that have occurred over the last thirty years. ECAs are based on the number of acres treated, the percent of vegetation removed, and the year of treatment. As timber is removed and/or roads constructed, the amount of water yield (stream discharge) may increase due to changes in interception and evapotranspiration. These changes may cause peak flows that could potentially result in channel damage if

the created openings of a 3rd order (or larger) watershed exceeds 25 percent of the area (Wasson et al. 1992). It is expected that less than 25 percent of created openings dispersed within a watershed will not cause significant adverse cumulative effects and will meet water quality goals for the forest (Forest Plan FEIS p. IV-17). As the vegetation in these areas becomes reestablished, the watershed begins to recover hydrologically. Recovery in the ECA model is considered complete when a fully stocked stand of new trees reaches a height of 35 feet (assumed to occur 30 years after treatment) (Wasson 1992). The recovery curve used in this analysis has been modified to reflect tree growth as modeled in the Forest Plan. Assumptions stated for the Washington State TFW model above are similar to assumptions used in the ECA model.

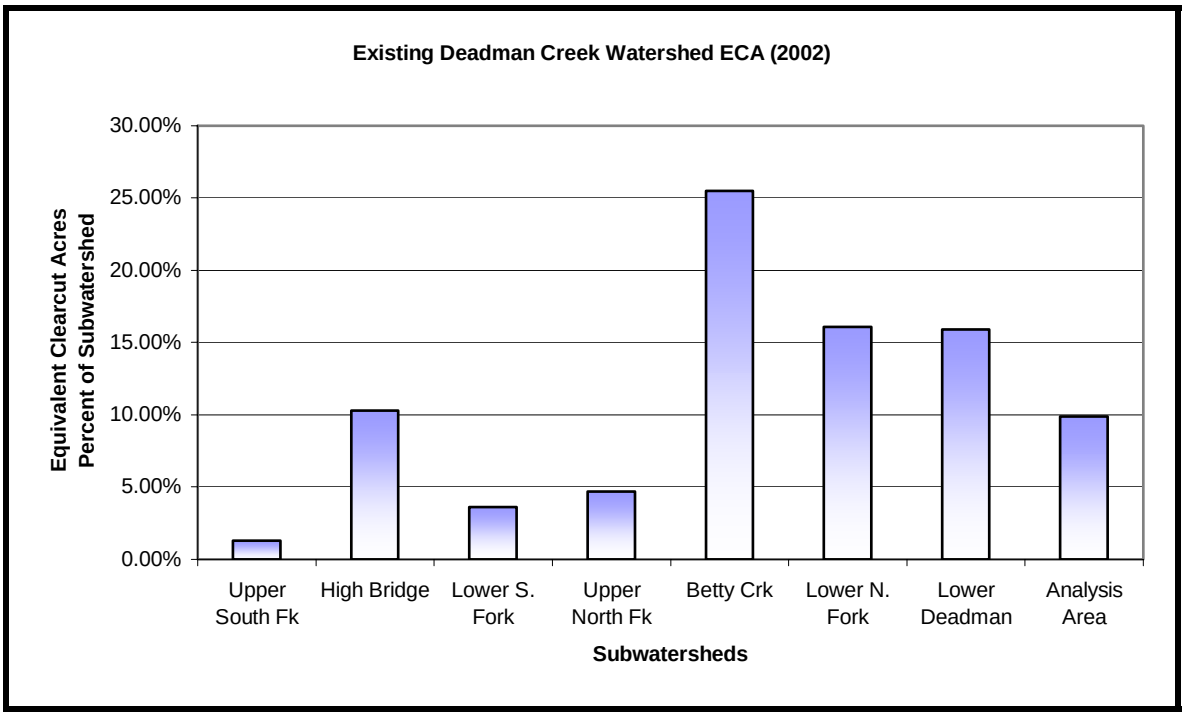
Figure 3. Comparison of natural and road-derived sediments in the Deadman Creek watershed and its subbasins in tons of sediment per square mile per year



ECA Existing condition

Betty Creek currently exceeds the Colville National Forest threshold of concern for created openings (25.5 percent). The ECA for this subwatershed first reached 25 percent in 1987. Although it has exceeded the threshold for 15 years, field observations indicate that peak flows have not increased enough to alter stream channels. Coarse-textured, glacial outwash soils cover between 30 and 50 percent of this basin and probably offset the effects of any increased water yield resulting from management activities. Betty Creek appears to be stable and resistant to erosion. Several low order tributaries with less than 95 percent of their banks rated as stable were also surveyed. Channels in these landscape positions should be responsive to increased flows or sediment loadings, but no large responses were identified. The remainder of the third order subwatersheds within the analysis area are all well below the Forest's ECA threshold of concern.

Figure 4. Equivalent Clearcut Acres (ECA) in percent by subwatershed in Deadman Creek Watershed



Roads, Landings, and Skid Trails

Road densities in Betty Creek and High Bridge Creek are higher than the remainder of the watershed. Water is being concentrated on roads and skid trails and is causing channel cutting below ditch relief culverts, however these ephemeral channels rarely connected with defined streams. This discontinuous cutting is common on the gentle slopes of lower Deadman Creek, along FS Road 9565.800 in North Deadman Creek subwatershed, and in portions of Betty, High Bridge, and Bailey Creeks. Overland flow was observed in many of these areas during spring runoff in 1996. It frequently appears to be associated with tractor units where it cascades over road cutslopes after being concentrated by skid trails. Ephemeral draws can also carry substantial amounts of water during snowmelt with similar results. Under such conditions, if ditches are impeded by vegetation or sloughed cutslope material, the road may saturate and fail. Landings in tractor units above roads have frequently been located near stream crossings. They have usually been effectively seeded with an erosion control mix of grass seed and are therefore attractive to cattle. In addition to continuing to cause soil compaction, they also breach water bars on old skid trails. This can decrease sediment storage capacities and channel runoff to stream channels.

3.8 Fisheries

3.8.1 Introduction

The following section and the effects analysis in section 4.6 was edited from a fisheries (aquatics) report by the project fisheries biologist. The report can be found in its entirety in the analysis file. The analysis area for fisheries is the Deadman Creek watershed boundaries.

Management direction

The Forest Plan (including the Inland Native Fish Strategy, INFISH) provides

direction for classification of all wetlands within forest watersheds into Riparian Habitat Conservation Areas (RHCAs). These RHCAs are then tied to riparian management objectives (RMOs) aimed at providing a diversity of high quality aquatic habitats to support viable fish populations. Objectives include managing for riparian plant communities that maintain high levels of riparian dependent resources, and restoring stream channels and the relationship between them and their associated riparian areas. Standards were defined for attributes of stream channels including the number of pieces of large woody debris (LWD) per mile, pools per mile (PPM) and the wetted width to depth ratio. For purposes of this analysis wetted width was replaced with bankfull width, considered by the fisheries biologist to be less variable and more repeatable over time. Channel conditions and aquatic habitat are discussed in terms of stream reaches and subwatersheds. The reader is referred to the stream reach and subwatershed map in Appendix F for locating these areas.

Stream order is a measure of the position of a stream in the hierarchy of tributaries. First-order streams are those that have no tributaries. The second-order steams are those that have as tributaries only first-order channels. However, each second-order stream is considered to extend headward to the tip of the longest tributary it drains. A third-order stream receives as tributaries only first- and second-order channels, and is considered to extend headward to the end of the longest tributary, and so on (Leopold et al. 1964).

History

Riparian vegetation, while being among the first altered by humans, also has the ability to recover more quickly than most upland sites because of the abundance of water and generally deeper soils. Historically, these areas were sites of dense vegetation and large trees. Most of the stream courses were shade covered, with only small breaks in the canopy formed when a large tree fell. When this occurred, brush and hardwoods would colonize the site for a time, until conifers eventually regenerated. The cycle would begin again as conifers overtopped the brush and grew tall with large crowns. Streams on warmer sites were less overtopped with conifers, because the surrounding stands were generally less dense due to the drying effects and species differences associated with southerly aspects. Willow, alder and other hardwoods were probably the major shrub species in lower elevations, particularly in the Douglas-fir biophysical environment.

When the intense fires burned through some stream channels in the 1920s, they destroyed the immediate potential for woody debris recruitment. Timber practices of the 1960s to 1980s harvested close to streams, as well as cleaning out stream channels, both of which leave channels with less than optimum large woody debris. In some cases, there is no trace of the stands that once existed. The most noticeable case of riparian harvesting is along Betty Creek. Of the three reaches surveyed on Betty Creek, most of the cattle damage is occurring in the third reach where the riparian harvest occurred. Sedimentation from past haul activities has probably made it through the system and into the Kettle River, though chronic sediment loading from roads remains.

Issues

The effects of entry into inventoried roadless areas and effects of new road construction on water quality and wildlife habitat were key issues in the public scoping (section 2.3). There are no fish bearing streams within the inventoried

roadless areas and no management activities proposed in any inventoried roadless area in a RHCA. The elements of these issues that relate to fisheries include:

- **New road construction may increase sediments in streams and affect habitat suitability for fish populations (sedimentation)**
- **Forest management activities may affect channel structure in streams and wetlands by removing natural barriers and increasing cattle and human access to riparian areas (grazing, trampling, firewood removal)**

3.8.2 Fisheries Distribution

The fisheries distribution and species composition in the area is heavily influenced by past fish stocking, habitat quality, and barriers to fish migration. Past stocking introduced Eastern brook trout into the Deadman Creek watershed. They were stocked in the watershed from 1933 to1982. Brook trout have thrived in the poorer quality habitats resulting from past timber harvest, cattle damage, and roading. Redband trout are thriving in the watershed especially where barriers have kept brook trout out of the stream. Overall this system is a unique fishery because of the genetically pure populations of redband trout. They are able to survive in very small headwater streams and to adapt to changes in habitat such as would result from fire. Redband trout are currently on the Regional Forester's list of Pacific Northwest Region Sensitive Species. Eastern brook trout are included with other trout as a Management Indicator Species in the Colville National Forest Plan.

Redband trout and Eastern brook trout are the only fish species found in the watershed. Coastal rainbow trout were stocked from 1936 to1955 but are no longer present. While individual bull trout have been found in the Kettle River at the mouth of Boulder Creek, there has not been a population documented in the any of the Kettle River Drainages to the Canadian Border. No bull trout were found in Deadman Creek fish population surveys in 1991, 1996, 1997, and 2002. The Bull Trout Draft Recovery Plan states that at the time of listing, the U.S. Fish and Wildlife Service identified only one subpopulation (South Fork Salmo River) within the Northeast Washington Recovery Unit (USFWS 2002), the area in which the DCEMP occurs. The USFWS stated that bull trout in the Kettle River might have been extirpated.

No Westslope Cutthroat trout have been found within the watershed. They were stocked in 1946 in Deadman Creek; however none have been found since. Only one population of cutthroat trout has been found in the Kettle River Drainage below the Canadian border, in Little Boulder Creek. This stream is located approximately 20 river miles north of the Deadman Creek confluence with Kettle River. Deadman Creek is isolated from this population and the Kettle River by a barrier culvert under Highway 395. This analysis will focus on redband trout and eastern brook trout. Habitat for bull trout and westslope cutthroat trout would be protected through the INFISH standards and guidelines.

3.8.3 Historic Influences on Fisheries and Channel Conditions

The Dollar Mountain fire burned through riparian areas in the North Fork as well as in the upper South Fork Deadman Creek. By the 1960s, the deadfall was so dense

that it was thought to be causing channel erosion and threatening the North Fork Deadman Creek riparian area adjacent to FS Road 9565.320. The North Fork between Merkel Canyon and Betty Creek was subsequently cleared of debris in 1961. Project records suggest that in-channel work was limited to winching trees out of the channel. It is not clear if bulldozers moved streambed material and reshaped the banks as was done in Sherman Creek.

The current access route to the upper North Fork basin (FS Road 9565.800) was built around 1980. Until the 1980s, the North Fork (9565.320) road and the jeep trail from Twin Sisters across Betty Creek to Davis Lake provided the only vehicle access to the upper North Fork basin. In spite of this early limited access, extensive cattle trampling was observed in near-stream wetlands and streambanks of the North Fork. A 1972 channel condition inventory highlights channel migration that resulted from fire-killed trees falling into channels, stock trampling, and local sedimentation from roads, jeep trails, and logging practices. The inventory describes inherently very stable streams, where intact downstream reaches were buffering localized, heavy impacts in a few segments. Although we have no comparable inventory on the South Fork, it seems likely that a parallel situation existed given a similar schedule of development.

3.8.4 Channel Conditions

Streams in the watershed that have not been directly affected by management activities (or beaver), appear to be highly stable. Small tributaries are stabilized by dense riparian vegetation and by cobble and boulder channel and bank substrates. Alluvial fans in the main valleys act to buffer the main stem from direct tributary influences provide landforms that permit beaver occupation, and are mantled with alluvial and outwash soils that rapidly absorb and transmit water. These factors combine to protect the main drainages from rapid surface runoff and reduce the risk of erosion. Substantial bank erosion may still occur, however, during wet years. Such an event occurred in 1996 when high flows caused a number of beaver dams to fail.

In addition to roads, the two management factors that currently exercise the most important control over channel condition in the Deadman Creek drainage are stock management in riparian areas, and dispersed recreation along streams. Both occur primarily because access has been created by past riparian logging or road construction. Today, direct impacts from cattle and humans are more detrimental than indirect or cumulative upstream impacts. Stream channels are highly resistant to upstream disturbances so long as they have a full complement of woody debris and riparian vegetation. This gives the channel the ability to temporarily store sediment and water behind debris obstructions. These impacts are then distributed along the channel rather than being routed downstream all at once. Vegetative root strength is enhanced by large woody debris that provides direct bank stabilization and enables channels to withstand high flows.

Roads provide openings for dispersed recreation use and cattle when they are located in or adjacent to riparian areas. In addition to the direct influence of roads, many of these riparian areas have also been previously logged. Some additional effects include:

- Stream bank trampling by cattle and off road vehicles (ORVs) widens streams and increases the bankfull width to bankfull width/depth (W/D) ratio below RMO standards.
- Grazing and trampling by livestock can reduce rooting strength of riparian vegetation. This affects the ability of the vegetation to resist the erosive effects of overbank flows

and retain sediment and water on the flooded area.

- **Removal of downed trees for firewood and as hazard trees reduces current large woody debris (LWD) in channel below RMO minimum (20 pieces per mile). Future sources of large in-channel wood are also reduced.**

In much of the Deadman Creek Watershed, channel structural diversity has been reduced by past management activities that removed woody debris from the creek channel and harvested riparian trees. These impacts are present along Deadman Creek (South Fork) in reaches 3 and 4 and in reach 1 of the North Fork (see map in Appendix F). Also, Betty Creek has undergone harvest along approximately 30 percent of its surveyed length. Cattle trampling impacts also occur on most tributaries that are crossed or paralleled by roads. A description of each stream length is found below. Surveys were taken in 1996, 1997 and 2002. Methods for describing stream reaches are listed in the Fisheries Report in the DCEMP Analysis File at the Three Rivers Ranger District.

Deadman Creek conditions

Kettle River to the confluence of the North Fork of Deadman Creek

The lower portion of the Deadman Creek section, immediately above the Kettle River, flows through a deep V-shaped valley. Boulders are the dominant structural components; woody debris is subdominant. Historically, the lower Deadman section was probably made up of boulder steps between debris jams. Currently there are few debris jams because of old riparian logging. In the past debris jams would have stored fine sediment and gravels and provided fish spawning and rearing habitat as well as adult habitat in large pools. Currently the number of storage sites behind stable debris jams is reduced, but the boulders continue to provide large trout habitat and bank and bed stability. **Based on Stream Channel Stability Field Forms, the stream is stable in relation to upstream hydrologic impacts.** Today riparian vegetation is alder and other hardwoods on the floodplain and low terrace, and small fir and cedars on the second terrace. Historically it was probably alder and hardwoods on the first terrace, but larger fir and cedars on the second terrace. **Redband and brook trout were observed using the remaining debris jams**. Currently the creek is probably not supporting as many fish in terms of size and numbers due to the loss of the debris jams and the large pools, spawning gravels, and cover.

The middle portion of the Deadman Creek section (reaches 1, 2, and 3) is not as confined and steep as the lower section. **Reach 2 was not surveyed because it is on private land**. Woody debris is the dominant structural component and creates many deep pools on stream segments that are not adjacent to roads. **These reaches show evidence of old riparian harvest and some beaver activity**. Riparian plant associations are the same as the lower Deadman reach. However, unlike the lowest reach, there are very few boulders in the banks and bank stability is dependent on large woody debris and the root strength of vegetation. The Deadman Creek road is located adjacent to the stream along much of reach 3. The road template is so close in places that the roadfill is the streambank**. There is a lack of large woody debris (LWD) near the road, while away from the road there are ample LWD and pools. This middle Deadman section has high width to depth ratios due to high quantities of sediment. The channel has high gravel mobility and exhibits bar building where debris is lacking near the road, and/or where sediment supply exceeds transport capacity**. Sediment storage areas are almost full. **This section is the**

receiving reach for sediment transported from the North and South Forks of Deadman Creek. This section also contains a mix of redband and brook trout. The population is below historic levels **due to loss of habitat diversity and high sediment levels. Since fry were collected in the reach, spawning is still occurring and the population is able to replace itself.**

South Fork Deadman Creek conditions

The South Fork begins at the confluence of Deadman Creek and North Fork Deadman Creek. It is divided into five main segments. Redband and brook trout fry were collected in reaches 4 through 8, so spawning is still occurring and the population is sustainable. The first segment (reach 4) extends from the confluence of North Fork to the pasture fence at Bailey Creek**. The riparian plant associations are alder/ladyfern, and cedar/ladyfern. It has a high bankfull width to depth ratio, that is, it is broad and shallow**. Cattle trampling, over-grazing of stream banks and near-stream wetlands (including sediment-filled beaver ponds), and browsing on riparian shrubs have caused the channel to widen and erode. **This has resulted in isolated pieces of former bank forming mid-channel islands. This reach shows a lack of habitat diversity when compared to reach 5, which is a similar channel type, because there is less LWD and residual pool depths are shallower.** The stream is not only wider than natural; it is actively losing floodplain by bank erosion. The dominant structural component is woody debris; **however cattle trampling and browsing, dispersed recreation, and old riparian logging have reduced debris levels. In some areas exposed soil may exceed the forest standard of 5 percent since virtually 100 percent of the surface has been affected by cattle hoof action.** Reach 4 has a mix of redband and brook trout. The population is below historic levels due to **loss of habitat diversity and high sediment levels. Redband trout need higher quality habitat, so this reach is becoming more favorable to brook trout and less suited to redband trout.**

The second segment is reach 5 and it begins above the Bailey pasture fence. Grazing effects are minimal and the reach may be indicative of the potential of reach 4. The banks are stable, and the dominant structural component is woody debris. **There is evidence of old beaver activity, and LWD created by the early 20th century fires. Debris sizes are larger than in reach 4 where fire-killed debris was apparently removed during logging. The riparian vegetation is alder and small cedar with small patches of larger, older cedars**. Reach 5 has a mix of redband and brook trout.

The third segment consists of stream reaches 6 and 8. **They include stretches where the stream is 15 to 20 feet wide and 1.5 feet deep, and the riparian plant association is alder/oakfern. Bank height is approximately 6 inches with a narrow floodplain between 3 to 4 foot terrace banks.** Channel shape is variable, possibly due to old aggradation behind beaver dams and debris jams. There are several side channels. Fire-killed trees provide ample woody debris, and sediment storage is available in the beaver ponds.

At the upper end of reach 8, over 50 abandoned beaver dams failed in 1996, probably during spring snowmelt runoff. This event resulted in severe bank erosion, and a large volume of stored sediment was remobilized. This has affected the near downstream reaches. At the upper end of beaver dam area, on the 3 to 4 foot terraces are intact, occupied beaver ponds, with slides and lodges**. They appear to be fed by slope seepage and/or by infiltrating flow from disconnected tributaries and draws that drain the adjacent south-facing slope.**

Upstream of the beaver dam reach, the South Fork is again a stable channel type with a narrow floodplain between 4 foot terrace slopes. Reaches 6 and 8 support a mix of redband and brook trout**. Since fry were found in the reach, the population is considered viable.** Habitat in these reaches is better suited to brook trout than to redband trout because of low gradients, broken beaver impoundments, and poor habitat quality. The brook trout population is larger than the redband population.

Reach 7 is a short canyon reach separating reaches 6 and 8. The channel is controlled by boulder and bedrock. Many pieces of LWD have fallen into the stream from the surrounding canyon walls. The riparian vegetation is dense alder and red osier dogwood. Competition with brook trout is probably not intense since the stream gradient is better suited for redband trout.

The last valley segment (the upper South Fork Deadman beaver ponds) includes reaches 9 and 10. The upland forest vegetation is dense lodgepole pine that has regenerated after the Dollar Mountain Fire in 1929. The riparian area is covered with jackstraw, fire-killed trees. Numerous old beaver ponds are filled with 1-foot diameter trees that were killed in the burn and later uprooted by wind**. The largest pond (2 feet deep) has been dewatered by a recent break in the abandoned beaver dam. Several of the upstream ponds have been drained by the break in the lower one. Even though this area has abundant LWD, the existing LWD is old and replacements cannot be recruited from the existing riparian vegetation because it is small in diameter and would not create the desired in-stream structure. Sediment storage is moderately full. There are no fish in the reach affected by dam failures**. However, there is a brook trout population with a small number of redband trout in the ponds. Above these ponds, the stream disappears into a meadow**. The hydrologic divide is so low that it is difficult to distinguish where South Fork Deadman Creek ends and North Fork of Sherman Creek begins.**

North Fork Deadman Creek conditions

Five fish bearing stream reaches were identified on the North Fork. They were surveyed in 1996 and 1997. **The tributaries (Merkel and Betty Creeks) were surveyed in 2002.**

The lower four reaches have a mix of redband trout with small populations of brook trout. These reaches generally lack the low gradient, beaver dam sections that are attractive to brook trout. Redband trout are better suited to the riffle-dominated, pool-riffle habitat in these reaches. The two upper reaches contain populations of redband trout. There is a culvert on the FS Road 9565.800 that is a barrier to fish migration. The Colville National Forest is maintaining this barrier to isolate the redband trout population from hybridization with other trout species. There are very few pure strains of redband trout. Management direction is to maintain this unique resource.

The first reach of the North Fork is divided into 2 segments; the first segment (the lower part of reach 1) begins at the confluence with Deadman Creek and ends a half-mile upstream at the bottom of a homestead meadow. **This segment is forested with large cedars and spruce.** Cattle use this segment, but bank damage is not extensive because little access has been created by timber harvest or riparian road construction**. This segment was burned and selectively harvested many years ago.** There is an abundance of woody debris that is the dominant structural element. Parts of this segment are close to the road and receive sediment from it.

Sediment storage sites are moderately full. **Most of the sediment in this reach is probably coming from upstream influences; such as the homestead meadow, bank erosion due to cattle trampling, road failures in reach 3 and from FS Road 9565.320. This segment has high sediment loading.**

The second segment of reach 1 is the 600-foot long Homestead Meadow. This segment continues to be heavily impacted by cattle. The historic riparian vegetation (cedar/oakfern) has been altered by homesteading and currently consists of scattered alders and grass. The channel has downcut several feet, and is laterally unstable. **This segment lacks LWD and has high W/D ratios. High W/D ratios translate to wide and shallow streams that cannot support large trout.** Continuing use by cattle maintains the poor channel conditions and impedes the recovery of the riparian plant community**. Recent changes and enforcement to the grazing permit is improving some of the conditions. The cows are not on these two areas as long. Cattle are having a negative impact to the fisheries; however management is taking an active role in improving the existing situation.**

Reach 2 of the North Fork extends from the upstream end of the Homestead Meadow to Merkel Canyon Creek. FS Road 9565.320 parallels this reach closely. Cattle trampling has occurred along the banks and near-stream wetlands. The road has also generated sediment and contributed to channel instability where the road encroaches against the stream. **This segment lacks LWD and has high W/D ratios.** Sediment storage areas are full.

Reaches 3 and 4 extend from Merkel Canyon upstream to the FS Road 9565.800 crossing. Here the North Fork is confined in a relatively narrow (30 to100 foot wide) V-shaped valley**. Large spruce and cedars are the dominant overstory species in the valley bottom.** Forest Service road 9565.320 parallels this section of the North Fork for most of its length and cattle access is most frequent where low terraces and flood plains exist. The cattle do not impact the banks as much where these low terraces do not exist.

Reach 3 is directly affected by landslides occurring on the FS Road 9565.320 located on the steep terrace scarp above the stream. **Several management actions have occurred along reach 3 to reduce impacts from this road. Portions between Merkel Canyon and Betty Creek were obliterated in the fall of 1998 using fillslope pullback, placement of slash, and grass seeding. Other segments were ripped, seeded, and had drainage structures installed. There was no slope work done in the vicinity of the slide areas since an additional road template would have been constructed to access the areas between the slides with mechanical equipment (dozers and excavators). The slide areas were planted with conifers and seeded with grasses by hand. Some brush species are beginning to invade the slide areas naturally**.

These reaches are extremely resistant to down cutting and bank erosion because of the frequency of boulders that stabilize both bed and banks and because the riparian forest is mostly intact. **Below Betty Creek (reach 3) the W/D is 14 and the LWD pieces per mile is 44, which is above the INFISH Riparian Management Objective (RMO) for a minimum of 20. Above Betty Creek, reach 4 lacks LWD (8 pieces per mile), but the W/D ratio is 12; it is slightly deeper and/or less wide. The top of reach 4, a segment located approximately 1/2 mile downstream from the FS Road 9565.800 stream crossing is not paralleled by FS Road 9565.320 and, therefore, is not easily**

accessed by cattle.

From FS Road 9565.800 to the line between section 21 and 22 (most of reach 5), the North Fork occupies a wider, less steep valley where wood is the dominant structural component. The valley bottom is a sequence of old beaver dam complexes and there are frequent channel splits due to the failure of the old dams. **Wood is abundant, but most of it is in the smaller size categories. It has a W/D ratio of 7 and LWD of 23 pieces per mile, which meets the INFISH RMOs.** Cattle have trampled approximately 25 to 30 percent of the banks, and they are eroding where boulders and debris do not protect them. Cattle have trampled many seeps on the low terraces and noxious weeds have invaded the disturbed areas.

The valley narrows in the upper portion of reach 5 and is somewhat less affected by beaver dams. Sediment production rates are near natural levels and cattle access is limited. **Trees in this area average about 20 inches dbh, but some are up to 3 feet in diameter.** These headwater reaches are surrounded by stands of pole-sized lodgepole pine resulting from the 1929 Dollar Mountain Fire. Alders and red osier dogwoods line the channel. There are many large downed logs resulting from the fire. The upper North Fork is a stronghold for the native redband population and has relatively high base flows.

3.8.5 Tributaries Surveyed

The following describes conditions of tributaries that were surveyed.

Betty Creek

There is a small population of trout in Betty Creek, a tributary to the North Fork, which is thought to be native redband**. Three reaches (2.5 miles) were surveyed in July 2002. LWD numbers meet INFISH standards in reaches 1 and 2.** In reach 3, riparian clearcutting has occurred on at least one bank along approximately 30 percent of the surveyed stream length. **The stream lacks woody debris in this section**. A substantial portion of the stream sustains chronic streambank trampling damage by cattle resulting in a loss of channel definition. **However W/D ratios meet INFISH RMO levels**. This is attributed to high inherent stability of the stream, **the low stream power, and armoring by the abundant root masses and woody debris where vegetation is undisturbed. Pools in the reaches are poor quality and shallow with residual pool depths less than 0.6 feet. However there are numerous pools and all the reaches meet the INFISH RMO level. The lowest is in reach 1 with 94 pools per mile. The high number of pools, good inherent bank stability, and high amounts of LWD supports a resident population of redband trout**.

Merkel Canyon Creek

Redband trout use only the lower portion of Merkel Canyon Creek, a tributary to the North Fork. Two reaches (0.5 miles) were surveyed in June 2002. Both reaches are steep with numerous waterfalls and cascades that are barriers to fish movement. LWD numbers meet INFISH standards in reach 2. In reach 1, LWD numbers are at 15 pieces per mile. In this channel that is acceptable since most of the structure comes from boulders and bedrock. Steep canyon walls and large cascades keep cattle out of the stream bottom in reach 2, and W/D ratios low. Reach 1 is above INFISH RMOs for W/D. This is due to some dispersed recreation use, cattle damage, and a stream crossing. Pools in the reaches are poor quality

and shallow with residual pool depths less than 0.9 feet. With less than 54 pools per mile on a 4-foot wide stream, the reaches do not meet the INFISH RMO level for pools per mile.

High Bridge Creek (Bridge Creek)

High Bridge Creek, a tributary to the South Fork, was observed just upstream of FS Road 9565 in a reach that has not been directly affected by any management activity but is located downstream of most of the road development and timber management that have occurred in the basin. The stream is confined within steep inner gorge slopes of 70 percent or greater. **Although the surrounding terrace slopes have been extensively clearcut, the gorge is incised about 60 to 80 feet and its maple and lodgepole pine vegetation has not been harvested**. The stream is 4 to 5 feet wide and has a fine to medium gravel bed with some cobble and small boulders. It is a debris-controlled step-pool system with a gradient of about 7 percent. This is a very stable channel. **The valley width is variable (15 to 20 feet), and is vegetated with maple, red osier dogwood and cottonwood. The stream shows no response to upstream management. Responses would not be expected on this type of stream unless it was directly impacted, like by debris removal.** The stream is steep enough to transport virtually all the sediment supplied to it. There are no fish in High Bridge Creek.

3.9 Geology and Soils

This section and the effects analysis in section 4.7 was edited from a Geology and Soils report by the project Soil Scientist. The report can be found in its entirety in the analysis file.

3.9.1 Geology

Structural and bedrock geology

The structural and bedrock geology of the area was set during the formation of the Kettle Metamorphic Core complex 50 to 70 million years ago. Formed during the continental transition from being a compressional magmatic arc to becoming an extensional basin. This regional east-west expansion caused a rapid uplift of a granitic batholith forming a dome accompanied by low angle normal faulting, both ductile and brittle deformation and broad folding.

The rocks found on King Mountain, CC Mountain, and Mack Mountain expose the inner portion of the dome. This dome is a heterogeneous metamorphic rock interlayered with feldspathic quartzite, muscovite, biotite with garnetiferous alaskite, gneiss, and rare calc silicate rocks. The bedrock found elsewhere in the watershed is an igneous protolith. Pretertiary metamorphic rocks of foliated granitic and tonalitic orhtogneiss made of pegmatites and migmites form huge intrusive bodies in the Kettle core complex. This leaves a resulting landscape of fractures along the flanks of the dome.

During the Pleistocene epoch all but the highest peaks along the Kettle Crest were covered by glacial ice. The Columbian lobe of the Cordilleran ice sheet covered the Deadman Creek analysis area. As the ice retreated, glacial sediment was left in the form of drift and from outwash deposited by glacial melt waters. Most of the drainages are aligned in an east west fashion and contain deposits of glacial outwash as well as subsequent alluvial deposits. Soils

most susceptible to compaction have formed on these outwash and alluvial deposits.

Geomorphology

In general, the Deadman Creek watershed is not prone to landslides (also see Hydrology section 3.7.2 landscape features). A lot of the managed timber stands are on slopes ranging from 20 to 40 percent. Managed stands on the escarpments occur on slopes of about 60 to 70 percent. Field observations by members of the DCEMP ID team revealed three landslide features in the watershed.

- **One is a saturated flow feature on FS road 6114. The feature is about 20 feet wide and about 200 feet long. This feature appears to have been caused by the culvert on the road above saturating the soil. This feature appears to have occurred several years ago and has been stable since.**
- **A second feature is a 'soil fall' observed along South Fork Deadman Creek. It is about 50 feet wide and 20 feet tall. This feature appears to have been caused by undercutting by the stream and a simple translational failure of the deep sandy glacial material. The failure plane is loose gravelly sand that continues to ravel and has not revegetated. This appears to be a naturally occurring failure.**
- **A third feature is the slide which occurs on FS road 9565.320, as previously noted in the Hydrology and Fisheries section. Failure of this road is depositing sediments directly into the North Fork. This feature was not measured, but restoration efforts and road closures have been enacted to mitigate the effects.**

3.9.2 Soils

Current management

A regulatory framework for maintaining soil productivity is provided by the Multiple-use Sustained Yield Act of 1960 that directs the Forest Service to achieve and maintain outputs of various renewable resources in perpetuity without permanent impairment of the land's productivity; and the National Forest Management Act of 1976 (NFMA) which requires the Forest Service to safeguard the land's productivity. The implementing regulations for Forest Planning that followed NFMA requires the Forest Service to measure effects of prescriptions, including "significant changes in land productivity" (36 CFR Part 200, Section 1, 1987). The Pacific Northwest Region (R6) developed soil quality standards for detecting soil disturbances indicating a loss in long-term productivity potential. For R6 and the Colville National Forest, these soil quality standards are located in the Forest Service Manual at 2520, R6 Supplement 2500-98-1. These standards supplement the standards in the Colville Forest Plan (pg. 4-50).

The Colville National Forest Land and Resource Management Plan Final Environmental Impact Statement (USDA Forest Service, 1988b) discusses the effects of timber harvest on soil productivity (pages IV-5 through IV-10). The Forest Plan concludes that timber harvest can reduce site productivity through compaction or severe site-prep burns. These conditions adversely effect air movement, nutrient holding capacity, and soil microorganisms. The Forest Plan (USDA Forest Service, 1988a) standards and guidelines for detrimental soil conditions are:

- **The total acreage of all detrimental soil conditions should not exceed 20**

percent of the total acreage within the activity area including landings and system roads. Consider restoration treatments if detrimental conditions are about 20 percent or more of the activity area. Detrimental soil conditions include compaction, puddling, displacement and severely burned soil.

- **Skid trail requirements must be specified in timber sale contracts that require tractor yarding.**
- **Identify areas of high soil erosion or mass failure potential and evaluate impacts of resource development.**
- **Retain organic matter to maintain site productivity.**

Issues

The effects of new road construction and entry into inventoried roadless areas on soil quality was identified as a key issue during public and internal agency scoping. The concerns focused on the potential impacts to soils from silviculture treatments and road building.

- **Forest management activities that use heavy equipment during ground-based yarding are typically associated with three primary adverse impacts: compaction, erosion and displacement (see Forest Plan EIS; Harvey et al. 1994).**
- **Forest management activities that employ fire have potential to detrimentally burn soils (R6 Soil Quality Standards).**
- **Forest management activities that remove biomass can adversely affect site productivity by removing nutrients, and by removing large organic material that holds water and provides refugia for soil microorganisms.**
- **New road construction removes land from the productive landbase.**
- **Cumulative effects of forest management on areas previously treated can increase potential impacts of proposed activities.**

Existing soils

A complete discussion of the soils of the DCEMP project area can be found in the Soil Report in the Analysis file on file at the Three Rivers Ranger District office. Soil mapping units used for the DCEMP area from the Natural Resource Conservation Service; Soil Survey of North Ferry Area (Zulauf and Starr 1979). These units were developed independent of other Washington State soils surveys. Table 14 displays the most common soils in the DCEMP area, their erosion and compaction potential and site class. Site class is a measure of suitability for timber production.

The remaining 3 percent of the analysis area was mapped as the following soil series: Wapal, Nanamkin, Donavan, Cobey, Talls, Ret, Goosmus, Torada, Karamin, water, marsh, and peat/muck lands.

The soils in the analysis area can be divided into two very broad groups – those formed on deep glacial till and outwash deposits, and those formed on bedrock that may or may not include some till. In general, soils formed on till and outwash are deep to bedrock and found in the lower elevations of the analysis area. Soils formed on deep till and outwash include Cobey, Donavan, Gahee, Goddard, Karamin, Namakin, Nueske, Nevine, Ret, Shaskit/Tonata, Torboy, and Wapal. Soils formed on bedrock with or without till are typically moderately deep to shallow and found at higher elevations in the analysis area. Soils formed on residium, colluvium and shallow till over residium, colluvium and bedrock include Edds, Growden, Karamin, Leonardo, Manley, Merkel, Nevine, Overine, Pepoon, Scar,

Talls, Togo, Torada and Torboy. Many of these mapping units contain significant areas of rockland and rock outcrops mixed with deeper soils. Slopes in these areas are variable reflecting the underlying materials. All the soils in the analysis area have some component of volcanic ash. This ash layer has a high water holding capacity and high nutrient holding capacity; and low soil particle detachability. In general, soils with deep ash layers are more productive and more resilient than other soils. However, the ash has little strength and soils with high ash contents are often susceptible to compaction.

Table 14. Common soils present in the DCEMP area

Soil Series Name	Percent of Analysis Area	Erosion Potential	Compaction Potential	Site Class*
Nevine	13%	Med - high	Medium	3-4
Rock outcrops	12%	NA	NA	NA
Oxerine	10%	Medium	Medium	3
Togo	10%	Med - high	Medium	3
Neuske	7%	Medium	High	3
Growden	6%	Med - high	Medium	5
Merkel	6%	Low - med	Medium	4
Edds	5%	High		3
Gahee	5%	High		2-3
Pepoon	5%	Low - med	Medium	4-5
Scar	5%	Med - high	Medium	3
Torboy	5%	Low - High	Medium	3-4
Goddard	2%	Low - med	Medium	3-5
Leonardo	2%	High	High	3
Manley	2%	Med - high	High	2-4
Shaskit/Tonata	2%	Low	High	4
	97.00%			

Site Class from the Soil Survey of the North Ferry Area, Washington Table 14. A rating of 2 is "high", 3 is "moderately high", 4 is "moderate" and 5 is "low".

Compaction

The Forest Plan defines detrimental compaction as an increase in bulk density of 15 to 20 percent over the undisturbed level, and macropore space reduction of 50 percent or more (Forest Plan FEIS glossary pg. 11). Detrimental compaction generally occurs in areas where heavy equipment crosses the same location a number of times, such as landings and skid trails. Compaction from the use of heavy equipment is expected to be the primary adverse impact on soil productivity from this project. Most of the soils in the project area have a volcanic ash component that makes them especially easy to compact. Once compacted, these soils do not decompact readily because on many sites deep snow cover early in the winter limits frost action. Also, these soils have low soil clay content, which limits decompaction through shrink-swell processes associated with some clay types. Therefore compaction within the soil profile may remain high for many decades especially deep in the soil. (Amaranthus et al. 1996).

Compaction adversely effects soil productivity and ecosystem processes by a variety of mechanisms including increasing the resistance to root penetration and elongation, and changes in air and water movement through the soil. Ectomycorrhizal fungi may be adversely affected (Amaranthus and others, 1996). Compaction often decreases tree growth.

The degree of compaction can vary widely depending on soil conditions (moisture content, frozen soil conditions, rock content, soil texture), the type of equipment used (including the size, weight, type of tracks or tires, and pounds per square inch of the tires), and the logistics of the operation being performed (number of passes over the same piece of ground, amount of slash or snow under the equipment, operator skill). Tractor yarding, forwarder-processor systems, mechanical felling machines, and grapple piling are expected to result in some compaction. Cable and helicopter yarding are expected to have a negligible effect on compaction.

Erosion

Surface erosion is the detachment and transport of individual soil particles by wind, water, or gravity. Surface erosion can occur as the loss of soil in a fairly uniform layer (sheet erosion, dry ravel), or as concentrated erosion (rills and gullies). Ketcheson, Megahan and King (1999) note "Numerous studies have shown that most sediment resulting from timber harvest activities is caused by erosion on forest roads associated with the harvest rather than by erosion on the areas disturbed by tree cutting and skidding." Severe erosion removes nutrient-rich topsoil, reducing soil productivity.

The Region 6 Soil Quality Standards define detrimental surface erosion as: *"…visual evidence of surface loss in areas greater than 100 square feet, rills or gullies and/or water quality degradation from sediment or nutrient enrichment (FSM 2532)."*

To prevent detrimental surface erosion, the Regional Soil Quality Standards recommend maintaining effective soil cover.

Accelerated erosion may occur where heavy equipment crosses the same ground many times eventually removing the duff and forest floor material and baring the soil to erosion. Most erosion occurs on tractor and skidder skid trails. Mitigation (such as waterbars and prompt revegetation of skid trails) is included to reduce erosion from this source. Special measures are included to address the high erosion hazard of the Torboy and Wapal soil series.

Some erosion can occur with skyline, cable, and helicopter logging. The primary type of detrimental disturbance found in these yarding systems is displacement, disturbance of the duff, and mixing of the duff and surface soils. Dryness (1967) found skyline harvesting disturbed about 6 percent of the site. Smith and Wass (1977) measured 7.6 percent disturbance. Most of the disturbance found was shallow disturbance to the duff and shallow mixing of duff and surface soils. McIver et al. (1998) measured about 7 percent detrimental disturbance under skyline yarding systems and most of the disturbance was displacement. Best Management Practices require the logger to suspend the logs to the extent possible, minimizing the number of areas where the logs scrape off the duff. The BMPs also require erosion control work (waterbars and seeding) areas that are disturbed. Combined these two measures are generally effective in controlling

erosion on cableways.

Monitoring on the Colville NF has seldom found erosion in areas large enough or severe enough to meet the Region 6 criteria for detrimental surface erosion (Nancy Glines, personal observation). The BMPs limit the slopes on which tractors may operate, require revegetation of disturbed areas, require erosion control measures on skid trails, cableways and landings, and require suspension on cable, skyline and helicopter yarding. These measures combine to minimize erosion from harvest units and prevent detrimental surface erosion. Timely implementation of erosion control seeding, as specified in BMPs would help to mitigate the detrimental effects of mechanized harvest equipment.

Displacement

Soil displacement is the lateral movement of soil from one place to another by mechanical forces such as equipment blades, vehicle traffic, or logs being yarded. The Forest Plan defines detrimental displacement as:
"…the removal of more than 50 percent of the topsoil or humus enriched A1 and/or AC horizons from an area of 100 square feet or more which is at least 5 feet in width."

Small amounts of displacement are common, for example displacement would occur where a tractor turns or where minor gouging happens in a skyline corridor. In tractor units, displacement generally occurs in conjunction with compaction. McIver and others (1998) reported displacement as the primary type of detrimental condition under a cut-to-length yarding system. It is not clear from his study whether the displacement he found was large enough to constitute detrimental displacement under the Forest Plan.

Based on the experience of the CNF Soil Scientist it is rare to find displacement that is either large enough or severe enough to constitute a detrimental condition under the Forest Plan, and that is not associated with compaction. Historically, machine piling logging slash with a tractor using a straight blade sometimes caused detrimental displacement. Full bench skid trails and landings are common examples of detrimental displacement in conjunction with detrimental compaction. Grapple piling, which is not associated with compaction, seldom results in detrimental displacement. Therefore displacement is unlikely to occur and will not be analyzed further.

Detrimentally Burned Soils

The Pacific Northwest Regional Soil Quality standards define detrimentally burned soils as:

> **"…when the mineral soil surface has been significantly changed in color, oxidized to a reddish color, and the next one-half inch blackened from organic matter charring by heat conducted through the top layer. The detrimentally burned soil standard applies to an area greater than 100 square feet, which is at least five feet in width."** ***FSM 2520 R6 supplement 2500-98-1***

The effects of fire on soils are numerous and highly variable depending on the type and intensity of the fire and the amount of surface fuels consumed. Severe burns can cause loss of plant cover, consumption of the organic litter layer, reduction of the macroscopic pore space in the surface soil layers, and short term increases in bulk density. Prescribed and natural fires can also cause accelerated erosion and

overland flows due to reduced infiltration rates. Both high and low intensity fires burn the soil litter layer. If fire removes the entire litter layer erosion can occur. Soils with coarse sandy surface textures, few coarse fragments, little duff and thin surface ("A") horizons are prone to erosion following fires that remove the organic matter.

Nutrients and Microorganisms

Biomass removal (removal of boles, branches, and tops) can adversely affect site productivity by removing nutrients, and by removing large organic material that holds water and provides refugia for soil microorganisms. South and west facing slopes and rocky soils are more sensitive to removal of biomass and nutrients.

Nutrient loss from the removal of the boles of trees is typically small and can be replaced through the course of a rotation (Spurr and Barnes, 1980; Grier et al., 1989). Much of the nutrients in a tree are located in the bark, limbs and foliage (Grier, et al., 1989). In a clearcut, about 10 percent of the site nitrogen was located in the bole of the tree. Whole tree yarding, where the limbs and tops are taken to the landing to be removed, can have a much greater effect on nutrient removal.

Timber removal can change soil microbiology through changes in stand density, soil temperature, moisture regime, species composition, and composition of the forest floor. The soil flora and fauna naturally changes as the vegetation changes. For example, the flora and fauna that are present in a young stand differs in a middle-aged stand (Plitz and Molina, 1996). Changes in types of fungi have been documented in stands that have been thinned, but these stands have had about the same about total biomass of fruiting bodies (Waters et al., 1994). Visser and Parkinson (1999) found that clearcut timber harvest did not kill the ecotmycorrhizal and saprophytic fungi studied. Reductions in ectomycorrhizal fungi diversity is likely where vegetation is intensively used, composition simplified, or surface organic matter is removed or consumed (Amaranthus and Louma, 1995).

New Road Construction and Rock Pit Development

Road construction and rock pit development remove land from the productive landbase. Roads can be obliterated and some productivity restored; however, full productivity would not be restored for many years until organic matter is restored, soil tilth has redeveloped, an A horizon develops, and soil processes are restored (Brady, 1974). Likewise, rock pits remove land from the productive landbase. Eventually rock pits would be restored (FSM 2853.22), but productivity would not be fully restored until the soil A horizon develops. The mineral material source for the Deadman planning area is the Alligator Pit. It is a 5 about acres. This is an established pit developed in gneiss, a heterogeneous metamorphic rock.

Historic Silviculture Treatments

About 660 acres (15 units) proposed for harvest were identified as likely to have experienced past harvest activities. About 600 acres were field reviewed. The amount of existing compaction was low (generally 2 to 6 percent) and appeared directly related to the number of trees removed from the site. Two areas were found to have about 10 percent existing compaction. Other uses such as the current effects of recreation and livestock grazing are negligible on the soil resources at the stand level. Most of the effects of recreation and livestock use

that were noted in riparian areas were in areas that would not be treated by the project.

3.10 Range Management

3.10.1 Introduction

A complete discussion of range management is contained in the Range section of the Deadman Creek Ecosystem Management Projects Analysis File that is on file at the Three Rivers Ranger District office in Kettle Falls. This report, written by Ellen Picard, Three Rivers District Range Management Specialist forms the basis for both this section and section 4.8.

3.10.2 Management

The Deadman Creek Watershed contains most of the CC Mountain and Boyds cattle grazing allotments and contains the northern one-quarter of the Nancy Creek allotment. A small portion of the Graves Mountain sheep grazing allotment overlaps along the southern boundary of the watershed. The Graves Mountain allotment is currently vacant and therefore, will not be discussed further. For the most part, cattle on the Nancy Creek allotment do not use that portion within the Deadman Creek watershed and therefore, the allotment will not be discussed further.

Management of grazing by domestic livestock and maintenance of range improvement are guided by project level allotment plans. These plans generally determine grazing practices in such a manner as to protect resource values of forage and non-forage vegetation, water and wildlife in both upland and riparian areas (Forest Plan p. 4-44 to 4-47). Range improvements would be protected under all alternatives, and additional fencing kept to a minimum unless determined to be the only solution for controlling cattle.

3.10.3 History

The devastation caused by forest fires in the early years of this century opened up a great deal of this area to grazing. Just a few years after the creation of the Forest Service, cataclysmic fires swept through this area. In 1910, the worst year on record for fires on the Colville National Forest, 160,000 acres of forest were consumed by wildfires. Between 1920 and 1934 over one-half of the forest vegetation now included in the Colville Forest were again lost to fires creating an abundance of transitory range. Sheep were grazed on the National Forest from the early 1900s.

3.10.4 Issues

The effects of the alternatives to grazing management were identified as a concern during public and internal agency scoping. This was not considered a key issue and was treated similarly for all action alternatives. New road construction and harvest activity have the potential to reduce the effectiveness of natural and artificial allotment boundaries. Loss of control of livestock under a management system due to loss of effective allotment or pasture boundaries can impact other resources such as wildlife, fisheries, recreation facilities, sensitive plants, and riparian areas. The effects of grazing on other resources are discussed in Chapter 4 under those affected resources. Mitigations for those potential impacts are listed in section 2.6. The degree to which the alternatives could affect livestock

management is discussed in terms of impacts to natural barriers, range structures (including fences), and creation of transitory range.

Livestock tend to concentrate on private lands along the county roads, especially the Jackknife Cutoff Road in the Boyds allotment. In recent years there has been an increasing number of complaints from private landowners about range cattle "trespassing" on private property. The private lands are within open range. In open range areas the burden of constructing barriers to livestock is on the private landowners. There is also a recurring problem with livestock using the Deadman pasture of the CC allotment all season long every year. While this use amounts to only about a dozen cow/calf pairs, damage to Deadman Creek aquatic resources is occurring.

3.10.5 Current Management

Allotment and pasture boundaries are designed to use natural barriers where possible to minimize the amount of fence construction and maintenance. However, fencing has been necessary in order to hold livestock on the CC Mountain and Boyds Allotments and within pastures of the CC Mountain Allotment. Past road construction, harvest activity, and recreation trails have reduced the effectiveness of the natural barriers and fences.

Boyds Allotment

Livestock have grazed the Boyds Allotment since at least 1922. The allotment management plan (AMP) prescribes a two-pasture deferred rotation system for the allotment. However, the creation of two pastures, as designed in the AMP, is not possible due to the large amount of private land in the center of the allotment. Currently, a season-long (June 1 to October 30) system is used. Two permittees run a total of 90 cow/calf pairs on this allotment.

CC Mountain Allotment

Cattle have grazed the CC Mountain allotment since 1949. In 1978, a deferred rest rotation system was set up using the five pastures. The AMP prescribes a two-year deferred rest rotation system by dividing the five pastures into two groups. The CC, Mack, and King pastures are used the first year. The Deadman and Betty pastures are used the second year. CC and Deadman are the early season pastures, and Mack, King, and Betty are the late season pastures. Season of use is June 1 to October 15. One permittee runs a total of 198 cow/calf pairs on this allotment.

3.10.6 Water Developments and Fences

Boyds Allotment

The allotment has three water developments and four drift fences within the allotment; two boundary fences run between the Boyds and CC Mountain allotments.

CC Mountain Allotment

The allotment has thirteen water developments. There are five pasture fences within the allotment, and two boundary fences run between the Boyds and CC Mountain allotments. There are also fences between the CC Mountain allotment and the Lambert Allotment to the west as well as fences between the CC Mountain allotment and the Bulldog allotment to the north.

3.10.7 Transitory Range

Timber harvest creates transitory range within the openings of the forest and provides additional forage for livestock. It is transitory in that the openings regenerate to trees over time which then shades out the forage. This generally occurs in 15 to 18 years. This is the amount of time that most stands in thee area grow from a seedling to an average height of 4.5 years.

Boyds Allotment

A range analysis done on the allotment in 1978 indicated that grazing capacity was about 750 animal-unit-months (AUMs) under a two-pasture rotation system. An AUM is the amount of forage one cow and her calf consume in one month. Under the current season-long use, the grazing capacity was found to be about 440 AUMs. Some loss of primary range has occurred due to tree encroachment in homestead meadows. Loss of primary range has also occurred where open stands of timber have become dense. Past harvest within the watershed has created some transitory range. Approximately 204 AUMs have been provided by transitory range within the watershed. Over 60 percent of the transitory range is older than 25 years. Forage value and quantities begin to decline after approximately 20 years.

CC Mountain Allotment

A range analysis done on the CC Mountain Allotment in 1979 indicated that grazing capacity was about 1887 AUMs for the entire allotment under a five-pasture deferred rest rotation. Loss of primary range has occurred where open stands have become dense. Past harvest within the watershed has created some transitory range. Approximately 579 AUMs of transitory range have been provided by harvest activity. Most of this is in the CC and Betty pastures and is less than 25 years old. However, within the Deadman pasture, more the 50 percent of the transitory range is over 25 years old.

3.11 Scenery and Recreation

The following section and the effects analysis in section 4.9 were edited from a Scenery and Recreation report by the project Landscape Architect. That report can be found in its entirety in the analysis file.

3.11.1 Existing Landscape Character

The following discussion contains general information about the existing landscape character of the Deadman Planning Area, and is intended to give an overall visual and cultural image of the area. It includes general and specific landscape character descriptions, a discussion on how people identify with the area, and the current trends that will have an effect on management of the area into the future.

General

The Deadman Planning Area falls within the Kettle Range Ecological Subsection, the area located in the Upper Columbia River basin, west of the Columbia River, east of the Republic Graben and south of the Canadian border in northeastern Washington. This subsection consists of 3 primary landscape settings: continentally glaciated mountain slopes, valley bottoms of moderate width with deep glacial outwash and drift deposits, and high elevation steep mountain slopes along the Kettle Crest, which runs north-south just west of the planning area. The

subsection is characterized by steep forested slopes ranging from 25 - 60%. The larger streams tend to be located in moderately wide to confined valleys. An example is Trout Lake near the southern edge of the planning area in a narrow, glacially scoured valley between steep rock cliffs. The primary natural disturbance processes are fire, and the major human-caused disturbances include logging, recreation, and stock grazing. The overall appearance of the planning area is of natural appearing forest lands, including broad undisturbed areas that are the primary scenic features of the landscape. Recreation opportunities within the Deadman Planning Area are primarily of a dispersed nature since there are no developed camping or trailhead facilities.

Recreationists utilize Forest campsites outside the Planning Area along Albian Hill road (Rd. 2030), and at Trout or Davis Lakes for overnight camping with limited amenities. Both campgrounds are small with only 4 campsites, one vault toilet and a boat launch.

Most dispersed camping occurs on slopes of less than 20%, which generally confines users to areas along streams or where clearing and leveling has occurred, such as a landing for timber harvest. Within the Deadman Planning Area, most dispersed sites are within the Management Area 3A designation.

There are 18.7 miles of trail within, or accessing, the Deadman Planning Area. Trails are managed based on specified Classes assigned to the trail system. The trail Classes applicable to these trails are as follows:

- Class 1 - **Primitive simple trail where the tread may be intermittent using native materials only and kept on the system primarily by the users. Both the Mac/King Trail (6.5 miles) and the Twin Sisters Trail (7.5 miles) are Class 1 trails.**

- Class 3 – **Trail appears constructed where the tread may be constructed using native or imported materials. Hoodoo Canyon Trail (4.7 miles) is maintained to this classification.**

Site-specific

For this discussion, the planning area was broken down into sites that are identifiable based on human use patterns and typical viewing locations.

Mixed Ownership.

As the visitor enters the planning area from the east, they pass through an area of mixed ownership with road access that serves to disperse users to other locations**. There is private land along the primary access route (County Road 460, Forest Road 9565).** This is land that has been homesteaded and is now being subdivided and further developed giving the area an altered appearance. **This broad area forks into the Deadman Creek and North Fork Deadman Creek drainages that reach towards the Kettle Crest.**

Sites within the Deadman Creek Ecosystem Management Projects planning area of primary importance for their scenic and recreational values are as follows:

Betty Creek

Forest Road 9565-800 leaves Road 9565 and runs along the North Fork of

Deadman Creek to the Betty Creek area. The area receives a great deal of use from berry pickers and dispersed campers, especially during deer hunting season. Recreationists use the road system extensively in this area, and there are several major dispersed camping sites along Betty Creek and North Fork Deadman Creek. The area is also used a great deal by ATV and Four Wheel Drive enthusiasts. **In the past, much of the use has occurred along an unmaintained jeep road from the Twin Sisters area connecting to a section of the 9565-320 Road along North Fork Deadman Creek, which was closed and obliterated in 1997. This old route accesses a major dispersed campsite near the southern entrance to Merkel Canyon. Because the 9565-320 road was obliterated between Merkel Canyon and the 9565-800 road, much of the ATV traffic now travels across Betty Creek and over the 9565-810 road system. The area of particular concern is along the 9565-810 Road at a major dispersed camping location. However, this site suffered severe wind storm damage during the summer of 2002, and future use patterns are uncertain. In the past, camping was actually well above the creek but four-wheel-drive vehicles, wishing to get behind the gate on Road 810, forded Betty Creek established a crossing. The crossing was closed using boulders and large woody debris in 1999. The connection to the 9565-320 from the 9565-810 was made through a steep ridge that drops into the dispersed site at the south end of Merkel Canyon. Resource damage has occurred in the past along this steep, unauthorized trail, but use patterns have been altered due to the closure and the wind-throw.**

There are few views into the Betty Creek area from key viewing locations, but from within the area past logging of stands previously infested by insects is highly visible.

Merkel Canyon

The slopes of this very narrow canyon are generally from 35 - 60%, with some areas over 60%. The canyon is a unique geological feature of the landscape that runs north towards Alligator Ridge from the narrow valley along the North Fork of Deadman Creek. Most of the recreation activity occurs around the southern entrance to the canyon, where there is a major dispersed camping area along North Fork Deadman Creek. The actual canyon receives little use, but does get some dispersed camping and trail use. The dense vegetation along the canyon bottom screens surrounding activities. Also, the steep, rocky canyon walls provide some sense of solitude for the canyon visitor.

Twin Sisters and Mack Mountain

The slopes are densely forested, with sparser vegetation scattered along the ridgetops where there are more exposed rock outcrops**. Grasses and forbs are found in open areas along southern exposures at high elevations.** Recreation centers around the motorized use of the four-wheel drive trails along the ridgelines. Use is primarily during deer hunting season. One of the highlights of these trails is the vistas available from the open areas along the higher peaks**. A large portion of this area is designated to provide opportunities for dispersed, motorized recreation in the Colville Land and Resource Management Plan.**

Surroundings viewed from the area are distant drainages and rolling foothills. There is evidence of human activities among the foothills, primarily for roaded access uses such as logging, cattle grazing, recreation, and private land development.

Deadman Creek and Hoodoo Canyon

This site lies along the north facing slopes to the south of Deadman Creek, and includes the Hoodoo Canyon area where slopes are generally over 60%. The slopes spreading away from Deadman Creek are densely forested with sparser vegetation scattered along the ridges and where there are more exposed rock outcrops. Recreation use is primarily dispersed along the Deadman Creek road, which runs the full length of the valley. Use is primarily during deer hunting season, but camping occurs throughout the year. Day use access to the Hoodoo Canyon Trail is also popular. **A large portion of this area is designated in the Colville Land and Resource Management Plan to protect the existing character of the area, and to provide opportunities for dispersed, non-motorized recreation. Impacts from current recreation use patterns are seen primarily where natural meadow openings, old homestead sites, and decades of previous dispersed camping coincide. In the past, human use of these areas has conflicted with use by range cattle. Evidence of past management activities on the south side of CC Mountain and in the area south of Jackknife Mountain are clearly visible from the Hoodoo canyon trail.**

While driving Deadman Creek road, visitors can get scattered and short duration views of the expansive and natural appearing slopes**. The typical forest user does not currently perceive a change in management of these slopes.** From some road locations, visitors can view portions of Hoodoo Canyon, one of the most scenic features within the planning area**. Both north and south-facing slopes in the eastern portion of the planning area are seen as backdrops from the private land along Deadman Creek Road.** The western portion of the valley is narrow and views of the slopes from the road are limited.

Surroundings viewed from within the area are distant drainages and rolling foothills. There is evidence of human activities among the foothills, primarily for roaded access uses such as logging, cattle grazing, recreation, and private land development.

Sense of place

The landscape that comprises the Deadman Creek planning area is primarily a place for the local public. Historically most recreation use within the area has been hunting, gathering of forest products for home use, and the dispersed camping done in association with those activities. There has also been logging, cattle grazing, and homesteading activity. Concentrations of these activities tend to dominate portions of the landscape. The dispersed type of recreational use has persisted however, and there is no real demand for changing to a more developed recreation opportunity.

This "place" is not seen by visitors just passing through. Even with brief glimpses of the ridge tops from Highways 395 or 25, there is nothing to draw visitors into the area. This is a place accessed by local individuals and families with access limited by the level of road development and the seasons. It is not an area for drive-through tourists.

The Deadman Creek area does not have easy access. County roads penetrate six to seven miles into the Planning Area, but in winter, access by anything other than snowmobiles, snowshoes, or skis stops at the end of the County Roads. As snow

recedes, people move into the area to work, gather firewood, berries and mushrooms, hunt in the fall, and leave again till the next season.

Trends

The Deadman Planning Area is experiencing a slow increase in the recreation uses seen there today. The rate of growth in recreational activities generally coincides with the population growth within the counties. The Planning Area is within Ferry County and adjacent to Stevens County. According to the County Population Projections for 2000 to 2025, put out by the State of Washington, the "most likely trend" in population growth annually during that time period will be 1.51% for Ferry County, 2.40% for Stevens County, and 1.41% for the State of Washington overall (Washington State County population Projections: 2000-2025, Office of financial Management).

The Deadman Planning Area is included in the USAF Survival School Permit as part of one of the training areas for instructors. During the 2000 environmental analysis for this permit renewal, an assessment was made of recreation use levels within the individual permit areas and used to determine if thresholds would be exceeded during the term of the permit. In that assessment, an annual population growth rate of 3.0% was used. The results of the analysis showed, that within the Deadman area, use levels reach approximately 1/10 of the area's projected capability within the Management Area 3A designation. The effects analysis focused on MA 3A due to the high recreation emphasis placed on this area within the Forest Plan, and the concentration of use within these areas. A complete discussion of the analysis and the assumptions used is included in the USAF Survival School Special Use Permit Environmental Assessment (10/2000).

There is an increase in hunting use from non-locals along the Kettle Range, and the Kettle Crest has been featured in National hunting publications as a premiere area for trophy mule deer and for grouse. Hunting use within the Deadman Planning Area is not heavy compared to other areas of the Colville National Forest, but there are some hunting camps that traditionally appear each year.

Forest wide, snowmobiling is on the increase, but is primarily a weekend sport. Currently the Deadman Creek area sees little of that use, but approximately 50 miles of trail are available in the vicinity of the Deadman Planning Area. The Albian Hill Road (Rd. 2030) is groomed during winter months for snowmobile use covering 40 of these miles. Another 10 miles of ungroomed trail is available on Deadman Creek Road. There are no developed trailheads that serve these snowmobile routes. The State generally plows out small parking areas for approximately 6 vehicles with trailers near the junction of Albian Hill Road and Highway 20, and the County plows a small area near the forest boundary off the Deadman Road. The groomed trail can also be accessed from the Boulder-Deer Road. This system receives lower use than any of the other Forest trail systems (around Ione, Radar Dome, Calispell Peak, Chewelah, and Dominion Mountain). These areas are more attractive due to the easy access to amenities such as food and gasoline. The local grooming council members are the managers of the grooming program and have requested that the limited State funded grooming be done on the heavier use areas. The heavily used areas are groomed twice per week or more depending on the level of use, but the Albian Hill route near the Deadman Planning Area is groomed only once every other week due to low use. There are no groomed routes within the Deadman Planning Area and the

ungroomed route receives low use, partly due to poor access road conditions.

All Terrain Vehicle (ATV) / "jeep" use is also on the increase on Colville National Forest. The Deadman Planning Area contains one of the few designated areas on the Forest for a back country Semi-primitive motorized challenge. ATV use within the area is generally limited to roads due to the steep and densely wooded terrain.

There is also a deeper and growing appreciation for areas without roads, and a strong desire to preserve the types of use now enjoyed and valued in an unroaded situation. There is a high personal value placed on these areas, as well as a concern that once roaded their value is lost for everyone, much like threatened or endangered species. This is not an attitude shared only by the person that hikes the Hoodoo Canyon Trail, seeking the solitude of that unroaded setting. The forest user that logs timber for a living may hunt there in the fall or enjoy a view of Hoodoo Canyon at lunch break from a distant slope. There may be a difference in perspective, but both users want to preserve a portion or all of the character of the landscape that they enjoy.

3.11.2 Management Considerations

The Colville National Forest Land and Resource Management Plan designated several locations within the Deadman Planning Area to be managed by goals and objectives intended to retain the scenic qualities of these landscapes and provide for recreation opportunities highly valued by forest users. The Desired Future Condition for these landscapes is based on the assumptions, allocations, and direction given in that Plan.

The Forest-wide Standards and Guidelines for Visual Resource Management (Forest Plan, pg. 4-36) describe how silvicultural treatments should be applied to maintain the desired landscape character and support the visual and recreation goals.

The Recreation Opportunity Spectrum (ROS) is used to provide a framework leading to direction on the level of development appropriate on National Forest System Lands. The process was used during Forest Plan analysis to inventory and map the various kinds of recreation opportunities available as a result of existing conditions. The resulting ROS classifications that are applicable within the Deadman Planning Area are described below.

1. ***Roaded Modified and Roaded Natural*** **- An area designated within ½ mile from better than primitive roads and railroads with no size limitation. Frequency of contact is Moderate to High on roads. Low to Moderate on trails and away from roads (based on typical use season, not peak days**).

2. ***Semi-Primitive Motorized*** **- An area designated within ½ mile of primitive roads or trails used by motor vehicles; but not closer than ½ mile from better than primitive roads, and a size limitation of 2,500 acres. Low to Moderate contact frequency (based on typical use season, not peak days).**

3. ***Semi-Primitive Non-Motorized*** **- An area designated at least ½ mile but not further than 3 miles from all roads, railroads or trails with motorized use; can include the existence of primitive roads and trails if usually closed to**

motorized use, and a size limitation of 2,500 acres. Usually 6-15 parties per day encountered on trails and 6 or less visible at campsites (based on typical use season, not peak days).

The Management Areas of primary scenic and recreation emphasis are described below.

- ***MA 3A - Recreation* - roaded and unroaded recreation opportunities in a natural appearing setting, developed recreation facilities should be compatible with the Roaded Natural ROS setting.**

- ***MA 5 - Scenic Timber* - natural appearing foreground, middle, and background along major scenic routes, developed recreation facilities and uses are compatible with the Roaded Natural or Semi-Primitive Motorized ROS setting.**

- ***MA 6 - Scenic Winter Range* - natural appearing foreground, middle and background along major scenic travel routes, developed recreation facilities and uses are compatible with the Roaded Natural or Semi-Primitive Motorized ROS setting.**

- ***MA 10 - Semi-Primitive, Motorized Recreation* - opportunities for dispersed, motorized recreation on lands accessed by primitive travelways through a natural appearing landscape, manage according to the Semi-Primitive Motorized ROS guidelines.**

- ***MA 11 - Semi-Primitive, Non-Motorized Recreation* - protection of the existing unroaded character of the area while providing opportunities for dispersed, non-motorized recreation in a natural appearing setting, manage according to the Semi-Primitive Non-Motorized**

3.12 Heritage Resources

3.12.1 Current Management

This section and the effects analysis in Section 4.10 was edited from a report by the project Archaeologist. That report can be found in its entirety in the analysis file.

A system of site evaluation has been developed to classify existing cultural sites according to the type of management required. The following list of management prescriptions was developed for heritage properties on National Forest System lands.

1. No further need to manage
2. Additional documentation needed; no further need to manage.
3. Protect and preserve as is; current documentation sufficient.
4. Protect and preserve as is; needs further documentation.
5. Mitigation required; needs further documentation; protect and preserve.
6. Mitigation required; current documentation sufficient; protect and preserve.

3.12.2 Existing Condition

There is no verified evidence on NFS land within the Deadman Creek watershed of the following types of heritage sites: early history, Native American allotments, grazing, or lumber mills.

Nine sites have been identified that reflect the homesteading era. Four of these sites were designated to be managed under prescription 1. Five were designated to be managed under prescription 3.

Today there are a few portions of the Old State Road still visible. Most of the historic road has been obliterated by past logging, large forest fires of the 1920s and 30s, and the present FS road #9565. Based on the lack of integrity and short-lived use, it was determined not eligible for the National Register.

Wash Cabin is the only recorded site in the watershed that is representative of the mining theme. It was designated to be managed under prescription 1.

Benefield Station, the old Forest Service crew camp was designated to be managed under prescription 1. The site of the Deadman Ranger Station was designated to be managed under prescription 4.

3.13 Transportation

3.13.1 Introduction

This section was compiled using both the Transportation Planner Report by the project engineering technician, dated December, 2002, and the Roads Analysis Report in the Deadman Creek Ecosystem Management Projects Analysis File. Both documents are on file at the Three Rivers Ranger District office. The Roads Analysis Report is required documentation of the road system within the project area. The Roads Analysis IDT (which was essentially a core IDT consisting of key specialists assigned to the project) reviewed all known roads in the watershed, but particularly those that cross National Forest System Land, on which the Forest Service has administrative responsibility. The Roads Analysis discussed the state of the road system prior to any proposed management projects. The analysis identified needed and unneeded segments of road, as well as closed and open segments of road. Areas of concern were discussed, including the needs for repair, closure, obliteration, and/or decommissioning. The resulting report made recommendations to the Deciding Official for future management of the transportation system within the Deadman Creek watershed. These recommendations will be discussed in the Environmental Consequences section of the EIS under Transportation. The effects analysis in Section 4.11 was also edited from Holt's report and from the Roads Analysis Report.

3.13.2 Access and the Existing Road System

The Project Area is approximately 40,792 acres in size, including private land. There are approximately 19.5 miles of Ferry County Roads within the Project Area. The origin of these county roads is east of the planning area: U.S. Highway 395, which runs along the west side of the Columbia and Kettle Rivers. The town of Kettle Falls, Washington, is approximately nine miles south and east of the east entrance to the planning area, on County Road 460.

There are 3,506 acres of private land within National Forest boundaries, divided into over 70 parcels in the east-central part of the Project Area. This area is accessed by five separate county road spurs. Additionally, approximately 800 acres is within the Project Area but east of the National Forest boundary. The private land can also be accessed by Colville National Forest roads coming from the Mattson Creek drainage on the northeast and from the Albion Hill area on the west. The road from Mattson Creek ultimately connects into Ferry County Road 480 and connects in with U. S. Highway 395 approximately one mile north of where Ferry County Road 460 meets the same highway. Access through the Albion Hill area connects in with Washington State Highway 20, approximately four road miles south of the west boundary of the Project Area. Highway vehicle access from Mattson Creek and Albion Hill is closed during winter months (approximately December through April, but this varies depending on the annual snowfall and timing of melt-off). Snowmobiles do use these access routes during the winter, mostly for recreational pursuits.

Classified roads

Classified roads are roads that are constructed or maintained for long-term highway vehicle use. Classified roads may be public, private, or forest development roads. About 110 of the 132 miles of existing classified road within the Deadman Project Area are Colville National Forest system roads. Of that number, 55% or approximately 60 miles are open road, and 45% or approximately 50 miles are closed. Road closures are either natural closures (brush, downed trees, rocks, slope failures) or human-provided barriers (earthen berms, removed culverts, guardrails, or gates). Many classified roads in the analysis areas were originally constructed for the purpose of timber management and log haul. They continue to periodically serve that function as well as serving as transportation routes for recreation users and administrative uses by Forest Service employees. A Forest Service permittee uses roads in the analysis area to move and monitor cattle in his grazing allotment. The U. S. Air Force Survival School also uses the area (and its roads) in its flight crew training program.

The number of miles of classified road per square mile of National Forest System Land is 1.9, which may be a bit misleading, because there are large blocks lacking classified roads within the Project Area. There are approximately 13,600 acres that lie in two Inventoried Roadless Areas. Subtracting out these acreages leaves 22,850 acres of National Forest System Land, for an average of 3.1 miles of classified road per square mile. A more meaningful number may be the miles of *open* classified road per square mile of National Forest outside of Inventoried Roadless Areas, which is 1.7.

Table 15. Classified roads within the Deadman Creek watershed.

Road ownership/management	Miles of Road	km of Road
State	0.23 mi.	0.37 km
County	19.45 mi.	31.30 km
Private	4.01 mi.	6.45 km
USFS	108.74 mi.	175.00 km

Unclassified roads

Unclassified roads are roads that are not constructed, maintained, or intended for long-term vehicle use, such as roads built for temporary access and other remnants of short-term use associated with fire-suppression, logging, or mineral activities. The initial inventory showed approximately 0.5 miles of unclassified road within the Project Area. This analysis process will determine if these roads were listed in error, if they exist and need to be obliterated, or if they exist and need to be numbered and added to the list of classified roads.

Temporary roads

Temporary roads are unclassified roads that have been constructed for use during timber sales and very few other activities. (Thinning conducted in the early 1970's using caterpillar tractors to bulldozed rows through stagnant lodgepole pine stands, so-called "dozer thinning" used temporary roads to access strategic points during thinning operations. These old temp roads are still visible on aerial photos). Temporary roads are put back to slope, with the road template ripped and seeded with grass species. Earthen berms, large woody debris, and large boulders are used to close these roads and prevent the public from putting vehicles onto these roadbeds. Because of these closure efforts, temporary roads are not included in this analysis, unless a breach has occurred and vehicles are using the old roadbed. In this case the road will be considered and analyzed along with other unclassified roads.

3.13.3 Recent Road Management Decisions and Activities

Forest Road #9565-320 was identified as an area of concern in the Deadman Creek Ecosystem Management Projects hydrologic and aquatic analysis due to the unstable slopes adjacent to the road. This was the original road into the North Fork drainage and the Twin Sisters area. Slumps and slides had reduced the road template to a width of only three or four feet in several locations. Since it no longer functioned as a road, it was used primarily as a stock driveway and ORV trail. These road segments were focal points of sediments being introduced directly into the North Fork of Deadman Creek from the slides. The Deadman Aquatic Report recommended closing and decommissioning (through obliteration) a 1.8 mile segment of the road above Merkel Canyon. This road segment was closed, pulled back to slope in critical places, covered with boulders and large woody debris, and seeded with grasses during the summer of 1998. These slide areas have been revegetated with native conifer and hardwood species.

A segment of Forest Road #9565.360 has also been recently reconstructed. In 1997, poor road drainage saturated the fillslope on this road resulting in a debris flow that delivered an estimated 500 cubic yards of soil and rock to the main stem of Deadman Creek. Spring runoff was unusually high that year due to an above average snowpack. This road segment was reconstructed in 1998 using compacted fill, aggregate surfacing, insloping, and additional drainage structures. The face of

the debris flow was also revegetated using native grasses and conifer species.

3.13.4 Concerns and Risks Associated with the Current Road System

As with any given situation, there are some segments of the public that would like more roaded access for their favorite outdoor activities, and another segment that would favor reducing the roaded access for a variety of resource-driven and emotional reasons. Other considerations for managing roads are related to environmental issues, resource management considerations and administrative needs as illustrated by the following examples:

- **In the Betty Creek area there is a continued problem concerning gates that block the 9565-810 and 9565-830 roads. Fire management has stressed the need for emergency access to the Alligator Ridge area from the south due to the high frequency of lightning strikes on Alligator Ridge and the lack of access north of the ridge in the South Fork of Boulder Creek area. The gates that block these roads have been subject to vandalism over the entire time that they have existed. The area has been closed to public vehice access dating back to the 1980s when conflicts over deer range management caused Washington Department of Fish and Wildlife and Colville National Forest biologists to request closing access to Betty Creek. In 1999 new heavy-duty gates were installed on both roads. These gates and locks have fared better, though one gate was found open in the summer of 2001 (possibly left open by CNF personnel or contractors working in the area). Fire management is the benefiting function for keeping the gates maintained in a closed condition.**

- **A similar situation exists on the 9565-535 road south of CC Mountain. This system is closed from the winter until August 31 for mule deer fawning habitat. After that date the system is open through hunting season, except for the 9565-540 road which wraps around CC Mountain to the north and should be closed at all times. The 9565-535 road sometimes has been reported open prior to August 31. The 9565-540 segment in closed status has a guardrail closure that has not been effective. On both of these it is desirable to retain the ability to open up the roads for a variety of management activities (most notably range permittee access and fire suppression situations).**

- **An approximately 1.2 mile stretch of the 9565-320 road below Merkel Canyon has been identified by the fisheries biologist as a source of sedimentation due to the close proximity of this open road to the stream channel of the North Fork of Deadman Creek.**

- Some segments of classified road are no longer needed in the road system, either as full-time open roads or as system roads altogether. Approximately 4.5 miles of open system roads were identified by the Roads Analysis IDT as needing closing and/or obliteration. Approximately 10.1 miles of Forest Service classified roads (open each Forest Service road is maintained in accordance with an assigned operational/objective maintenance level. The following definitions apply to maintenance levels on the Colville National Forest.

Maintenance Level 1

Assigned to intermittent service roads during the time they are closed to vehicular traffic. The closure period is one year or longer. Basic custodial maintenance is performed to keep damage to adjacent resources to an acceptable level and to perpetuate the road to facilitate future management activities. Emphasis is normally given to maintaining drainage facilities and runoff patterns. Planned road deterioration may occur at this level.

Roads receiving Level 1 maintenance may be of any type, class, or construction standard, and may be managed at any other maintenance level during the time they are open to vehicle traffic. However, while being maintained at Level 1, these roads are closed to vehicular traffic, but may be open and suitable for non-motorized uses.

Maintenance Level 2

Assigned to roads open for use by high clearance vehicles. Passenger car traffic is not a consideration. Traffic is normally minor, usually consisting of one or a combination of administrative, permitted, dispersed recreation, or other specialized uses. This is the minimum level required for log haul to occur.

Maintenance Level 3

Assigned to roads open and maintained for travel by a prudent driver in a standard passenger car. User comfort and convenience are not considered priorities. Roads at this level are typically low speed, single lane with turnouts and spot surfacing. Some roads may be fully surfaced with either native or processed material.

Maintenance Level 5

This level is assigned to roads that provide a high degree of user comfort and convenience. These roads are normally double lane, paved facilities. Some may be aggregate surfaced and dust abated. The only road in the Deadman Planning Area assigned this maintenance level is a 0.23-mile segment of State Hwy 395.

The following table is a listing of classified roads under Colville National Forest jurisdiction in the Project Planning Area by operational maintenance level:

Table 16. Levels of USFS-classified roads within the Deadman Creek watershed.

Road Maintenance Level	Miles of Road	Km of Road
Level 1	41.1 mi.	66.1 km
Level 2	53.7 mi.	86.5 km
Level 3	13.9 mi.	22.4 km

These roads are included in the Colville National Forest Transportation Management System (TMS) and are tracked in the TMS database.

3.14 Inventoried Roadless Areas and Other Areas without Classified Roads

3.14.1 Introduction

This section will describe the existing condition of Inventoried Roadless Areas and other areas of similar concern within the project area for the Deadman Ecosystem Management Projects. The effect of entry into these areas is identified as a Key Issue within the Environmental Impact Statement. Included in the analysis is a discussion of Forest Service regulations governing management activities in these areas. The regulations have changed several times since the inception of the project. This section and the effects analysis in section 4.12 was edited from a Roadless Area Report that report can be found in its entirety in the analysis file.

3.14.2 Inventoried Roadless Areas

The term "Roadless Area" is used within this report in reference to Inventoried Roadless Areas that were identified for consideration as wilderness areas in the Roadless Area Review and Evaluation (RARE I) study, conducted in the late 1970's. The RARE I study used numerous criteria to review areas where no roads had ever been built. Sideboards for that study included minimum size restrictions (5,000 acres, in conformance with the Wilderness Act) and some guidelines regarding the shape of the area (more blocked parcels of land being favored over stringers or narrow peninsulas of areas without roads). An example of a desired shape might be an entire subwatershed that had no roads, whereas a narrow valley where one side of the valley had been heavily managed and the other not managed might be less than desirable. Another factor considered was if the parcel in question contained any unique features such as rock formations or unusual vegetation.

The RARE II study followed on the heels of RARE I, with the intent of taking a closer look at those areas that came out of the RARE I study as "potential" wilderness. The outcome of the RARE II study was a recommendation of qualifying areas for inclusion as wilderness. In 1984 thousands of acres of wilderness, nationwide, were designated within the National Forest System. On the Colville National Forest, the 39,937- acre Salmo-Priest Wilderness area was designated as an outcome of this study. RARE II study areas not designated for wilderness as a result of the study were identified as Inventoried Roadless Areas, with set borders inscribed on maps. The remaining Inventoried Roadless Areas on the Colville National Forest were reviewed during formulation of the Forest Plan (Land and Resource Management Plan) that was completed in 1988. Various management area assignments were made to these areas ranging from designations which prohibited road construction and regularly scheduled timber harvest (MA-1, MA-10, and MA-11), to designations where timber harvest was the *purpose* of land management activities, and road construction was an acceptable impact to enable management activities.

With the passage of the Washington State Wilderness Act of 1984, Congress stated that the Forest Service was not required to review the wilderness option for the remaining RARE II areas, areas less than 5,000 acres in size, and certain areas evaluated for wilderness in unit plans when developing the Forest Plan. The Wilderness Act does provide that the areas that are still in an unroaded condition when the Forest Plan is revised *shall* be reviewed with wilderness as an

option.[9] The Colville National Forest Land and Resource Management Plan revision began in 2002 and is scheduled for completion in 2006 or 2007.

Within the Deadman Project Area, two Inventoried Roadless Areas have been identified in the Colville Forest Plan. The following table details area and land management designation information about those areas.

Table 17. Land management allocations in inventoried roadless areas[10]

Inventoried Roadless Area	Total Acres	Acres in Deadman Project Area	Acres MA-1	Acres MA3a	Acres MA-5	Acres MA-7	Acres MA-10	Acres MA-11
Hoodoo[11]	7,103	5,596	81	170	489	945	0	3,911
Twin Sisters[12]	13,311	7,992	246	50	765	3,952	2,979	0

Both the Hoodoo and Twin Sisters Inventoried Roadless areas have had limited or no management entries since inception of the Colville Forest Plan in 1988, despite having 46% of the acres assigned to management areas (in the Deadman Creek watershed) where timber harvest and other activities are allowed. Although restrictions have been placed on management entries into these areas recently, a more valid reason for lack of management is economic. Most of the landscape in these roadless areas was burned over in 1929. Timber values have been slow to recover. There was no driving force to construct road into these areas. And, although some stands approach or now contain merchantable-sized trees and are densely stocked, the economics of road construction needed for management activities is still not favorable. In many parts of the roadless areas, stands are still too small and too remote to consider helicopter yarding as a viable option.

Thus, the roadless area landscape remains densely stocked, in general, mostly with stands of lodgepole pine or western larch, and mostly a mix of the two species. Douglas-fir is the next most prolific species, particularly on the southern-exposed slopes. Engelmann spruce, subalpine fir, grand fir, western redcedar, and quaking aspen appear in some areas, interspersed with the larch and lodgepole. Due to the amount of lodgepole pine in the landscape, the entire amount of acreage in roadless status remains highly susceptible to damage from catastrophic fire and from insects into the foreseeable future.

The Transportation System in the Roadless Areas

The two roadless areas are nearly joined, except for the presence of the Deadman Creek Road, (Forest Road 9565), which is a major (transportation level 2) road up the drainage, open approximately mid-May through mid-November, weather dependent. The road is used by campers, hikers, berry-pickers, hunters, sightseers, and by the Forest Service for a variety of management needs, not the least of which is access for fire suppression. The 9565 road connects the Albion Hill/Sherman Pass area with the lower Deadman Creek/Highway 395 areas. There are over 70 landowners within the Deadman Project Area, many of which use this portion of the

[9] Colville National Forest Land and Resource Management Plan, Appendix C, page C-1.
[10] Maps included in Appendix F.
[11] Described in Colville National Forest Land and Resource Management Plan, Appendix C, pages C-52 to 61.
[12] Described in Colville National Forest Land and Resource Management Plan, Appendix C, pages C-62 to 72

forest for some form of recreation. Jeep trails run from the Albion Hill road east to the Twin Sisters Mountain area on the north side of the project area (Jeep Trail 98) and from the Albion Hill road east to the King/Mack Mountain areas (Jeep Trail 109). Both of these trails are within the Twin Sisters Inventoried Roadless Area, and are surrounded by a MA-10 (Semi-primitive motorized recreation designation). Both trails can link through to the Colville National Forest road system in Deadman Creek, but with a fair amount of effort. Most users choose to enter and return from the Albion Hill Road without making a loop route through the Deadman Creek road system. These trails are used some in the summer by recreationists in jeeps or ATV vehicles, and more often during hunting season in the fall. The trails receive some snowmobile use in the winter, although parts of the trail require more than novice expertise in order to safely traverse the landscape.

Hoodoo Inventoried Roadless Area

Recreation Opportunity Spectrum

Preserving the character of the recreating experience and the benefits provided by a natural appearing landscape is the objective of the current Forest Plan direction. The Recreation Opportunity Spectrum is used to provide a framework leading to direction on the level of development appropriate on National Forest System Lands. This Spectrum combines activities, settings, and experiences that are correlated to the desired settings. The process is used to inventory and map the various kinds of recreation opportunities currently available as a result of existing conditions.

The current ROS rating for most of this area is Semi-Primitive Non-Motorized.
The ROS definition of Semi-Primitive Non-Motorized is: "An area designated at least ½ mile but not further than 3 miles from all roads, railroads or trails with motorized use; can include the existence of primitive roads and trails if usually closed to motorized use", and a size limitation of 2,500 acres. Smaller parts of the Hoodoo Inventoried Roadless Area have been designated as Roaded Modified, Roaded Natural, and Semi-Primitive Motorized.

The ROS rating in the Hoodoo Roadless Area is based on the characteristics listed below.

1. ***Access*: The only access into the area is the Hoodoo Canyon hiking trail.**

2. ***Remoteness*: Most of the area is within one mile of existing roads, but topography limit sights and sounds associated with these roads.**

3. ***Social Encounters*: Other than on the Hoodoo Canyon trail, a popular hiking trail, there is almost no likelihood of encountering another party while using the area. Probable encounters in a single day are rated low, which is 0-6 per day.**

4. ***Visitor Management*: Other than information boards at the trailheads, there are no other controls or information facilities.**

5. ***On-site development*: The Hoodoo Canyon trail is the only development.**

Wilderness Attributes

The Washington Wilderness Act of 1984 stated that the area shall be managed for multiple use in accordance with land management plans pursuant to section six of the Forest and Rangeland Renewable Resources Act of 1974. Due to public concern regarding possible loss of Wilderness Attributes, the attributes of Natural Integrity, Apparent Naturalness, Opportunity for Solitude, and Primitive Recreation Opportunities and Unique Features were reviewed.

1. Natural Integrity: There has been very little alteration to the natural integrity of the area**. The Hoodoo Canyon trail and several dispersed campsites at Emerald Lake are the only on site alterations to the natural integrity of the area. The effects of these areas are only apparent in the area immediately adjacent to the trail and do not affect the majority of the roadless area. The fire regime of the area is characterized by large stand replacement fires. Control of small fire starts in the area has delayed the start of a large fire, but the area will in all likelihood be subject to a large fire in the future. There is very little cattle use due to the rugged terrain and dense stands of lodgepole pine. There is evidence of past logging activity within the area where remnant trees were removed after fires in the late 1920's. These trails are completely grown over and do not detract from the natural integrity.**

2. Apparent Naturalness: The area appears natural when viewed from outside and within the area.

- **Opportunity for Solitude:** The majority of the area faces north into the Deadman Creek drainage with some exposure to the Sherman Pass Highway on the southwestern boundary. There are many short- to middle-background views that are undisturbed. However, because of the orientation of the Roadless Areas on the landscape, there are many middleground and background views that are less than pristine. Management activities and existing roads are evident from many vantage points within the Roadless Areas. The wooded landscape could not be considered to be ancient or anywhere close to old growth however, due to the catastrophic nature of the 1929 fire. For the most part the landscape is densely-stocked with 70-year-old trees, except for odd patches of older trees, which escaped destruction in 1929. The landscape is traversable by foot, but difficult in some places due to downfall or dense stands. The roadless areas generally lack old stumps or old logging trails which are prevalent in other areas of the forest, making a trek through the areas pleasant for those who seek an undisturbed outdoor experience. **Although most of the area is within one mile of a road, the rugged terrain and the dense vegetation will make opportunities for solitude abundant. The area near the Hoodoo Canyon trail would be an exception.**
- **Primitive Recreation Opportunities and Unique Features: Primitive recreation opportunities are limited by the size of the area and the ease of access to existing roads. Considering the rough terrain and the dense vegetation, the entire area can be reached within two hours.**

In conclusion, the Hoodoo Roadless Area has changed very little since the Colville National Forest Land and Resource Management Plan was signed in 1988. The ROS designation of Semi-Primitive Non-Motorized appears to be still accurate.

Twin Sisters Inventoried Roadless Area

Recreation Opportunity Spectrum

Preserving the character of the recreating experience and the benefits provided by a natural appearing landscape is the objective of the current Forest Plan direction. The Recreation Opportunity Spectrum is used to provide a framework leading to direction on the level of development appropriate on National Forest System Lands. This Spectrum combines activities, settings, and experiences that are correlated to the desired settings. The process is used to inventory and map the various kinds of recreation opportunities currently available as a result of existing conditions.

The current ROS rating for this area, as defined by the Colville Forest Plan, is divided between Semi-Primitive Motorized and Roaded Modified. **The ROS definition of Semi-Primitive Motorized is: "An area designated at least ½ mile but not further than 3 miles from all roads, railroads or trails with motorized use; can include the existence of primitive roads and trails if usually closed to motorized use", and a size limitation of 2,500 acres. The ROS definition of Roaded Modified is, "An area designated within ½ mile from better than primitive roads and railroads", and no size limitation.** The Semi-Primitive Motorized designation was derived from the use patterns generated the public utilizing motorized trails leading from the Albion Hill Road into the King-Mack Mountain area and into the Twin Sisters area. **The Roaded Modified designation was derived from the designation of MA-7 to a large portion of the Roadless Area under the Forest Plan. Implementation of the Colville Forest Plan allowed for development and management of a large portion of the Twin Sisters Roadless Area when the Plan was released in 1988.**

The following are actual attributes of the Twin Sisters Inventoried Roadless Area:

1. ***Access*: Access to the area is provided by Forest Service Roads along the South Fork of Boulder Creek, Deadman Creek and Albion Hill; and by motorized trails that access Twin Sisters peaks, King Mountain and Mack Mountain.**

2. ***Remoteness*: Much of the area is within one mile of existing roads or motorized trails, but topography limit sights and sounds associated with these roads.**

3. ***Social Encounters*: There is a high likelihood of encountering other forest users along established roads and trails in MA-10. The number of probable encounters in a single day is rated at 15 or more. Off of the trails, there is a low likelihood of encountering another party: probable encounters in a single day are rated low, which is 0-6 per day.**

4. ***Visitor Management*: Trails and roads are identified with signposts corresponding with available trail maps.**

5. ***On-site development*: ATV / Jeep trails.**

Wilderness Attributes

The Washington Wilderness Act of 1984 stated that the area shall be managed for multiple use in accordance with land management plans pursuant to section six of the Forest and Rangeland Renewable Resources Act of 1974. Due to public concern regarding possible loss of Wilderness Attributes, the attributes of Natural Integrity, Apparent Naturalness, Opportunity for Solitude, and Primitive Recreation Opportunities and Unique Features was reviewed.

1. Natural Integrity: There has been very little alteration to the natural integrity of the area. The two motorized trails and several dispersed campsites are the only on site alterations to the natural integrity of the area. **The effects of these areas are only apparent in the area immediately adjacent to the trail and do not affect the majority of the roadless area. The fire regime of the area is characterized by large stand replacement fires. Control of small fire starts in the area has delayed the start of a large fire, but the area will in all likelihood be subject to a large fire in the future. There is very little cattle use due to the rugged terrain and dense stands of lodgepole pine. There is evidence of past logging activity within the area where remnant trees were removed after fires in the late 1920's. These trails are completely grown over and do not detract from the natural integrity.**

2. Apparent Naturalness: The area appears natural when viewed from outside and within the area.

3. Opportunity for Solitude: **The majority of the area faces into the north fork of Deadman Creek drainage. There are many short to middle background views that are undisturbed, however, because of the orientation of the Roadless Areas on the landscape, there are many middleground and background views that are less than pristine. Management activities and existing roads are evident from some vantage points within the Roadless Area. A high degree of solitude can be obtained by hiking into the heart of this area, particularly in the north fork of the Deadman Creek watershed, between Twin Sisters and Mack Mountains. The wooded landscape could not be considered to be ancient or anywhere close to old growth, however, due to the catastrophic nature of the 1929 fire. For the most part the landscape is densely-stocked with 70-year-old trees, except for odd patches of older trees, which escaped destruction in 1929. The landscape is traversable by foot, but difficult in some places due to downfall or dense stands. The roadless areas generally lack old stumps or old logging trails which are prevalent in other areas of the forest, making a trek through the areas pleasant for those who seek an undisturbed outdoor experience. Although most of the area is within one mile of a road or trail,** the rugged terrain and the dense vegetation will make opportunities for solitude abundant.

4. Primitive Recreation Opportunities and Unique Features: Primitive recreation opportunities are limited by the size of the area and the ease of access to existing roads. Considering the rough terrain and the dense vegetation, the entire area can be reached

within two hours.

In conclusion, the Twin Sisters Roadless Area has changed very little since the Colville National Forest Land and Resource Management Plan was signed in 1988.

3.14.3 Areas without Classified Roads Outside of the Inventoried Roadless Areas

There are several areas within the Deadman Project Area that are not included in the Hoodoo or Twin Sisters Inventoried Roadless Areas, but still share some of the same attributes due to a lack of classified roads. The attempt to analyze or even describe these areas has been hindered over the course of the project due to changing regulations concerning management of these areas. At the initiation of the Deadman Ecosystem Management Projects in 1996, the only limitation placed upon management was in Management Area designations within the 1988 Colville National Forest Land and Resource Management Plan. By 1996, a report had come out entitled Interim Protection for Late-Successional Forests, Fisheries, and Watersheds, developed by the Eastside Forests Scientific Society Panel, 1994, an opinion paper written by a group of scientists, which stressed the importance of leaving undisturbed parcels of 1,000 acres and larger alone, to the benefit of wildlife. The initial work on the Deadman EIS included an analysis of these areas. However, there was no direction as to how to define these areas.

For the purpose of analysis, the decision was made to exclude any existing roadbed and discernable harvested area from these "unroaded" areas, and also to buffer these roads and harvest units by 100 meters, based on the idea that solitude values would not start immediately beside an existing road or harvest unit due to both visual and auditory concerns. Narrow "necks" or peninsulas of land less than a half-mile across were eliminated for the same reasons.

Whether this mapping exercise was correct or not was a subject of debate. It did accomplish two things: it enabled the Forest Service to come up with an approximate acreage figure for the amount of land without classified roads within a given contiguous parcel, and when speaking about human values, one could be reasonably comfortable that they were accurate for the entire parcel.

The areas of concern and analysis varied between 1999 and when the original Record of Decision was signed in March, 2001, due to changing policy direction.[13] For this analysis, all areas in excess of 1,000 acres lacking classified roads, whether wholly or partially inside the Deadman Project Area were analyzed. The aforementioned criteria for buffering off of roads and deleting narrow necks and peninsulas of land lacking classified roads were used, not to determine an absolute "boundary" of these areas, but to make a determination on approximate sizes of these areas. Areas less than 1,000 acres that lack a presence of classified roads, therefore, are not analyzed for effects of project implementation. Areas larger than 1,000 acres partially inside or totally within the project area which do not contain classified roads are listed in the table below.

Table 18. Areas greater than 1,000 acres lacking classified roads[14]

[13] See Alternative Development and Policy Changes Regarding Roadless, later in the document.
[14] Maps included in Appendix F.

DESCRIPTION OF AREA LACKING CLASSIFIED ROADS	APPROXIMATE TOTAL ACRES	APPROXIMATE ACRES WITHIN PROJECT AREA
Area directly east of the Hoodoo Roadless Area, including T 37 N, R 36 E, parts of sections 32-35; T 36 N, R 36 E, parts of sections 1, 2, and 12; T 36 N, R 37 E, parts of sections 5-7.	**2,400**	**900**
Area in the vicinity of Katy Creek, including T 37 N, R 36 E, parts of sections 22-27, and 35; T 37 N, R 37 E, parts of sections 18, 19, 30, and 31.	**4,200**	**2,800**
Area in the vicinity of Tie Camp Creek, including T 37 N, R 36 E, parts of sections 1 and 12; T 37 N, R 37 E, parts of sections 6, 7, and 18.	**1,800**	**700**
Area in the vicinity of and north of Alligator Ridge, and west of Thompson Ridge, including T 37 N, R 35 E, parts of sections 1 and 12; T 37 N, R 36 E, parts of sections 3-9; T 38 N, R 35 E, part of section 36; T 38 N, R 36 E, parts of sections 15, 16, 21, 22, 23, 27, 28, 32, 33, and 34.	**6,800**	**500**
Area directly west of the Hoodoo Roadless Area, including T 35 N, R 35 E, parts of sections 2-5, 8-11; T 36 N, R 35 E, parts of sections 31-33.	**2,500**	**800**

Descriptions of Individual Areas Greater Than 1,000 Acres without Classified Roads

- **Area directly east of the Hoodoo Roadless Area**
  The area is located immediately to the east of the Hoodoo area in the vicinity of Hoodoo Mountain. This area is approximately 2,400 acres and directly adjacent to the Hoodoo Inventoried Roadless Area. A portion of this area included harvest units included in the recently completed Nancy Timber Sale. These units are located in the northeast portion of this area. No new roads were constructed into this area during completion of the Nancy Timber Sale.

Recreation Opportunity Spectrum

The current ROS rating for the portion of this area within the Deadman Project Area is split between Semi-primitive Non-motorized and Roaded Natural. The ROS definition of Semi-Primitive Non-Motorized is: "An area designated at least ½ mile but not further than 3 miles from all roads, railroads or trails with motorized use; can include the existence of primitive roads and trails if usually closed to motorized use", and a size limitation of 2,500 acres. The ROS definition of Roaded Natural is: "An area designated within ½ mile from better than primitive roads and railroads", and no size limitation.

The ROS rating in this area is based on:

1. ***Access*: Forest Service Roads access the perimeter of the area from Deadman Creek on the north, the Trout Lake area on the south, and the**

Nancy Creek area on the east.

2. ***Remoteness*: Most of the area is within one mile of existing roads, but topography limit sights and sounds associated with these roads.**

3. ***Social Encounters*: Probable encounters in a single day are rated low to moderate, which is 6 to 15 per day. The number of people occupying the area at a single time ranges from a low of 1 person per 125 acres to a high of 1 person per 12 acres, which would probably be rarely reached. The amount of visitation is highest during hunting season in the fall.**

4. ***Visitor Management*: There are some closed roads at the perimeter of the area, mostly closed by earthen berms, but a few with guardrails or gates. Many roads have closed due to vegetation reclaiming the roadbeds. These roads are generally old logging roads built in the last 40 years. Many roads on the perimeter of the area remain open.**

5. ***On-site development*: None within the general area, developed roads on the perimeter.**

This area has changed very little since the publishing of the Forest Plan in 1988.

- **Area in the vicinity of Katy Creek**

  The area is located immediately to the south of Deadman Creek and to the north of Nancy Creek. This area is approximately 4,175 acres and directly west of the Forest Boundary. A portion of this area included harvest units included in the recently completed Nancy Timber Sale. These units are located in the southwest portion of this area. No new roads were constructed into this area during completion of the Nancy Timber Sale.

  Recreation Opportunity Spectrum
  The current ROS rating for the portion of this area within the Deadman Project Area is split between Semi-primitive Motorized, Roaded Natural and Roaded Modified.

  The ROS rating in this area is based on:

  1. ***Access:* Forest Service Roads access the perimeter of the area from Deadman Creek on the west and the Nancy Creek area on the south. Access is limited on the east by private land, which borders the Colville National Forest. The presence of Deadman Creek allows limited access on the north.**

  2. ***Remoteness*: Most of the area is within one mile of existing roads. The topography allows sights and sounds associated with the Deadman Creek area to be noticeable.**

  3. ***Social Encounters*: Probable encounters in a single day are rated low to moderate, which is 6 to 15 per day. The number of people occupying the area at a single time ranges from a low of 1 person per 125 acres**

to a high of 1 person per 12 acres, which would probably be rarely reached. The amount of visitation is highest during hunting season in the fall.

4. ***Visitor Management*: There are some closed roads at the perimeter of the area, mostly closed by earthen berms, but a few with guardrails or gates. Many roads have closed due to vegetation reclaiming the roadbeds. These roads are generally old logging roads built in the last 40 years. Some roads on the west and south perimeter of the area remain open.**

5. ***On-site development*: None within the general area, developed roads on the perimeter.**

This area has changed very little since the publishing of the Forest Plan in 1988.

- **Area in the vicinity of Tie Camp Creek**

The area is located immediately to the north of Deadman Creek and to the south of the Matsen Creek road. This area is approximately 1,800 acres and directly west of the Forest Boundary. A portion of this area included harvest units included in the recently completed Nancy Timber Sale. These units are located in the southwest portion of this area. No new roads were constructed into this area during completion of the Nancy Timber Sale.

Recreation Opportunity Spectrum
The current ROS rating for the portion of this area within the Deadman Project Area is split between Semi-primitive Motorized, Roaded Natural and Roaded Modified.

The ROS rating in this area is based on:

1. ***Access*: Forest Service Roads access the perimeter of the area from Deadman Creek on the south and the Matsen Creek area on the north and west. Access is limited on the east by private land, which borders the Colville National Forest. The road from Deadman Creek is very primitive.**

2. ***Remoteness*: Most of the area is within one mile of existing roads. The topography allows sights and sounds associated with the Deadman Creek road and the Matsen Creek road to be noticeable.**

3. ***Social Encounters*: Probable encounters in a single day are rated low to moderate, which is 6 to 15 per day. The number of people occupying the area at a single time ranges from a low of 1 person per 125 acres to a high of 1 person per 12 acres, which would probably be rarely reached. The amount of visitation is highest during hunting season in the fall.**

4. ***Visitor Management*: There are some closed roads at the perimeter of the area, mostly closed by earthen berms, but a few with guardrails or gates. Many roads have closed due to vegetation reclaiming the**

roadbeds. These roads are generally old logging roads built in the last 40 years. Some roads on the west and north perimeter of the area remain open.

5. ***On-site development*: None within the general area, developed roads on the perimeter.**

This area has changed very little since the publishing of the Forest Plan in 1988.

- **Area in the vicinity of and north of Alligator Ridge, and west of Thompson Ridge**

  The area is located immediately to the south of Alligator Ridge and to the west of Thompson Ridge and the Davis Lake area. This area is approximately 6,800 acres, of which about 475 acres are in the Deadman Planning Area.

  Recreation Opportunity Spectrum

  The current ROS rating for the portion of this area within the Deadman Project Area is split between Semi-primitive Motorized, Roaded Natural and Roaded Modified.

  The ROS rating in this area is based on:

  1. ***Access*: Forest Service Roads access the perimeter of the area from Deadman Creek on the south and west, and the Davis Lake and Thompson Ridge areas on the east. Very little access comes from the north due to the presence of the South Fork of Boulder Creek.**

  2. ***Remoteness*: Most of the area is within one mile of existing roads. The topography allows sights and sounds associated with the South Fork of Boulder Creek road to be noticeable.**

  3. ***Social Encounters*: Probable encounters in a single day are rated low to moderate, which is 6 to 15 per day. The number of people occupying the area at a single time ranges from a low of 1 person per 125 acres to a high of 1 person per 12 acres, which would probably be rarely reached. The amount of visitation is highest during hunting season in the fall.**

  4. ***Visitor Management*: There are some closed roads at the perimeter of the area, mostly closed by earthen berms. A few are closed with guardrails or gates (most notably from Betty Creek on south side of the area). Many roads have closed due to vegetation reclaiming the roadbeds. These roads are generally old logging roads built in the last 40 years. Most of the public access comes from the east or west side of the area.**

  5. ***On-site development*: None within the general area, developed roads on the perimeter.**

This area has changed very little since the publishing of the Forest Plan in 1988. Three units in

the Gatorson Timber Sale were cut in the early 1990's on the north edge of this area.

- **Area directly west of the Hoodoo Roadless Area**
  The area located immediately to the south of Deadman Creek and to the east of the Albion Hill Road. This area is approximately 2,400 acres, divided between the Deadman Creek and the Sherman Creek watersheds. Approximately 825 acres are within the Deadman Planning Area.

  Recreation Opportunity Spectrum
  The current ROS rating for the portion of this area within the Deadman Project Area is split between Semi-primitive Motorized, Roaded Natural and Roaded Modified.

  The ROS rating in this area is based on:

  1. ***Access*: Forest Service Roads access the perimeter of the area from Deadman Creek on the north, Sherman Creek on the south, and the Albion Hill Road on the west. Access from the east is through the Hoodoo Roadless Area.**

  2. ***Remoteness*: Most of the area is within one mile of existing roads. The topography allows sights and sounds associated with the Deadman Creek/Albion Hill area to be noticeable.**

  3. ***Social Encounters*: Probable encounters in a single day are rated low to moderate, which is 6 to 15 per day. The number of people occupying the area at a single time ranges from a low of 1 person per 125 acres to a high of 1 person per 12 acres, which would probably be rarely reached. The amount of visitation is highest during hunting season in the fall.**

  4. ***Visitor Management*: There are some closed roads at the perimeter of the area, mostly closed by earthen berms, but a few with guardrails or gates. Many roads have closed due to vegetation reclaiming the roadbeds. These roads are generally old logging roads built in the last 40 years. Some roads on the west and south perimeter of the area remain open.**

  5. ***On-site development*: None within the general area, developed roads on the perimeter.**

  This area has changed very little since the publishing of the Forest Plan in 1988.

3.14.4 The Development of Alternatives and Policy Changes Regarding Roadless Areas

Because the effects of entry into Roadless Areas and areas of a similar nature greater than 1,000 acres was considered to be a Key Issue, alternatives were developed around management entry into these areas.

Alternative development from the standpoint of roadless/unroaded considerations

Given the background of the Forest Plan, and the fact that 46 percent of the Inventoried Roadless Areas in the Deadman Project Area were in Management Areas that either allowed or promoted timber management, a proposed action that included extensive management proposals within the Inventoried Roadless Areas was generated and scoped with the public in 1996. Following responses to the proposed action, and further on-the-ground reconnaissance by members of the IDT, the proposed action was scaled back to approximately the existing Alternative B in the EIS due to economic reasons associated with road construction in the Inventoried Roadless Areas.

Alternative C was developed to not enter any Inventoried Roadless Area, or area larger than 1,000 acres identified as lacking classified roads, using the aforementioned buffering of 100 meters from existing road templates and previously harvested units. (Alternative C also did not propose any specified road construction).

Alternative D was developed to not enter any Inventoried Roadless Area, but to allow management activities in the "unroaded" areas, including road construction and timber harvest treatments.
Alternative E was developed to resemble Alternative C, except for proposing Silvicultural treatments inside the Inventoried Roadless Area by using helicopter yarding of timber.

How changing management direction affected the development of alternatives

In October, 1999, President Bill Clinton directed the Chief of the United States Forest Service to "develop, and propose for public comment, regulations to provide appropriate long-term protection for most or all of the currently inventoried "roadless" areas, and to determine whether such protection is warranted for any smaller "roadless" areas not yet inventoried." In the Notice of Intent to the Federal Register (NOI), filed that same week, the Forest Service proposed to the public several restrictive actions and alternative actions for management of Inventoried Roadless and other areas lacking classified roads in the National Forest System.15

It was under this timeframe, shortly after a national scoping effort took place, but before any decisions were made, that the Deadman Ecosystem Management

[15] See Roadless Report in Analysis File for complete text of NOI.

Projects Draft Environmental Impact Statement was released. In order to meet any possible outcome from the ongoing scoping and analysis effort going on at a National level, Deadman Alternatives C and D were changed so that both alternatives also stayed out of areas lacking classified roads areas greater than 1,000 acres that were adjacent to inventoried roadless areas, thus insuring that at least one alternative could meet any future regulations that would result from the roadless area conservation effort.

More changes

In May of 2000, almost four months after the Deadman DEIS was released, and after the comment period for the DEIS had concluded, a notice of proposed rulemaking was posted in the Federal Register regarding protection of certain roadless areas of the National Forest System. It is noteworthy that the definition of an "unroaded" area appeared in this document: Any area without the presence of a classified road, which is of a size and configuration sufficient to protect the inherent characteristics associated with its unroaded condition.

On November 13, 2000, the Final Environmental Impact Statement for Roadless Area Conservation was released.

This was followed by the Final Rule for Roadless Area Conservation, released January 12, 2001, to be enacted on March 13, 2001. On May 4, 2001, the Department announced that it would allow the rule to go into effect.

On May 10, 2001, a ruling by the U.S. District Court for the District of Idaho enjoined USDA from implementing the Roadless Area Conservation Rule. On December 12, 2002, the Ninth Circuit Court of Appeals reversed the ruling of the Idaho court, allowing the Final Rule for Roadless Area Conservation to stand. The Forest Service made a statement on the Present Status of Roadless Conservation Direction

On December 14, 2001, Interim Directive 1920-2001-1 became effective. That directive was in effect until June 13, 2003, when it was allowed to expire. The text of that directive is included in the analysis file in the Roadless Area Report, as an explanation to the evolving nature of this direction.

Thus, the Final Rule for Roadless Area Conservation, dated January 12, 2001 is the most recent written direction for management within Inventoried Roadless Areas. However, that Rule has been enjoined by a Wyoming court. Until that issue is resolved, the guiding direction reverts to the Colville NF Land and Resource Management Plan. Finally, informal guidance from the Chief of the Forest Service is to not build roads in Inventoried Roadless Areas at this time.

The policy sections that would be applicable to the Deadman Ecosystem Management Projects within the Roadless Area Conservation Rule (36 CFR 294):

§ 294.12 Prohibition on road construction and road reconstruction in inventoried roadless areas.

(a) A road may not be constructed or reconstructed in inventoried roadless areas of the National Forest System, except as provided in paragraph (b) of this section.

(b) Notwithstanding the prohibition in paragraph (a) of this section, a road may be constructed or reconstructed in an inventoried roadless area if the Responsible Official determines that one of the following circumstances exists:

(1) A road is needed to protect public health and safety in cases of an imminent threat of flood, fire, or other catastrophic event that, without intervention, would cause the loss of life or property;

(2) A road is needed to conduct a response action under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) or to conduct a natural resource restoration action under CERCLA, Section 311 of the Clean Water Act, or the Oil Pollution Act;

(3) A road is needed pursuant to reserved or outstanding rights, or as provided for by statute or treaty;

(4) Road realignment is needed to prevent irreparable resource damage that arises from the design, location, use, or deterioration of a classified road and that cannot be mitigated by road maintenance. Road realignment may occur under this paragraph only if the road is deemed essential for public or private access, natural resource management, or public health and safety;

(5) Road reconstruction is needed to implement a road safety improvement project on a classified road determined to be hazardous on the basis of accident experience or accident potential on that road;

(6) The Secretary of Agriculture determines that a Federal Aid Highway project, authorized pursuant to Title 23 of the United States Code, is in the public interest or is consistent with the purposes for which the land was reserved or acquired and no other reasonable and prudent alternative exists; or

(7) A road is needed in conjunction with the continuation, extension, or renewal of a mineral lease on lands that are under lease by the Secretary of the Interior as of January 12, 2001 or for a new lease issued immediately upon expiration of an existing lease. Such road construction or reconstruction must be conducted in a manner that minimizes effects on surface resources, prevents unnecessary or unreasonable surface disturbance, and complies with all applicable lease requirements, land and resource management plan direction, regulations, and laws. Roads constructed or reconstructed pursuant to this paragraph must be obliterated when no longer needed for the purposes of the lease or upon termination or expiration of the lease, whichever is sooner.

(c) Maintenance of classified roads is permissible in inventoried roadless areas.

§ 294.13 Prohibition on timber cutting, sale, or removal in inventoried roadless areas.

(a) Timber may not be cut, sold, or removed in inventoried roadless areas of the National Forest System, except as provided in paragraph (b) of this section.

(b) Notwithstanding the prohibition in paragraph (a) of this section, timber may

be cut, sold, or removed in inventoried roadless areas if the Responsible Official determines that one of the following circumstances exists. The cutting, sale, or removal of timber in these areas is expected to be infrequent.

(1) The cutting, sale, or removal of generally small diameter timber is needed for one of the following purposes and will maintain or improve one or more of the roadless area characteristics as defined in §294.11

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(i) To improve threatened, endangered, proposed, or sensitive species habitat; or

(ii) To maintain or restore the characteristics of ecosystem composition and structure, such as to reduce the risk of uncharacteristic wildfire effects, within the range of variability that would be expected to occur under natural disturbance regimes of the current climatic period.

3.15 Minerals

The earliest mining to occur in this area was placer mining. The earliest indication of mining activity comes from a local resident who remembers there was some placer mining on Tie Camp Creek before 1938. The evidence of hard rock mining in this area seems to date from the 1930s and later.

As of December 2002, only one mining claimant is known to hold mining claims within the Deadman Creek Watershed. These mining claims are located in section 10, T. 37 N., R. 35 E., W.M., on the southeast side of Twin Sisters Mountain.

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

This chapter discusses the environmental effects that would occur if one of the five alternatives presented in Chapter 2 were implemented. The effects of all the alternatives are listed by resource in the order presented in Chapter 3 where the affected environment is described. Chapter 4 provides the scientific and analytical basis for the alternative comparisons presented in Chapter 2.

4.1 Introduction

Environmental consequences are described in terms of direct and indirect effects, and cumulative effects. Direct effects are those that would be caused by a proposed action, occurring at the same time and place. Indirect effects are those which would be caused by the proposed action but occur across time or distance. Cumulative effects are those that result from the incremental impact of the action when added to other past, present, or reasonably foreseeable future actions.

Depending upon the resource analyzed, the scale or area of analysis can vary greatly. For some resources the area of analysis is small and inside the watershed, but others require large areas extending well beyond the boundaries of the watershed. The analysis area for cumulative effects will include state, private, and other federal land holdings within the project area.

Complete, detailed discussions of each resource are located in the resource specialists' reports that are part of the project Analysis File available at the Three Rivers Ranger District office.

This assessment of effects assumes compliance with standards and guidelines established in the Forest Plan, in Regional standards, guidelines, and policies, in State and Federal laws, and in National policies**. Analyses also assume mitigation measures listed in Chapter 2 and BMPs included in the DCEMP Analysis file would be implemented.**

New text, compared to the March 2001 FEIS, is highlighted in Verdana boldface.

4.2 Vegetation

4.2.1 Introduction

Biophysical environments were introduced in Chapter 3, Affected Environment. What follows is an analysis of how the proposed actions would contribute to the objective of moving toward the historic range of variability for stands in late seral conditions in each biophysical environment. The effects of the proposed actions on old growth, noxious weeds and sensitive plant species are also discussed in this section. Analysis of the economics of timber harvest is included in Section 4.14 Financial Analysis. Effects of entry into inventoried roadless areas and new road construction on wildlife habitat, water quality, soil quality and recreation opportunities are discussed in the wildlife, hydrology, soils and recreation sections of Chapter 4 respectively.

4.2.2 Forested Vegetation

Direct effects of the proposed actions to forested vegetation was not identified in the scoping as a key issue but is relevant to many of the effects to resources analyzed later in this chapter. Indirect effects include those that may show a delay in the cause-and-effect relationship with the action. The effects of the proposed actions upon the future stand structure of treated stands within the planning area could be considered an indirect effect because benefits may not be realized for years or decades.

Direct and indirect effects to forested vegetation

The direct effects of the proposed actions on forested vegetation are discussed in terms of acres of treatment by type (Table 19); the indirect effects by the amount of treatment by biophysical environment (Table 20).

Qualitative effects to tree species composition and risks of pathogen outbreaks are considered here as well. The assumption is made that thinning of timber stands in dense forested conditions would allow the remaining trees to increase their growth rate and achieve large structure faster because inter-tree competition is reduced. This has been demonstrated in many research projects and in many vegetation types, a list of which is not included here, but may be found in most silviculture books and symposia.

Standard silviculture tools include stocking charts for many forest types and sites. These charts delineate the optimum stocking (number of trees per acre) that would allow the trees to achieve maximum basal area increases per year (growth). Because not all stands react alike, site and forest conditions were examined in the DCEMP area and a total of 7,024 acres of forested stands were identified as having priorities for silvicultural treatments. These qualifying stands are mostly in biophysical environments deficient in late structure, or in biophysical environments deficient in a particular type of late structure, but adequate in another (Table 9 and Table 20). Further refinement of the list of qualifying stands was conducted by resource specialists on the DCEMP Interdisciplinary Team with the intent of minimizing potential undesirable effects and maximizing desirable ones. The proposed alternatives meet National Forest Management Act regulations concerning adjacent created openings.

Treatments would result in stands that reach late structure, with multiple (stage 6) or single (stage 7) strata sooner than if the stands were left untreated. This is partially due to increased growth rates of residual trees caused by reducing competition within the stands. It is also due to reduced pathogen caused mortality in treated stands because many of the diseased and infested trees are removed during treatment. Treatment of some stands by removal of portions of the insect and disease-susceptible overstory (notably grand fir, subalpine fir, Engelmann spruce, and mistletoe-infected Douglas-fir) could greatly reduce the probability of forest health problems for many years. Healthy seral species trees such as western larch and ponderosa pine would be favored as leave trees in most situations. Inter-stand species diversity would remain intact, given the species mosaics formed as a result of the fires of the 1920s. Intra-stand species diversity could decline in some stands where lodgepole pine is targeted for removal.

Table 19. Acres of silvicultural treatment type by alternative[16]

Silviculture treatment type	Alternative				
	A	B	C	D	E
Uneven-aged selection harvest	0	373	194	204	234
Commercial thinning	0	2,996	1,737	1,820	2,230
Shelterwood harvest	0	214	0	0	146
Sanitation/Shelterwood harvest	0	512	430	512	512
Salvage removal	0	25	25	25	25
Clearcut and, or Seed tree harvests	0	0	0	0	0
Total Acres of harvest treatments	*0*	*4,120*	*2,386*	*2,561*	*3,147*
Precommercial thinning	0	562	562	562	562
Post and Pole sales	0	104	104	104	104
Total Acres of Silvicultural Treatments	*0*	*4,786*	*3,052*	*3,227*	*3,813*
Planting	0	403	248	305	325

Caution should be used in interpreting the data in Table 20 because the scale of mapping used for biophysical environments is larger than the scale of mapping for harvest units. For example, the very moist western redcedar/western hemlock biophysical environment is typically located in riparian areas and would typically fall under protection for Riparian Habitat Conservation Areas (RHCAs). It shows up in Table 20 **at very low percentages, with an average unit size of 1.46 acres. Most of these acres are slivers resulting from differences in mapping scales.**

Table 20. Percent of forested NFS lands harvested, by biophysical environment[17]

Biophysical Environment	Alternative				
	A	B	C	D	E
Very moist Western red cedar/western hemlock bottoms	**0**	**2.0**	**0.2**	**0.4**	**0.6**
Very moist Englemann spruce/subalpine fir bottoms	**0**	**0.6**	**0.1**	**0.1**	**0.6**
Cold dry Subalpine fir, shrub	**0**	**2.7**	**1.4**	**1.5**	**1.8**
Warm dry Douglas-fir/grand fir shrub	**0**	**0.2**	**0.2**	**0.2**	**0.2**
Cool mesic Douglas-fir/grand fir forb-shrub	**0**	**0.2**	**0.1**	**0.1**	**0.1**
Cold mesic Subalpine fir forb-shrub18	**0**	**0.0**	**0.0**	**0.0**	**0.0**
Cool mesic Western redcedar/ western hemlock forb-shrub	**0**	**7.7**	**5.7**	**6.1**	**6.9**
Total Percent of Forested Acres Treated	**0**	**14**	**8**	**8**	**10**

Refer to the Silviculture Treatment Tables in Appendix C for a comprehensive list of proposed harvest units in Alternatives B, C, D, and E. The Silviculture Report in

[16] Planted acres are not included in total acres of silviculture treatments because these areas are first treated with sanitation, and, or shelterwood harvests.
[17] These numbers are rounded to the nearest tenth of a percent.
18 Proposed treatments are less than 0.05 percent of forested acreage in watershed.

the Analysis File contains a detailed description of each harvest prescription and the intent of those treatments. All treatments will be conducted on sites that are suitable for timber production.

Alternative A (no action)

Under this alternative, no vegetation management would be prescribed for the DCEMP area. Direct effects of implementation of this alternative would include no treatments to any of the 7,064 acres of qualifying stands. Growth of these stands would continue or begin to slow due to stand age and density for all biophysical environments.

Indirect effects of implementation of this alternative would include the continuing susceptibility of qualifying stands, and stands adjacent to them, to forest pathogens. **There is an ongoing Douglas-fir beetle attack within the DCEMP area. This insect preferentially attacks larger diameter Douglas-fir trees, thus reducing the viability of late-structural stands in the area. Large Douglas-fir trees are expected to continue to die, particularly if windthrow events and snow breakage sustain woody debris supplies. Without removal of beetle brood trees (infested trees still standing), the perpetration of this outbreak may continue longer, or recur more frequently.**

Most of the lodgepole stands within the analysis area are approaching 80 years in age and are nearing susceptible diameters and density for beetle attacks. Because of the density of stocking, these lodgepole stands could be described as slow-growing and of poor vigor, both factors in elevated risk of pine beetle attack. Failure to reduce stocking levels in some of these areas during this decade (under Alternative A) could result in an accelerated rate of insect infestation should a beetle outbreak begin. **Also, large-scale mortality of these 6 to 10 inch dbh lodgepole pine would exacerbate risk of fire without contributing woody debris of a size necessary for many wildlife species.**

Alternative B

This alternative was developed to meet management objectives in the watershed by treating the greatest number of qualifying stands. This alternative applies ecosystem management through implementation of silvicultural treatments designed to move stands toward late structure, or move from a multi-stratum late structure to a park-like late structure, **as described in Chapter 3**. Direct effects under this alternative would include silvicultural harvest treatments on approximately 4,120 acres (13 percent of the forested National Forest System Lands within the planning area). **There would be 570 acres of treatments in inventoried roadless areas for the purpose of removing small diameter timber and influencing species composition to favor native tree species less prone to pathogen outbreaks than the existing vegetation (Table 7). These treatments would mostly occur using helicopter yarding so no roads would be constructed in inventoried roadless areas**.

Under this alternative, 107 units are proposed for treatment. This includes: 373 acres of uneven-age selection harvest**; 2,996 acres of commercial thinning; 214 acres of shelterwood harvest; 25 acres of salvage removal treatment**, and 512 acres of combination sanitation/shelterwood harvest. Harvest methods would include tractor (56 percent), cable (30 percent), and helicopter (14 percent). All proposed treatments would support the management objectives of restoring late structure and reducing the risk of forest pathogen outbreaks**.**

Biophysical environments that would receive the most treatment under this alternative include the Warm, dry Douglas-fir/grand fir shrub-forb type, the Cool mesic, Douglas-fir/grand fir, forb-shrub type and the Cool mesic subalpine fir forb-shrub type (Table 20). These biophysical environments are deficient in late structure. Because of fire suppression and past harvest, the Warm, dry Douglas-fir/grand fir shrub type is deficient in late structure with open park-like condition, but not deficient in late structure in a multi-layered condition. Treatments in multi-layered late structural stands (stage 6) would move these stands toward a more open condition (stage 7).

Seven units, totaling 104 acres, have been proposed for removal of post and/or pole products. The majority of the trees in these units are submerchantable (dbh less than 6 inches) lodgepole pine. The stand densities are in excess of 300 trees per acre. The combination of these factors would enable stand thinning to be accomplished through removal of post and pole products. The trees to be left would be designated either by painting reserve trees or diameter designation. The effects of these treatments would be similar to that of a precommercial thinning. Stand vigor should improve due to increased space between trees. Access to proposed unit PG would be obtained by opening a previously closed road, 9565-440. It would be closed again by earthen berm immediately upon completion of removal activities. All other proposed post and pole units are accessible by existing open classified roads.

Precommercial thinning is proposed in 23 units, totaling 562 acres. The vigor of these stands would improve due to lessened inter-tree competition. Residual trees would have access to sunlight without side-crown overlap. Root systems would have less competition for soil nutrients and water. All of the proposed precommercial thinning units were previous regeneration harvest units in the 1980s, four of which were planted. Precommercial thinning in both natural and previously managed stands would be undertaken during the timeframe in stand development where optimal benefit in growth would be derived. Spacing of residual trees would be roughly 12 to 13 feet between trees. An increased fire hazard would result in those areas that are thinned, from the time of the operation until several winters have passed. After several winters of snow compaction, the slash would be effectively broken down and represent less of a fire hazard. **Precommercial thinning may temporarily allow cattle to wander through the plantations. Nominally, the space between crowns (which are still around waist to chest high) is only 5-6 feet. Thus there may be a temporary additional growth of grass under the crowns when the trees are thinned, but the crowns tend to close in quickly again, as the competition for sunlight and water resources moves forward. The plantations to be precommercially thinned are not currently receiving adverse impacts from cattle grazing. The treatments would be monitored by the Three Rivers district silviculture department.**

As mentioned previously, implementation of Alternative B would include 373 acres of uneven-age tree selection prescription. Although this prescription would move stands toward being uneven-aged, this initial treatment would be identical to that of a commercial thinning; which is most critical at this time to lower stand density and allow for more growing space for residual trees. Lodgepole pine would be a target species for harvest in all situations because much of the lodgepole pine trees are of an age and size that is particularly susceptible to mountain pine beetle. Naturally growing ponderosa pine and western larch would be encouraged. This is consistent with late seral species composition in the biophysical environments where most of the

treatments will occur. Long-term changes to species composition favoring these seral species would support the purpose of growing late structure stands because they have greater resistance to forest pathogens than shade tolerant Engelmann spruce, subalpine fir and, even Douglas-fir. The seral species are more likely to reach maturity and become large, but less likely to reproduce under the current dense stand conditions.

Species composition would be also influenced through planting of nursery stock, primarily ponderosa pine and western larch, on 403 acres in the DCEMP area. Planted units would not be contiguous because harvesting within the units would create highly irregular patches and corridors. Areas to be planted meet National Forest Management Act standards for ability to regenerate within 5 years after harvest or after removal of residual overstory.

Where active Douglas-fir beetle outbreak areas occur inside of, or adjacent to, planned units, some standing dead, plus existing bark beetle brood trees would be removed, which could cause openings in the stand not expected to be larger than a few acres. **These dying trees are considered dead when the infestation is visible on the bark of the lower tree bole and the crown has begun to fade. An attempt will be made to remove as many bark beetle brood-trees as possible, as this will aid in reducing the spread of Douglas-fir bark beetle into other large green trees in the stand**.

Openings two acres or larger would be planted, unless existing regeneration is acceptable both in amount and in species mix, (containing adequate ponderosa pine and, or western larch). Bark beetle brood trees and merchantable snags greater than 21 inches dbh may be removed in this event. Snag numbers as directed by screening and mitigation measures would be retained, and RHCA buffers and heritage sites protected.

Alternative B proposes to treat more stands than all other alternatives.

Alternative C

This alternative was developed to meet management objectives in the watershed by treating the greatest number of qualifying stands, without construction of new specified roads or entry into inventoried roadless areas. Direct effects under this alternative would include silvicultural harvest treatments on approximately 2,386 acres (8 percent of the forested National Forest System Lands within the planning area).

Under this alternative, 63 units are proposed. This includes: 194 acres of uneven-age selection harvest; **1,737 acres of commercial thinning; 25 acres of salvage removal treatment**; and 430 acres of combination sanitation/shelterwood harvest. Harvest methods would include tractor (43 percent), cable (27 percent), and helicopter (30 percent). All proposed treatments would support the management objectives of restoring late structure and reducing the risk of forest pathogen outbreaks.

Uneven-age tree selection harvests would be an effective treatment in meeting forest health needs, as discussed under Alternative B

Seven units, totaling 104 acres, have been proposed for removal of ***post and/or pole products***, as described under Alternative B.

Biophysical environments most treated would include the Warm, dry Douglas-fir/grand fir shrub type and the Cool mesic, Douglas-fir/grand fir, forb-shrub type. Uneven-age tree selection harvests would be an effective treatment in meeting the purpose and need for late structure, as discussed under Alternative B.

Approximately 562 acres of precommercial thinning would be conducted as in Alternative B. Species composition would be managed to support long term objectives for forest structure, and short and long term objectives of decreasing susceptibility of stands to forest pathogens.

Planting of nursery stock would occur on 248 acres. Planted units would not be contiguous because harvesting within the units would create highly irregular patches and corridors. Areas to be planted meet National Forest Management Act standards for ability to regenerate within 5 years after harvest or after removal of residual overstory.

Where active Douglas-fir beetle outbreak areas occur inside of, or adjacent to, planned units some standing dead, plus existing bark beetle brood trees would be removed, which could cause openings in the stand not expected to be larger than a few acres. Openings two acres or larger would be planted, unless existing regeneration is acceptable both in amount and in species mix, (containing adequate ponderosa pine and or western larch). Bark beetle brood trees and merchantable snags greater than 21inches dbh may be removed in this event. Snag numbers as directed by screening and mitigation measures would be retained, and RHCA buffers and heritage sites protected.

Alternative C proposes fewer stands for treatment (and acres of treatment) than any other action alternative.

Alternative D

This alternative was developed to meet management objectives in the watershed by treating the greatest number of qualifying stands, without entry into inventoried roadless areas or adjacent areas lacking classified roads (met the interim directive concerning roadless). Direct effects under this alternative would include silvicultural harvest treatments on approximately 2,561 acres (8 percent of the forested National Forest System Lands within the planning area).

Under this alternative, 65 units are proposed. This includes: 204 acres of uneven-age selection harvest; **1,820 acres of commercial thinning; 25 acres of salvage removal treatment**; and 512 acres of combination sanitation/shelterwood harvest. Harvest methods would include tractor (73 percent), and cable (27 percent). All proposed treatments in these units would support the management objectives of restoring late structure and reducing the risk of forest pathogen outbreaks.

Uneven-age tree selection harvests would be an effective treatment in meeting forest health needs, as discussed under Alternative B

Seven units, totaling 104 acres, have been proposed for removal of **post and/or pole products**, as described under Alternative B.

Biophysical environments most treated would include the Warm, dry Douglas-fir/grand fir shrub type and the Cool mesic, Douglas-fir/grand fir, forb-shrub type. Uneven-age tree selection harvests would be an effective treatment in meeting the purpose and need for late structure, as discussed under Alternative B. Approximately 562 acres of **precommercial thinning** would be conducted as in Alternative B, with the same effects. Species composition would be managed to support long term objectives for forest structure, and short and long term objectives of decreasing susceptibility of stands to forest pathogens.

Planting of nursery stock would occur on 305 acres. Planted units would not be contiguous because harvesting within the units would create highly irregular patches and corridors. Areas to be planted meet National Forest Management Act standards for ability to regenerate within 5 years after harvest or after removal of residual overstory.

Where active Douglas-fir beetle outbreak areas occur inside of, or adjacent to, planned units some standing dead, plus existing bark beetle brood trees would be removed, which could cause openings in the stand not expected to be larger than a few acres. Openings two acres or larger would be planted, unless existing regeneration is acceptable both in amount and in species mix, (containing adequate ponderosa pine and or western larch). Bark beetle brood trees and merchantable snags greater than 21 inches dbh may be removed in this event. Snag numbers as directed by screening and mitigation measures would be retained, and RHCA buffers and heritage sites protected.

Alternative D proposes treatments in more stands than Alternatives A or C, but less than Alternatives B or E.

Alternative E

This alternative was developed to meet management objectives in the watershed by treating the greatest number of qualifying stands, without construction of any new specified roads. Direct effects under this alternative would include silvicultural harvest treatments on approximately 3,147 acres (10 percent of the forested National Forest System Lands within the planning area). **There would be 324 acres of treatments in inventoried roadless areas for the purpose of removing small diameter timber and influencing species composition to favor native tree species less prone to pathogen outbreaks than the existing vegetation (**Error! Reference source not found.**). These treatments would be conducted using mostly helicopter yarding, so no road construction would occur within the inventoried roadless areas.**

Under this alternative, 86 units are proposed. This includes: 234 acres of uneven-age selection harvest; **2,230 acres of commercial thinning; 25 acres of salvage removal treatment**; 146 acres of shelterwood harvest; and 512 acres of combination sanitation/shelterwood harvest. Harvest methods would include tractor (39 percent), cable (23 percent), and helicopter (38 percent). All proposed treatments would support the management objectives of restoring late structure and reducing the risk of forest pathogen outbreaks.

Uneven-age tree selection harvests would be an effective treatment in meeting forest health needs, as discussed under Alternative B

Seven units, totaling 104 acres, have been proposed for removal of ***post and/or pole products***, as described under Alternative B.

Biophysical environments most treated would include the Warm, dry Douglas-fir/grand fir shrub, the Cool mesic, Douglas-fir/grand fir, forb-shrub and the Cool mesic subalpine fir, forb-shrub biophysical environments. Uneven-age tree selection harvests would be an effective treatment in meeting the purpose and need for late structure, as discussed under Alternative B. Approximately 562 acres of **precommercial thinning** would be conducted as in Alternative B. Species composition would be managed to support long term objectives for forest structure, and short and long term objectives of decreasing susceptibility of stands to forest pathogens.

Planting of nursery stock would occur on 325 acres. Planted units would not be contiguous because harvesting within the units would create highly irregular patches and corridors. Areas to be planted meet National Forest Management Act standards for ability to regenerate within 5 years after harvest or after removal of residual overstory.

Where active Douglas-fir beetle outbreak areas occur inside of, or adjacent to, planned units some standing dead, plus existing bark beetle brood trees would be removed, which could cause openings in the stand not expected to be larger than a few acres. Openings two acres or larger would be planted, unless existing regeneration is acceptable both in amount and in species mix, (containing adequate ponderosa pine and or western larch). Bark beetle brood trees and merchantable snags greater than 21 inches dbh may be removed in this event. Snag numbers as directed by screening and mitigation measures would be retained, and RHCA buffers and heritage sites protected.

Alternative E proposes more stands for treatment than Alternatives A, C or D, and less than Alternative B.

Old Growth

Silvicultural treatments are not proposed in any stand that currently meets the North Idaho Zone (NIZOG) definitions for old growth as presently used on the Colville National Forest. As more middle structural stands are recruited to grow into late structure, and late structural stands are left alone, the amount of old growth should increase for all biophysical environments. This may not become apparent for another 20 to 30 years when some of the managed middle structural stands and unmanaged late structural stands begin to meet NIZOG standards for old growth.

Individual trees that are relics within stands and could be classified as "old trees" may be harvested under a variety of prescriptions. Where planned units have active Douglas-fir beetle outbreak areas within or adjacent to them, some standing dead, plus existing bark beetle brood trees would be removed, which could cause openings in the stand not expected to be larger than a few acres. Bark beetle brood trees and merchantable snags greater than 21 inches dbh may be removed in this event. No green non-bark-beetle brood trees harvested would be larger than 21 inches dbh. Bark beetle brood trees greater than 21 inches dbh are expected to be a very minor percentage of the trees removed under any of the action alternatives, far less than one-half a percent of the total trees removed by this action. Wildlife needs for large, older trees as green-

tree replacements for snags would be taken into account in individual unit prescriptions as per the Forest Plan.

Between 37 and 43 percent of the acreage proposed for harvest treatment in the action alternatives was formally examined. Emphasis was placed on placing formal exams into stands which might qualify as late structure and/or old growth.

Table 21. Formal stand exams on harvest treatment areas

ALTERNATIVE					
	A	B	C	D	E
Acres of stand exams	0	1,755	886	1,035	1,322
Total acres of harvest	**0**	**4,120**	**2,386**	**2,561**	**3,147**
Percent of harvest areas with formal stand exams	**0%**	**43%**	**37%**	**40%**	**42%**

The remaining stands in these alternatives have either been field verified as to not qualifying as old growth using NIZOG standards, or are obviously not old growth based on aerial photo interpretation (very small trees).

Effects of Proposed Treatments on Stand structure

The screening process requires the promotion/retention of stands of large trees where there is insufficient late structure within certain biophysical environments. The bulk of the proposed silvicultural treatments are commercial thinnings and individual-tree selection prescriptions designed to thin out dense stands and allow residual trees to grow faster into large-tree status. Individual tree selection, sanitation, and commercial thinning treatments account for between 88 and 90 percent of the proposed treatments in the action alternatives. Most of the stands where these treatments are proposed are early or middle structural stands. These treatments would not result in an immediate change to that classification. In the long term, it is predicted that these stands will reach late structural status at an earlier date, and be less susceptible to insects and diseases in the process.

Where these prescriptions are applied to late-structural stands in warm dry Douglas-fir biophysical environments, the intent is to remove a portion of the stand that is diseased, dying, stagnant, or imminently susceptible insect attack, while leaving an existing healthy or desirable component standing. In most cases, this preferred residual component would consist of ponderosa pine, healthy western larch, and on occasion, healthy Douglas-fir. The residual stand would qualify as single-strata late structure. The use of harvesting as a tool to move from multi-strata to single-strata late structure is allowable in all late structural stands in the warm dry Douglas-fir environment, regardless of size of block, where the HRV for late structure is within historic levels for stage 6. Multi-strata late structure, however, will remain at or above the minimum for stage 6: Five percent of the warm-dry Douglas-fir biophysical environment. When used in a late structural stand in the very moist Engelmann spruce-subalpine fir biophysical environment, the intent is to remove stagnant and diseased trees while improving the spacing of the residual trees in the stand. This is within the direction for the screens, Scenario B.

Within units CZ, DC, DD, DL, DQ in all action alternatives, shelterwood treatments will move portions of middle structural stands toward an earlier structural stage

due to *forest health* concerns. Portions of these stands will have difficulty reaching or maintaining late structural status due to present stand conditions, including severe dwarf-mistletoe and armillaria problems. Both overstory and understory trees are infected with dwarf-mistletoe in some of these areas. But the occurrence of this situation in these stands is patchy. Other parts of these stands do not show the same characteristics. So, the result will be a mosaic effect where sanitation treatments are interspersed with shelterwood regeneration patches, corridors, and blocks. Where appropriate, tree seedlings, primarily ponderosa pine, which is not affected by western larch or Douglas-fir mistletoe, will be planted. All live trees greater than 21 inches in diameter will be left as legacy trees, regardless of presence of disease or not. This treatment meets the intent of the screens in providing the best, most sure, and quickest route toward sustainable late structural stands in these patches. Future management in the form of precommercial thinning, and finally commercial thinning would result in far healthier stands than what exist now, or will exist if no treatment is undertaken.

Other shelterwood harvests, in units AB, AQ, AV, AW, AX, BJ, EJ, ES, EX, and FN, are designed for reaching late structural status sooner by regenerating stands into species which can attain late structure sooner than the existing stand, if left untreated. A bi-product of that treatment would be an improvement of lynx foraging habitat. The amount of early and middle structure in warm-dry Douglas-fir, cool mesic western redcedar, and cold mesic subalpine fir biophysical environments would be temporarily reduced to early structure. The maximum amount of middle structure acreage moved to early structure for this purpose would be 214 acres in Alternative B. Approximately 126 acres in Alternative E would be treated for this purpose. No units within Alternatives C or D are proposed for a shelterwood treatment for this expressed purpose. Screening direction would be met by this treatment. Most of the treated stands would be re-entering middle structural status in approximately 30 years, a point in time where these lodgepole pine dominated stands, if left untreated, would most likely be falling apart.

Use of Clearcutting

Clearcuts and seed tree harvests are not proposed. The proposed alternatives meet National Forest Management Act regulations concerning adjacent created openings.

Cumulative Effects to Forest Vegetation

The following table shows the past timber harvest activities in the project area. Included are both acres of regeneration harvest and non-regeneration treatments by decade.

Table 22. Past NFS harvest records for Deadman Creek watershed.

Silviculture Treatment	Acres harvested, by decade*						Total Acres
	1950s	1960s	1970s	1980s	1990s	2000s	
Non-regeneration subtotal	0	516	343	1,257	329	876	3,321
Regeneration subtotal	176	454	1,197	1,608	552	0	3,987
Total commercial harvest	176	970	1,540	2,865	881	876	7,308

***More than one harvest activity can take place on the same acre, so these values over-state the number of acres actually affected.**

Alternative A

Approximately 13,740 acres of the Deadman Creek watershed have been harvested or roaded, including state and private land. Alternative A would

contribute no additional acreage to this basis, however, because of the National Fire objectives, it is reasonable to predict that areas adjacent to houses or other structures and private land will be treated to reduce fuels at some point in the next decade. There are 26.3 miles of boundary between NFS, and state or private lands. Harvests on private lands are expected to continue at current rates, though influenced by timber prices.

From a stand structure perspective, the deficits in existing late structure would continue, with slow but steady growth toward reaching the minimum HRV for late structure. Over time, growth rates would decline in some stands where treatment would have prevented stagnation. Implementation of Alternative A increases the risk of damage to stand structure from pathogens such as Douglas-fir beetles, which tend to attack the larger trees in stands. The cumulative effect is a risk of loss of late structure not only in stands that would have been treated under action alternatives, but to surrounding stands in the landscape.

Cumulative effects under Alternative A would include the continued state of susceptibility of many stands to western spruce budworm, Douglas-fir beetle, or mountain pine beetle damage and diseases such as dwarf mistletoe and root rot. Because of the existing forest pathogens, and the high risk of future outbreaks that inter-tree competition creates, middle structural stands could be so damaged as to lessen the likelihood of those stands reaching late structure. A spruce budworm or mountain pine beetle outbreak could more easily move through the area into other watersheds or into private land in the future under Alternative A, than if stands were treated under the action alternatives. Implementation of Alternative A may have much broader cumulative effects and consequences to surrounding stands.

Alternatives B, C, D, and E

Cumulative effects under the action alternatives would be an additional number of acres of treatment in the DCEMP area ranging from 4 to 10 percent of the total acres in the watershed. Some of these acres were previously treated, so these numbers overstate the cumulative effect to the watershed. It is expected that the action alternatives would result in less severe effects from an insect outbreak and existing diseases such as dwarf mistletoe and root rot compared to implementation of Alternative A. This is due to treatment of stands susceptible to insect and disease problems, which would lessen the risk of pathogens spreading to other stands in the same area, and possibly other watersheds under severe conditions. By lessening the risk of pathogens being spread to adjacent stands, the risk of damage to structural integrity of those adjacent stands is also reduced.

With implementation of the National Fire Policy, it is expected that much of the area adjacent to private or state lands would be treated to reduce fuels, particularly in the vicinity of structures. It is uncertain what the cumulative effect would be on the DCEMP area, but treatments may require reentry into areas proposed for treatment under the action alternatives. All action alternatives propose units for treatment on NFS land adjacent to state or private lands totaling approximately 500 acres (units CS, CU, CZ, DC, DD, and GA). All of these units would be within the *Warm dry Douglas-fir/grand fir shrub* biophysical environment, an environment adapted to frequent low severity fires. Underburning treatments that would reduce fuel loading are proposed for 424 of these acres (units CZ, DC, and DD). (See Section 4.4 for effects to fire and fuels from the alternatives).

Post-Sale Site Preparation

Site Preparation

Some ecosystem management treatments may result in fuel loading that pose acceptable risks to fire managers, but may deter the attainment of natural regeneration, or the ability to successfully plant seedlings. In other cases, the residual small trees or brush may be deterring the attainment of desired regeneration. Post harvest treatment including all those listed above in fuel treatments may be used to create conditions for tree planting, or natural regeneration.

Yarding tops attached can accomplish site preparation needs for unit EJ. In this case, the removal of tops along with the harvested trees will keep the slash from covering the ground. Some soil disturbance will result from yarding the tops, which should aid in baring spots of mineral soil where natural regeneration could begin to grow. It is in this manner that new stands may begin to form where it is desirable to create two-storied stands in even-aged management. Some additional damage in the form of scraped bark on residual tree boles can be expected where tops are yarded. This is not expected to have negative effects to the stands. .

Underburning is prescribed only when the residual stems are large enough to withstand a warmer fire. The desired results of site preparation are similar to jackpot burning, but due to existing brush and/or created slash it is known that a more intense fire will result. In both jackpot burning and underburning the intensity and duration of fire is designed so as to not significantly affect soil productivity and mycorrhizal abundance. These fires, in most cases, will leave duff layers blackened, but intact. Prescribed fire is designed to preserve trees left for wildlife, seed cast, shelter, and aesthetics. However, some reserve trees, if smaller or thinner-barked, may be subject to mortality or damage due to the burning of large concentrations of slash or funneling of heat columns in the course of the burn. Units CG, CZ, DC, DD, DL, and DQ fall under this prescription**. A total of 594 acres would be underburned for site preparation in Alternative B, D, or E. If Alternative C were selected, 525 acres would be underburned.**

Grapple piling of slash, and subsequent burning of the piles, may accomplish desired site preparation where slash is the only concern and the slopes are less than 35 percent. This treatment has proven to have less detrimental impacts than traditional machine piling. The machinery used for grapple piling exerts lighter pressure on the ground than most caterpillar tractors, and places far less soil into piles than caterpillar tractors historically did.
Smaller diameter logging slash would be grappled into piles and burned when the weather is rainy or snowy. The fire can be intense on the site of the pile, generally burning through to mineral soil. The area between piles remains unburned. Site preparation objectives would be met by the removal of excessive fine fuels, allowing for the possibility of natural regeneration on the site. This is the preferred site preparation treatment for units AT, BF, BG, CA, CE, CO, and EX**. A total of 46 acres in Alternative B or E would be grapple piled. Alternatives C and D would have 35 and 33 acres, respectively, grapple piled for site preparation**. Also see the report on Site Preparation Vegetation Management in the Analysis File.

Other Disclosures

Pacific Yew

No pacific yew (*Taxus brevifolia*) was found in proposed treatment units within the planning

area. It is, however, known to exist within the planning area in shrub-form. Any tree-form yew found during implementation will be protected. Shrub-form yew, if found, would be protected from prescribed fire.

4.2.3 Sensitive Plant Species

No federally listed threatened or endangered plants or plants proposed for federal listing are known to occur in the DCEMP area (USFWS 1999, 2001). In the project area there is potential habitat for 26 sensitive species on the Pacific Northwest Regional Forester's Sensitive Species List (USDA 1999). Based on the planned activities, the cumulative effects to sensitive plant populations in the project area from the proposed activities are expected to be minimal because sensitive plant populations near areas of ground disturbing activities will be protected with a buffer or fenced. In addition, the risk assessment in the Biological Evaluation shows that the likelihood and consequence of adverse effects are low.

Risk assessment

Three fencing projects will be implemented to protect *Botrychium* populations that are especially vulnerable to cattle impacts. Several populations or sub-populations are found in areas far enough away from the proposed harvest units or roads (all action alternatives) that these activities are expected to have no effects on the plants or their habitat. The Likelihood of Adverse Effects is rated as "None" (0). The remaining sensitive plant locations are found near proposed harvest units but are protected by a 250-foot or greater no-harvest buffer zone. Therefore, the Consequence of Adverse Effects is rated as "Moderate" (5) because of possible effects to habitat. The Likelihood of Adverse Effects is rated as "Low" (1). The resulting Risk Assessment value is 5. Overall, the proposed activities "may affect individual plants, but not likely to cause a trend to federal listing or loss of viability" to the plant populations located in these areas.

Cumulative effects

4.2.4 Noxious weeds

The noxious weed section of this report consists of two parts; the first looks at the potential effects of the alternatives on the spread of noxious weeds. The second looks at the potential effects of implementation of the prescription for integrated noxious weed management in the DCEMP area. Integrated noxious weed management would follow the CNF Noxious Weed Prevention guide and would be conducted under the 1998 CNF EA for Integrated Noxious Weeds. Treatments would be aimed at mitigating the possible effects of the action alternatives and treating existing noxious weed populations (all alternatives). The prescription is tiered to the Forest Plan and the CNF EA for Integrated Noxious Weed Treatment. More details of the proposed Integrated Noxious Weed Prescription can be found in the DCEMP Analysis file, on file at the Three Rivers Ranger District Office.

Issues

The effectiveness of noxious weed management and the degree to which the alternatives would provide conditions for noxious weed spread were issues identified in the public scoping. Weeds are considered a key issue and would be treated similarly under all action alternatives.

Direct and Indirect Effects to Noxious Weed Populations

The spread of noxious weeds occurs in the DCEMP area by vehicles, humans, livestock, and wildlife. Natural forces such as wind also move noxious weeds. Roads, as part of County, private, or NFS transportation systems, encourage the spread of noxious weeds from infested to non-infested areas. Soil disturbance caused by road construction or reconstruction, harvest, fuels reduction, and site preparation activities, creates the soil and vegetation conditions conducive to noxious weed infestation rather than to revegetation by desirable, natural species. In general, it is assumed that the more understory vegetation (especially grasses and shrubs) left on a site, the less likely noxious weeds will infest that site.

The removal of overstory can influence the type and quantity of noxious weeds that might infest a disturbed area. In general, the more overstory removed, the more likely noxious weed infestations may be established. Most noxious weeds found in the DCEMP area are shade-intolerant, preferring open areas such as road right-of-ways and clearcut, seedtree, and shelterwood harvest units. These include diffuse knapweed, thistles, mullen, and goatweed.

The following table displays predicted soil disturbance acreage by alternative for proposed activities for the Deadman Project Planning Area. These numbers do not include acres of temporary roads.

Table 23. Acres of predicted soil disturbance by alternative

ACTIVITY	ALT A	ALT B	ALT C	ALT D	ALT E
New roading (ac)	0	72.1	0	32.2	0
Logging systems/landings (ac)	0	219.9	87.2	151	118.2
Site preparation/fuels (ac)	0	29.8	23.2	22.6	26.1
Total (ac)	**0**	**321.8**	**110.4**	**205.8**	**144.3**

The following analysis of conditions created for noxious weed infestation and spread are based on the levels of detrimentally disturbed soils listed in section 4.7 Geology and Soils, and developed in the Geology and Soils report in the DCEMP Analysis file, available at the Three Rivers Ranger District.

Alternative A

This alternative does not create conditions for noxious weed infestation and spread above existing conditions.

Alternative B

Alternative B would have the greatest potential to create conditions for noxious weed infestation and spread of any of the action alternatives. Overall, about 6 percent of the treatment areas would have soils detrimentally disturbed. The primary cause of disturbance is compaction from ground-based logging systems,

though an estimated 82 acres of roads would be constructed or reconstructed.

This alternative displays the greatest amount of soil disturbance due to individual categories and overall.

Alternative C

Alternative C would have the least potential to create conditions for noxious weed infestation and spread of any of the action alternatives. Overall, about 4 percent of the treatment areas would be detrimentally disturbed. The primary cause of disturbance is compaction from ground-based logging systems. An estimated 5 acres of road would be reconstructed under this alternative. No new classified roads would be constructed.

This alternative displays the least amount of soil disturbance due to logging systems/landings, new roading, and overall. There is no new roading proposed to spread noxious weeds.

Alternative D

Overall, about 7 percent of the treatment areas would be detrimentally disturbed. The primary cause of disturbance is compaction from ground-based logging systems. Some disturbance is expected from prescribed fires, but affected areas would be small and isolated. This alternative proposes approximately 39 acres of new road construction and reconstruction.

This alternative displays the least amount of soil disturbance due to site preparation/fuel treatments; it is at the mid-range of soil disturbance due to logging systems, new roading, and overall.

Alternative E

Overall, about 4 percent of the treatment areas would be detrimentally disturbed. The primary cause of disturbance is compaction from ground-based logging systems. This alternative has proportionately more helicopter logging and less tractor logging than Alternatives B and D. This alternative proposes no new road building, though a small amount (nine acres) of roads would be reconstructed during harvest operations.

This alternative has mid- to low-range amounts of soil disturbance due logging systems, site preparation/fuel treatments, and overall. There is no new roading to spread noxious weeds.

Implementation of integrated noxious weed treatments

A combination of methods from the prevention, early treatment, and maintenance strategies would be selected for the DCEMP area under all alternatives.

Timber sale purchasers will be required to seed temporary roads, landings, and skid trails to revegetate soil disturbances. Acreage for seeding by the timber sale purchaser is based on predicted soil disturbance due to proposed roads, landings, harvest activities, and site preparation, (Table 23).

Failure of this contract specified seeding does sometimes occur, plus additional disturbances may occur after harvest activity due to natural and man-caused forces. To cover this, additional seeding for revegetation may be necessary, and

will be added to the Sale Area Improvement Plan (done following sale preparation activities).

As described in the Deadman Noxious Weed Prescription, newly invading species would be hand pulled before they become established. Projects proposed for all the Alternatives are shown in Table 24 below.

Table 24. Proposed integrated noxious weed treatments within project area

TREATMENT	ALT A	ALT B	ALT C	ALT D	ALT E
Seeding (ac)	0	150	50	100	75
Hand pulling (ac)	0	15	5	10	5
Total to be treated (ac)	0	165	55	110	80

Direct and Indirect Effects of Integrated Noxious Weed Treatments

Diversity and Integrity of Natural Ecosystems

If disturbed soils are not revegetated by desirable species and noxious weeds establish, a fluctuating, monoculture plant community could result. Selection of revegetation species that are native or as similar to the native vegetation as possible would be desirable and add to the diversity of the understory.

Removal of noxious weeds through hand pulling or biological agents strategically released by the Forest Service is expected to benefit the diversity and integrity of the ecosystems over the long run by removing highly competitive, monoculture type species.

4.3 Wildlife

The wildlife section is divided first by listing status and second by species in the order shown in Table 25. Sensitive and Federally listed species are then discussed in terms of (1) direct and indirect effects of the alternatives, (2) cumulative effects and (3) a risk assessments (R-6 Supplement 2600-90-5, FSM 2672.24b-2676.17e). Management Indicator Species (MIS) follow a similar format without a formal risk assessment, but with a summary section at the end relating the species to the issues and summarizing the effects. All alternatives would meet Forest Plan habitat capability objectives for MIS as described in Chapter 3.

The effect of the proposed actions on wildlife habitat was an issue identified in the scoping process. Table 25 demonstrates the relationship between habitat components (environmental attributes critical for maintaining a given population), proposed actions, the species that depend on the component, and the management that would mitigate the potential effects. Not all habitat components are listed, as some are not influenced by the proposed actions. A detailed description of the habitat components, listed by species, is in Chapter 3, Affected Environment

Table 25. Relationship between proposed actions, habitat components and management guidelines

HABITAT COMPONENT	PROPOSED ACTION	SPECIES AFFECTED	MANAGEMENT
Seclusion habitat	New road construction. Entry into Inventoried and uninventoried Roadless Areas	Wolverine, Grizzly Bear, Gray Wolf, Big Game (deer)	Maintain sufficient habitat to meet species needs across the Colville National Forest.
Travel corridors	New road construction Silviculture treatments	Wolverine, Grizzly Bear, Canada Lynx, Pine Marten,	Do not narrow to more than 400 feet; Retain cover; Implement RHCAs
Successional stage diversity	Silviculture treatments	Wolverine	Move stands toward HRV for structural stages
Old growth	Silviculture treatments	Pine Marten, Northern Three-toed and Pileated woodpeckers, Barred Owl,	No harvest in old growth stands; Establish 5 pine marten and 2 pileated woodpecker Management Requirement Areas (MRs)
Large tree dominated stands	Silviculture treatments	Pine Marten, Blue Grouse, Northern Three-toed and Pileated Woodpeckers, Barred Owl	Enhance large tree populations; No harvest in old growth stands: Maintain at least 8 large “limby” trees per acre in blue grouse habitat
Foraging habitat	Entry into IRA, Shelterwood harvests	Canada Lynx, Franklin’s Grouse	Regenerate lodgepole pine stands with even-aged middle or early structure
Big game as prey	Silviculture treatments in big game winter range (MAs 6 and 8)	Wolverine, Grizzly Bear, Gray Wolf	Enhance long term winter range cover; Improve forage quality and quantity; Implement integrated noxious weed treatments
Winter range (MAs 6 and 8)	Silviculture treatments New road construction	Big Game	Enhance stands to increased winter range cover in long term; Mitigate cover loss with restoration burn
Forage quality	New road construction (as avenues for noxious weed spread)	Grizzly Bear, Big Game	Implement integrated noxious weed treatments to reduce risk of spread
Down woody debris (DWD)	Silviculture treatments	Canada Lynx, Pine Marten, Pacific Fisher	Maintain sufficient DWD while minimizing fire risks
Snags	Silviculture treatments	Pacific Fisher, Great Gray Owl, Northern Three-toed and Pileated Woodpecker, Barred Owl	Enhance large tree populations; Maintain snag populations as per screening direction; Erect Great gray owl nest platforms

4.3.1 Sensitive Species

Habitat exists in the DCEMP area for West Slope Cutthroat Trout, Interior Redband Trout, American peregrine falcon, Great gray owl, Townsend's (Pacific western) big-eared bat, California wolverine, and Pacific fisher. The analysis summary for these species is presented in Table 26.

Table 26. Summary of the results of risk assessments conducted on sensitive wildlife species

SPECIES	PRE-FIELD REVIEW	FIELD REVIEW	RISK ASSESSMENT (Likelihood x Consequences)	
			Alternative A	Alternatives B, C, D, E
California Wolverine	Habitat present	Species present	***No Effect***	Not likely to lead in a trend towards Federal listing or loss of viability (NLTFL)
Pacific Fisher	Habitat present	Species not present	No Effect	NLTFL
Townsend's (Pacific western) big eared bat	Habitat present	Species present	No Effect	NLTFL
American peregrine falcon	Habitat present	Species not found	No Effect	No Effect
Great gray owl	Habitat present	Species present	No Effect	NLTFL
Westslope cutthroat trout	Habitat present	Species not present	No Effect	NLTFL
Redband trout	Habitat present	Species present	No Effect	NLTFL

Effects on California wolverine (Gulo gulo)

Assessing effects of the alternatives to wolverine, a wide-ranging carnivore, consists of evaluating potential effects to forest successional stages, prey populations (primarily big game), travel corridors, and seclusion habitat and disturbance of natal den sites.

Successional Stages

All proposed silviculture treatments would maintain late structural stands across the landscape and enhance the ability of early and middle structural stands to attain late structure. Shelterwood harvests would move multi-layered late structure to more open and park-like structure, a condition that is also deficit in the watershed. Moving conditions in the watershed towards a more historic distribution of structural stages should benefit wolverine. **Alternative B would treat the greatest number of acres, Alternative A, the least (Table 27).**

Prey Species Habitat (see Big Game within section 4.3.4)

Big game (as carrion) is a primary food source for wolverine in winter. All action alternatives would cause a slight short-term decrease in big game cover in winter range from proposed harvest. However, harvest in existing cover would improve long-term winter cover for deer and

benefit wolverine in the long term. Post-harvest treatments including under burning and prescribed fire would improve forage quantity and quality for big game mitigating, in part, the short-term loss of cover. All action alternatives propose the same amount of harvest and post harvest activities in winter range, though Alternatives B and D propose some road building, which could reduce forage quality through providing access for noxious weeds. For summer range, all of the action alternatives improve the cover:forage ratio, moving it closer to the 50:50 considered optimum for big game.

Road construction and reconstruction, skidding trees, and other activities involved with log haul disturb soil and provide habitat for noxious weeds like diffuse knapweed and goatweed. Noxious weeds displace native and desired non-native forage species, thus reducing an area's capacity to support prey for wolverine. Predicting the degree to which noxious weeds will invade new areas in the watershed is very difficult and dependent on factors such as the location and extent of a weed population relative to the disturbance, timing as to when a disturbance will occur (winter vs. the growing season), success of revegetation efforts, etc.

The relative amounts of disturbance and road acres can be used as a surrogate measure (see section 4.2.4 Noxious Weeds), however, it is improbable that all acres of disturbance will become infested with weeds. Alternative B would create the most acres of disturbance, Alternative D, about two-thirds of that and Alternative E about half. Alternative C would create about one-third as much disturbed acres as Alternative B, so would have the least potential for noxious weed spread and loss of big game habitat of all the action alternatives. Alternative A would not disturb any new acres. All action alternatives would mitigate possible noxious weed spread by implementation of the Noxious Weed Management Prescription for Deadman Watershed which is commensurate with the CNF Integrated Noxious Weed Management Program EA.

Travel Corridors

Corridors would not be narrowed to less than 400 feet. **Wolverine move through and occupy a wide variety of habitat types, from wet and heavily forested to dry and very open. Their abundance seems related to prey abundance (Gardner 1985, Banci 1987, Demarchi et al. 1990, Banci 1994). Few studies have examined the effects of timber harvest on wolverine, though Hornocker and Hash (1981) found no difference between wolverine movements, habitat use, or behavior in wolverines that inhabited logged vs. unlogged habitats in their study site. Wolverines do not appear to shun open areas: in Washington wolverines have been found in sagebrush and in Oregon on the south side of the Columbia River, across from which they presumably swam. In Idaho wolverines commonly crossed natural openings and areas with little overstory such as burned areas, meadows, and alpine areas (Copeland 1996). Based on the above, on a local scale, implementation of silvicultural and other treatments will not affect wolverine movements.**

Seclusion habitat (Core Area habitat) and Natal Den Sites

Harvest units or roads can affect wolverine seclusion habitat (also called core areas) both directly and indirectly. Direct effects of roads relate to length of time the road remains open, the level of traffic on the road, and habitat loss in the road prism. Indirect effects relate to loss of prey habitat due to noxious weed encroachment as previously discussed, and disturbance by humans. None of the alternatives would affect natal denning areas because the watershed does not contain

high elevation habitat wolverine use for natal den sites.

Those alternatives with the least amount of road construction would have the least direct and indirect effects to seclusion habitat. To examine the loss of seclusion habitat due to new roads, a buffer of 0.31 miles (500 meters) was drawn around proposed new roads, and then the buffered road areas were compared to the corresponding seclusion habitat in each alternative. Alternative A would not affect any seclusion habitat**. Alternative B would affect the most existing seclusion habitat, about 15 percent in spring and summer and 8 percent in autumn. Alternative D would affect about 10 percent of the existing seclusion habitat in spring and summer, but only 2 percent in autumn.** Alternatives A, C and E do not propose any new specified road construction, so would not affect seclusion habitat. Temporal effects of new specified road construction and road removal are dependent on effectiveness of road closures. It is expected that some road closures would be breached, particularly by off-highway vehicles (OHVs), so the effects of some new road construction are expected to outlast activities related to the DCEMP. Generally, these breaches decrease as closed roads become blocked with fallen trees and plants retake the site.

The effects to seclusion habitat of treating units relates to the length of management activities and the harvest intensity. Units proposed for commercial thinning should affect seclusion habitat only during the period that harvest and post-harvest activities take place, usually about a 3-to-5-year period. However, in most cases, the effects of the treatment are negligible because sight distance (how far a wolverine can be seen) would remain fairly short. The effects to seclusion habitat from units proposed for shelterwood harvest would be greater and last for several years because sight distance in the stands would be lengthened (some animals avoid these more open habitats). However, the total acreage of created openings (shelterwood and sanitation harvest) in seclusion habitat should have a minimal effect to wolverine. Alternatives C and D would have the least negative effects (40 and 70 acres of regeneration harvest, respectively). Regeneration harvest in Alternative E would affect 190 acres and in Alternative B 250 acres of seclusion habitat.

Cumulative Effects to Wolverine

The area considered for cumulative effects analysis consists of the entire ranger district.

Successional Stages

Recent activities that involve silviculture treatments have been implemented with the intent of managing towards historical ranges of variability for different forest structural stages. This should maintain successional patterns similar to those with which wolverine evolved. Continued management under this scenario should benefit wolverine.

Prey Summer and Winter Range

Recent salvage harvest and post-harvest activity improved big game winter range in the Deadman Creek watershed. Proposed silviculture treatments under all action alternatives would have a positive long-term effect to big game cover quality, cover distribution, and woody forage production. A prescribed fire was conducted on Churchill Mountain in the wedge area and more are to be conducted in winter ranges in the Sherman and Sheep watersheds near the Canadian boarder. These projects would benefit big game, thus wolverine. Road construction and reconstruction, skidding trees, and other activities involved with log haul disturb soil and provide

habitat for noxious weeds. Noxious weeds displace native and desired non-native forage species, thus reduce an area's capacity to support prey for wolverine, as discussed above.

Travel Corridors

Proposed silvicultural and other treatments would retain at least 400-foot widths for corridors and probably would not affect wolverine movement patterns

Seclusion Habitat and Undisturbed Natal Den Sites

Current and future projects that construct, reconstruct or reopen roads will reduce seclusion habitat. About 45 percent of the ranger district consists of seclusion habitat. If we include motorized trails and closed roads (still passable by all-terrain vehicles (ATVs), seclusion habitat drops to 30 percent of the ranger district. In addition to the DCEMP, sales in the Sherman watershed will temporarily reduce seclusion habitat because of new roads and reconstruction of existing, impassable roads. The project in the Sheep watershed proposes to close about 4.6 miles of existing road, thus increase seclusion habitat in that area. While restricting some vehicles, closed roads still allow access by humans riding ATVs, so nearly all closed roads have some effect to seclusion habitat until the road becomes too grown-over to pass.

Future implementation of the National Fire Plan would have effects closest to structures and other centers of human activity. These areas are generally outside of wolverine seclusion habitat, and so should have little or no effect to wolverines.

There are no cumulative effects to natal denning areas because these high-elevation areas fall into MA10 or 11, where we do not conduct timber management**. In the unlikely event that an active wolverine den is located, the area would be protected using timber sale provision CT6.25 and the Forest Plan standard which provides protection of unique habitats. Provisions in timber sale contracts would protect known denning sites and protect against any accidental "taking" (as defined in FSM 2670.5) of wolverine during harvest-related activities.**

Wolverine Risk Assessment

Alternative A is expected to have "no impact" on wolverine as it would not change the structural stage distribution within any biophysical environment and would not affect any seclusion habitat.

Alternatives B, C, D, and E propose harvests which would affect structural stage distribution, habitat for prey base, and/or seclusion habitat. These activities may modify use of the area by wolverine, but are not expected to substantially negatively affect wolverine. Thus, the Likelihood of Adverse Effects is "Low". The Consequences of Adverse Effects would be "Moderate" because the impacts to seclusion habitat would be cumulative. The action alternatives "may impact individuals but are not likely to result in a trend toward Federal listing or loss of viability."

Effects on Pacific fisher (Martes pennanti pacifica)

The effects of forest management on fishers have not been extensively studied. Fishers do occupy areas harvested using uneven-age management or selective harvest prescriptions: fisher habitat in southwestern Oregon contains many roads and selectively harvested stands, but management activities have retained abundant snags, logs, and cavity trees (C. Raley, pers. comm.). Even-aged management tends to degrade fisher habitat by periodically removing the

canopy and reducing the abundance of snags, cavity trees, and coarse woody debris. The effects to fishers are analyzed by evaluating the effects to late structure or mature forests, and to snags and down wood.

Late Structure or Mature Forest

Alternative A, the no action alternative, would not affect fisher habitat, but all action alternatives will. Those with the least amount of regeneration harvest or that regenerate the least amount of good habitat will have the least negative effects: Alternative C does not affect any good habitat, Alternative D affects about 40 acres, Alternative B affects 145 acres and Alternative E affects about 130 acres. Alternative B, which affects the largest amount of good fisher habitat, affects slightly more than 1% of good habitat.

Those alternatives that attempt to move the greatest acreage towards late or old structure more rapidly than if the stand were not managed will have the greatest short-term negative effect but also the greatest long-term beneficial effect provided that down wood and standing snags are retained, as per screen direction. Road construction and reconstruction will have negligible effects to late structure or mature forest.

Table 27. Acres of regeneration and non-regeneration harvest in potential fisher habitat in the Deadman watershed.

TREATMENT	ALTERNATIVE			
	B	C	D	E
Acres of regeneration harvest	519	248	305	451
Percent of good habitat affected by regeneration harvest	1.1%	0	0.3%	1.0%
Acres of non-regeneration harvest	3,395	1,955	2,050	2,490

Snags and Down Wood

The screening process amends the Forest Plan to retain additional snags and down wood on site. Snag felling would occur because OSHA requires felling of hazard trees and snags. Different harvest methods result in different levels of standing snags being left on site: ground-based systems usually retain the most standing snags and helicopter harvest retains the fewest. All units to be harvested would lose standing snags, and the alternatives with the lowest amount of harvest would result in the least loss of snags. Road construction and reconstruction would have negligible effects on snags and down wood. See section 4.3.4 Management Indicator Species, Northern three-toed woodpeckers for additional discussion of snags, and Pine Marten for additional discussion of down wood.

Post-harvest treatment of fire, and, or grapple piling can reduce, eliminate or redistribute down wood. Most of the prescribed fires for this project would consist of low-intensity fire and are intended to not kill the remaining overstory of partially harvested stands. These fires rarely consume large-diameter down wood. Prescribed fire in the shelterwood stands would be of higher intensity and might consume large down wood.

The proposed harvest would retain sufficient snags and down wood to meet or

exceed the levels outlined in the screens, thus the amount should be sufficient to maintain habitat of fishers.

Cumulative Effects

The area considered for cumulative effects analysis consists of the NFS land east of the Kettle Crest to the Columbia or Kettle Rivers. Several timber sales have taken place in the area. Because of fire and harvest history, most prescriptions have been designed to move stands more rapidly towards late and old structure than without management. In the short-term, these sales would negatively affect fisher habitat. However, in the long-term they would more rapidly grow into fisher habitat than if the stands had not been treated. Recent sales have met the snag and down wood levels outlined in the "screens".

Risk Assessment

It is extremely unlikely that fisher occupy the watershed, so no alternative would affect fishers. The No Action Alternative is expected to have "no impact" to fisher habitat. Fisher habitat would be affected in all action alternatives. All action alternatives create short-term negative effects to habitat but long-term positive effects. The number of large snags would decrease. The amount of large down wood would decrease slightly. The loss of large snags and down wood would be within the guidelines outlined in the "screens" and so not dramatically affect fisher habitat. The action alternatives "may affect but are not likely to adversely affect fisher habitat."

Effects on Townsend's (Pacific Western) big-eared bat (Coyrnorhinus townsendii)

For Townsend's big-eared bats, effects to sites that support hibernacula and maternal colonies (caves, mines, old buildings) were examined.

Because no caves or mines were found in the watershed, none of the alternatives would affect hibernacula or maternal colonies of Townsend's big-eared bats.

Cumulative Effects to Townsend's Big-eared Bat

The area considered for cumulative effects analysis consists of the entire ranger district. Two future projects would affect mines, caves or old buildings. The use of bat-friendly grates to close the entrances of two mines was proposed as mitigation measures for these projects.

Risk assessment for Townsend's big-eared bat

Alternative A is expected to have "no impact" on Townsend's big-eared bats. The Consequences of Adverse Effects is moderate because of the extent of the project. The Likelihood of Adverse Effects is Low because Townsend's big-eared bats might occupy the DCEMP area. Alternatives B, C, D, and E may affect individual Townsend's big-eared bats, but the proposed alternatives are "not likely to result in a trend toward Federal listing or loss of viability".

Effects on American peregrine falcon (Falco peregrinus)

To determine effects to peregrine falcon, effects to potential nest sites are examined.

No alternatives will affect peregrine falcon. We noted two suitable nesting cliffs in or adjacent to the watershed. Pagel (1993) judged quality to be moderate and low, respectively. We monitored these sites during the nesting season in 1993, 1994 and 1995 and did not sight any falcons. No activities would take place on or near these sites under any of the alternatives

Cumulative Effects to Peregrine Falcon

The area considered for cumulative effects analysis consists of the entire ranger district. No records indicate that peregrine falcons nest on or near the ranger district, though people see several in the area each year, usually during migration. We surveyed potential nest sites identified by Pagel (1993) throughout the ranger district during the nesting season in 1993, 1994 and 1995 and did not sight any falcons.

Risk to Peregrine Falcon

No alternative would affect peregrine falcons.

Effects on great gray owl (Strix nebulosa)

The great gray owl mainly occupies boreal forests but ranges south into the northern Rocky and Sierra Nevada mountain ranges. It feeds primarily on small rodents (Johnsgard 1988). Great gray owls nest in and occupy forested habitats (Hayward and Verner 1994) and use snags and other perches, particularly adjacent to openings in the forest canopy. One record of great gray owls exists from the northwestern border of watershed, from August 1998. Habitat components analyzed for the DCEMP include prey populations, nesting habitat, nesting sites, including artificial nest platforms, and perches near harvest units.

Prey Populations

All action alternatives would increase prey populations because harvest opens forest canopies and allows more sunlight to reach the forest floor, which stimulates ground vegetation. Additionally, prescribed fire stimulates shrub regrowth. Those alternatives with the greatest amount of regeneration harvest would provide the most habitat for Microtine voles and pocket gophers.

Nesting Habitat

Bull and Henjum (1990) reported that nesting great gray owls preferred unlogged stands (used this habitat type more than it was available), but did nest in harvested stands (though at a level far less than this habitat was available). All action alternatives would affect existing potential nesting habitat (Table 28).

Alternatives C and D would have the least negative effects to nesting habitat. Regeneration-type harvest prescriptions (shelterwood and sanitation/shelterwood) would eliminate or nearly eliminate nesting habitat, though the habitat is of poor quality. Non-regeneration-type harvest prescriptions (commercial thinning, single tree selection and sanitation harvest) would reduce the quality of the nesting habitat because the area will be more open. However, because relatively small trees would be removed, the units will still serve as nesting habitat.

Table 28. Acres of and percent of total potential nesting habitat proposed for harvest, by harvest prescription and alternative.

ALTERNATIVE	Regeneration		Non-regeneration		Total	
	Acres	Percent	Acres	Percent	Acres	Percent
B	79	3	221	9	300	12
C	28	1	108	4	135	5
D	50	2	56	2	105	4
E	79	3	202	8	280	11

Many stands proposed for harvest do not currently provide potential nesting habitat. In those stands whose prescription is commercial thinning or single tree selection, management is intended to improve growth of remaining trees, which could yield more potential nesting habitat sooner than if the stands remained in their current states. Alternative A would not affect nesting habitat.

Nest Sites (including artificial platforms)

OSHA regulations require felling of hazard trees, thus some nest sites (large snags) would be lost in potential nesting habitat that is harvested. Alternatives that propose the least harvest in potential nesting habitat would have the least negative effects. To mitigate loss of nesting sites (large snags) in potential nesting habitat proposed for harvest, artificial platforms would be constructed and placed in remaining nesting habitat. The number and placement will be determined post-project and depends on the number of large snags felled during harvest activity.

Perches and Standing Dead Wood

OSHA regulations require felling of hazard trees, so harvest activities would reduce complexity of dead standing and leaning timber under all action alternatives. It is anticipated that unharvested areas, and damage due to harvesting, would maintain sufficient structure for perches and escape habitat.

Cumulative Effects to Great Gray Owls

The cumulative effects area consists of the east side of the Kettle Crest.

Prey Population

The forest canopy continues to close because of the lack of disturbance, either natural or human-caused, which decreases habitat for Microtine voles and pocket gophers, the primary prey of great gray owls. Harvest, prescribed fire and wildfire will continue to create pockets of prey concentrations.

Nesting Habitat

Until the mid-1990s, when the screens process was incorporated into the Forest Plan, nesting habitat had declined because harvest had removed entire stands of large trees. Since implementing the screens, the Forest Service east of the Cascade Mountains has not harvested live trees greater than 21 inches dbh, and prescriptions for harvest within many of these stands has been partial-removal rather than regeneration. Though this does not leave the stand as attractive for great gray owls as unharvested stands, some of these stands still provide nesting habitat for great gray owls. Some nesting habitat has been lost due to Douglas-fir bark beetle infestations. Though this beetle can create nest sites by infesting and killing individual trees, it also has killed entire stands, which reduces or eliminates their function as nesting stands.

Nest Sites (including artificial platforms)

The Forest Service has not placed great gray owl nest platforms east of the Kettle Crest. Though nesting habitat has declined, nest sites have increased because of recent infestations of Douglas-fir bark beetles, which attack large trees. It is assumed that the number of platforms created by mistletoe or large birds remains the same.

Perches and Standing Dead Wood

Retaining snags continues to be problematic, though more structure is now retained than before the mid-1990s. OSHA regulations require felling of hazard trees, which includes standing and leaning snags. Down wood remaining in stands has increased because many stands are now harvested under a non-regeneration prescription. Non-regeneration prescriptions retain many standing live, large trees. To prevent the loss of these trees during post-harvest burning of logging slash, prescribed fire is of lower intensity than in stands harvested under a regeneration prescription. The lower intensity fire does not fully consume mid-sized and larger down wood.

Risk assessment for great gray owls

Nesting habitat and availability of prey appear to be more important than nest sites in determining success of great gray owl reproduction (Hayward and Verner 1994). Alternatives C and D have the least negative effects to nesting habitat; Alternatives B and E have nearly three times the negative effects of Alternative D and more than twice the negative effects of Alternative C However, though the action alternatives may affect individual great gray owls, they are not likely to lead to a trend toward Federal listing or loss of viability.

4.3.2 Threatened and Endangered Species

The Endangered Species Act (ESA) requires that the Forest Service address the potential effects of proposed management activities on threatened and endangered species. Table 29 identifies the species, the status of those species and the risk assessment.

Effects on grizzly bear (Ursus arctos)

The Deadman watershed lies within a Management Situation #5 which is not managed primarily as grizzly bear habitat (USFS 1993). To determine the effects to grizzly bear, we examined effects to hiding cover, forage, road density, and seclusion habitat: components similar to those analyzed for areas that contain grizzly bear.

Travel Corridors and Hiding Cover

Among the action alternatives, little difference exists in their potential effects to hiding cover and travel corridors. Hiding cover would be eliminated in only those units proposed for shelterwood harvest (214 acres in Alternative B and 146 acres in Alternative E) and the shelterwood portion of the sanitation/shelterwood harvests (248 acres in Alternative C and 305 acres in Alternatives B, D and E). None of these units lie on a major ridge or saddle, areas important for grizzly bear travel. At most this would affect 1.4 percent of the NFS lands in the watershed and the effects would be negligible. The effects of these units would last about 15 years.

Table 29. Summary of the risk assessments conducted on the threatened, endangered, and proposed species

SPECIES	PRE-FIELD REVIEW	FIELD REVIEW	RISK ASSESSMENT	
			Alternative A	Alternatives B, C, D, E
Grizzly bear (T*)	Habitat present	Species may be present	No Effect	NLTAA**
Woodland caribou (E)	Habitat present	Species not found	No Effect	No Effect
Gray wolf (T)19	Habitat present	Species may be present	No Effect	NLTAA
Canada lynx (T)	Habitat present	Species present	NLTAA	NLTAA
Bald eagle (T)	Habitat present	Species present	No Effect	NLTAA
Bull trout (T)	Habitat present	Species not present	No Effect	NLTAA

*T = Threatened, E = Endangered, P = Proposed
** Not Likely To Adversely Affect

Forage

No units were designed to improve forage for bears, though all harvests would stimulate some forage production. Underburning in several of the units may improve berry fields. Alternatives that propose the greatest acreage for harvest would probably have the highest increase in forage.

The discussion under section 4.3.4 Management Indicator Species, Big Game outlines the effects of each alternative to big game. Briefly, in all alternatives, proposed harvest in big game winter range should not have a substantial negative effect. Harvest in existing cover will improve long-term winter cover for deer. Post-harvest prescribed fire will improve forage in those areas. For summer range, all of the action alternatives improve the cover:forage ratio, moving it closer to the 50:50 considered optimum for big game. The increased risk of noxious weed invasion that

19 Previously listed as “Endangered”, the status of Gray wolf was downgraded to “Threatened” on March 18, 2003.

accompanies ground disturbing management activities is the greatest threat to big game habitat. The loss of habitat due to noxious weed invasions, can be decreased by pre-harvest techniques such as controlling noxious weeds on existing haul roads in the watershed starting a few years before harvest activities, and re-seeding roads with species that will aggressively compete with noxious weeds when the roads are built (D. Fagerlie, pers. comm., CNF Integrated Noxious Weed Management Program EA 1992). **All action alternatives would implement the CNF Integrated Noxious Weed Management Program EA as described in the Noxious Weed Management Prescription for the Deadman Project Planning Area.**

Densities of Motorized Roads and Trails

Roads affect habitat both directly and indirectly. Direct effects of roads relate to length of time the road remains open, the level of traffic on the road, and habitat loss in the road prism. Indirect effects relate to loss of prey habitat due to noxious weed encroachment and future disturbance by humans**. Rather than provide road density figures seclusion habitat is used as a proxy for road effects, because the road itself only directly affects a small portion of habitat. The indirect effects of the road are much greater.**

The densities of open roads would increase during harvest activities but affects of new road construction would be short-term. Though road closures are not always effective, most roads eventually close through natural revegetation and deadfall of trees. **Additional obliterations and removals of roads that are proposed under all action alternatives should help maintain the current density of open and motorized roads and trails after implementation. Roads analysis identified about 10 miles of existing road to be closed.**

Effects to Seclusion Habitat

Effects to grizzly bear seclusion habitat are analyzed similarly for **wolverine and gray wolf**. Harvest units and roads both can affect seclusion habitat (also called core areas). The effects of units relate to the length of management activities and the harvest intensity. Proposed units should affect seclusion habitat only during the period that harvest and post-harvest activities take place (about 3 to 5 years).

Table 30. Acres and percent of existing core area habitat affected by proposed roads

Amount of habitat affected	Alternative B		Alternatives A, C and E		Alternative D	
	Spring/Summer	Autumn	Spring/Summer	Autumn	Spring/Summer	Autumn
Acres	2,800	1,190	0	0	1,850	340
% of total	15%	8%	0	0	10%	2%

Seclusion habitat is best maintained if no roads are built into them. Those alternatives with the least amount of roads would have the least direct and indirect effects. To examine the loss of seclusion habitat due to new roads, a buffer of 0.31 miles (500 m) was created around proposed new roads, and then compared the buffered road area to the corresponding seclusion habitat in each alternative. Table 30 illustrates the direct effects to seclusion habitat.

Temporal effects of new specified road construction are dependent on effectiveness of road closures. It is expected that some closures would be

breached, particularly by OHVs, so the effects to seclusion habitat of some new road construction would be expected to outlast activities related to the DCEMP. Generally, these breaches decrease as closed roads become blocked with fallen trees and woody plants reestablish on the site. In Alternatives B and D, just a few roads accessing a few units would greatly increase the amount of seclusion habitat affected (Table 31). Alternatives A, C and E propose no new road construction.

Roads analysis identified about 10 miles of road to close. Few of these will dramatically increase the amount of seclusion habitat because most of these roads branch from existing open roads, and most are short.

Table 31. Proposed road construction that most affects seclusion habitat and the units accessed by those roads, under Alternatives B and D

Alternative B		Alternative D	
Acres affected	Units accessed by road Spring/Summer	Acres affected	Units accessed by road Spring/Summer
180	EJ		
230	EN/FP	140	EN
1760	BL/BP/BT/BX/EV/FH/CP	1090	BT/BX/CP
440	DG	440	DG
	Autumn		Autumn
170	EJ		
120	EN/FP		
830	BL/BP/BT/BX/EV/FH	210	BT/BX

Cumulative Effects to Grizzly Bear

The area considered for cumulative effects analysis consists of the entire ranger district. Though grizzly bears have not been seen on the district, they do occupy land in Canada, within a mile of NFS land in the Wedge between the Columbia and Kettle Rivers, about 25 miles form the DCEMP area.

Travel Corridors and Hiding Cover

The amount of hiding cover should increase over time, which should have a minor positive effect. Because most of the district falls below historical conditions for late and old structure, regeneration harvests in the current and proposed sales would be limited and little hiding cover eliminated. An estimated maximum loss of hiding cover due to regeneration harvests is about 400 acres over the ranger district. Though these units eliminate hiding cover, overall, hiding cover is expected to increase because many regeneration harvest units cut in the 1980s and early 1990s should grow into hiding cover. Additionally, parts of the 10,000-plus acres burned during the White Mountain fire should soon grow into hiding cover. The Forest Service adopted guidelines to maintain travel corridors and all current and future projects would retain at least 400-foot widths.

Forage

No units in any project were designed to improve forage for bears, though all harvests would slightly increase available forage.

Road Density Seclusion Habitat

Current and future projects that construct, reconstruct or reopen roads would reduce seclusion habitat and decrease habitat suitability for grizzly bears. About 45 percent of the ranger district consists of seclusion habitat. If we include motorized trails and closed roads (still passable by ATVs), seclusion habitat drops to 30 percent of the district. In addition to this project, sales in the Sherman watershed would temporarily reduce seclusion habitat because of new roads and reconstruction of existing, impassable roads. The project in the Sheep watershed proposes to close about 4.6 miles of existing road, thus increase seclusion habitat in that area.

Because the Forest Plan requires that new roads be closed at the end of harvest activities, the most severe effects should be limited to the time during which the roads remain open to vehicle traffic, usually about a 3-to-5 year period. While restricting some vehicles, closed roads still allow access by humans riding ATVs, so nearly all closed roads would have some effect to seclusion habitat until the road becomes too grown-over to pass.

Risk assessment for grizzly bear

Alternative A would have no effect to grizzly bear. Alternatives B, C, D and E have moderate consequences, but the likelihood of adverse affects is low because bears probably do not occupy the watershed.

Effects on Woodland Caribou (Rangifer tarandus)

No proposed activities in the DCEMP are would affect woodland caribou. There are no cumulative effects to woodland caribou because no other projects on the district will affect them. Risk analysis resulted in a “no effect” determination for woodland caribou under all alternatives.

Effects on Gray Wolf (Canis lupus)

To determine effects to gray wolf, effects to the ungulate prey base, denning and rendezvous sites, and seclusion habitat were examined**. Many of the habitat components for Gray wolf are common to grizzly bear, and/or wolverine previously discussed. Where possible, these topics are not repeated here.**

Ungulate Prey Base

All action alternatives propose the same harvest activities in winter range: about 320 acres in 5 units. Though the amount of cover is below the amount required in the Forest Plan, silvicultural input indicates that harvest in these units is necessary to manage for future cover. However, any loss of cover without an increase in forage quality would be detrimental to deer. Therefore, conducting prescribed fires in the units, thereby increasing forage quality, would mitigate the loss of cover. For summer range, all of the action alternatives improve the cover:forage ratio, moving it closer to the 50:50 considered optimum. (See section 3.5.4 Management Indicator Species, Big Game).

Road construction and reconstruction, skidding trees, and other activities involved with log haul disturb soil and provide habitat for noxious weeds as previously discussed in section 4.2.4 Noxious Weeds. (Also see section 4.3.1 Sensitive Species, Wolverine and Grizzly Bear above).

Noxious weeds displace native and desired non-native forage species, thus reduce an area's capacity to support prey for wolves.

Denning and Rendezvous Sites

No sites were found during field reconnaissance from 1991 to 1995. Because recent information suggests that sensitivity to human disturbance may be less than previously thought, and because wolves den in a variety of habitats, no attempt to identify potential denning and rendezvous sites was made during the analysis of this project. The alternatives proposed in this project would have no effect to denning and rendezvous sites. **Provisions in timber sale contracts would protect known denning and rendezvous sites and protect against any accidental "taking" (as defined in FSM 2670.5) of a wolf during harvest-related activities.**

Seclusion Habitat

Wolves and grizzly bears probably respond to disturbance in a similar fashion, so we used the same evaluation criteria for wolves as for grizzly bear. See discussion of the effects to *Seclusion Habitat* within the **Grizzly Bear** section described above. Briefly, Alternative A does not affect any seclusion habitat. Alternative B affects the most existing seclusion habitat (about 15 percent of spring and summer seclusion habitat). Alternative D affects about 10 percent of spring and summer seclusion habitat. Alternatives A, C and E do not affect any.

Cumulative Effects to Gray Wolf

The area considered for cumulative effects analysis consists of the entire ranger district. Though there are no confirmed sightings on the district, the Forest Service has received many reports of wolf-like animals, so some probably move through.

Ungulate Prey Base

Recent salvage harvest and post-harvest activity improved big game winter range in the Deadman Creek watershed. Proposed silviculture treatments under all action alternatives would have a positive long-term effect to big game cover quality, cover distribution, and woody forage production. A prescribed fire was conducted on Churchill Mountain in the wedge area and more are to be conducted in winter ranges in the Sherman and Sheep watersheds. These projects would benefit big game, thus gray wolves.

Noxious weeds may encroach into areas where harvest and post-harvest activities disturb soil, thus reducing site productivity for big game forage. The level of forage reduction and consequent reduction in big game populations is not known but relative levels of **soil disturbance described in section 4.4, Noxious Weeds can be used to estimate impacts. Implementation of the Colville National Forest Noxious Weed Program EA under all future management activities is expected to minimize spread where soils are disturbed.**

Denning and Rendezvous Sites

From 1991 to 1994 we conducted howling surveys throughout the district to identify denning activity. No wolves responded. Because wolves den in a variety of habitats, we did not speculate about their location, thus do not attempt to identify potential denning and rendezvous sites during the analysis for a project. Current projects probably have no effect to denning and rendezvous sites.

Seclusion Habitat

Reductions in seclusion habitat decrease habitat suitability for gray wolves. All current projects construct, reconstruct or reopen roads and reduce seclusion habitat. See discussion of the cumulative effects to road *Densities and Seclusion Habitat* within the **Grizzly Bear** section earlier in this chapter.

Risk Assessment for Gray Wolf

Alternative A would have no effect on wolves, habitat, or recovery areas. Since all action alternatives propose harvest and thus, provide forage for big game, they "may affect but are not likely to adversely affect" gray wolves, habitat, or recovery areas. The Likelihood of Adverse Effects is rated as Low for all action alternatives. Because very little stand-regeneration harvest would be conducted and new roads would be closed after harvest, the Consequence of Adverse Effects is rated as Moderate for Alternatives B, C, D, and E. The prescribed mitigation measures would reduce the Consequence of Adverse Effects to Low for all action alternatives.

Effects on Canada lynx (Lynx canadensis)

The analysis is based on the Lynx Conservation Assessment and Strategy (LCAS (Ruediger et al. 2000)) because the LCAS contains the best available science relating to lynx management. Analysis elements consist of non-lynx habitat within an LAU, connectivity habitat, unsuitable habitat, foraging habitat, denning habitat and human access.

Lynx prey mainly on snowshoe hare, and the well being of lynx populations seems correlated with snowshoe hare populations. Habitat management for lynx consists of providing good foraging habitat (good snowshoe hare habitat), good denning habitat (large areas with an abundance of down logs), and limiting the size and amount of created openings (limiting unsuitable habitat). On September 8, 2000, the U.S. Fish and Wildlife Service (USFWS) concurred with the finding that the projects and activities described within the Deadman Project area "may affect but are not likely to adversely affect" the lynx.

Travel Corridors

Harvest prescriptions for the portions of units that lie on or near ridge tops (travel corridors) were modified during DCEMP development so that cover would remain on the site. Harvest would not occur near streams, so these important corridors would remain virtually intact.

Foraging Habitat

Poor foraging habitat is prevalent in the DCEMP area. Precommercial thinning would not be conducted in lynx habitat under any alternative, thus existing forage habitat created by past harvest would not be affected.

Shelterwood harvests would be for the purpose of removing small diameter timber and influencing species composition to favor native tree species less prone to pathogen outbreaks than the existing vegetation. These treatments, when conducted in stands dominated by lodgepole pine, would have the added benefit of creating future high quality lynx forage areas because they will be prime snowshoe hare habitat in 10 to 15 years. Alternatives B and E have about the same effect to future high-quality forage habitat, whereas Alternatives A, C and D would not affect it.

From the standpoint of future high-quality forage habitat only, Alternative B creates more (215 acres of shelterwood harvest) than Alternative E (145 acres). However, Alternative B also creates 55 acres of permanent non-habitat because of roads while Alternative E creates 5 acres of permanent non-habitat from road reconstruction. Thus, the benefits of the greater harvest in Alternative B are nearly offset. Though minimal in amount, these shelterwood stands will provide important snowshoe hare habitat in about 15 to 20 years, and so benefit lynx.

Partial removal harvests will not regenerate much lodgepole pine, but may release some understory hardwoods, which also are an important component of the diets of snowshoe hares. The amount of understory opened is directly related to the acreage harvested. Alternative B proposes to harvest the most. The other action alternatives propose to conduct silviculture treatments on one third to about half as many acres in the LAU. **Alternative A proposes no treatments**.

Denning Habitat

Harvest in potential denning habitat would not reduce the amount below the **ten percent minimum** recommended in the LCAS. All potential denning habitat proposed for harvest was examined. Though the overstory trees provided sufficient cover, no units contained large areas with the high density of down logs that lynx seem to require for denning. Therefore, silviculture treatments and post-harvest activities in all alternatives would not directly reduce the amount of existing denning habitat because none is proposed for treatment.

No harvest or road building would occur in any alternative near pockets of good denning habitat. As a result of harvest, some piles of slash may remain in some of the units and may provide poor denning cover in the future.

Unsuitable habitat

The amount of **unsuitable lynx habitat** would not exceed the 30 percent recommended in the LCAS from implementation of any alternative. In Alternative B, which proposes the most regeneration harvest and the most road building in lynx habitat, unsuitable habitat would increase slightly from 25 percent to less than 26 percent.. Other alternatives would have even smaller effects to unsuitable habitat.

Only the shelterwood and sanitation/shelterwood treatments would reduce tree cover in stands to the point where the stands would be unsuitable. However, the shelterwood-only units proposed in the Twin Sisters Inventoried Roadless Area would provide future high quality forage habitat, thus benefit lynx. Alternative B proposes shelterwood only treatments for about 215 acres in 11 units in the inventoried roadless area, and Alternative E about 145 acres in 8 units. Alternatives C and D do not propose any management activities in the inventoried roadless areas. The sanitation/shelterwood units all lie in warm, dry biophysical environments so will not affect lynx.

All road building will create near-permanent non-cover at the rate of about 4 acres of non-cover per mile of road, or about 55 acres for Alternative B and 20 acres for Alternative D. No roads will be built in Alternatives A, C or E. The amount of created non-cover will have a minimal negative effect to lynx habitat and the overall amount of non-cover remains below the maximum recommended by the LCAS.

Human Access

Though recent studies indicate that lynx can tolerate the level of traffic that would be expected on forest roads in the area, they might be susceptible during the denning season to traffic near denning habitat. No road building will occur near identified pockets of good denning habitat, and no roads will be built in "unroaded" or "roadless" areas.

Alternatives B and D propose new road construction in lynx range, and all action alternatives propose road reconstruction.

When harvest activities have ended, the roads would be closed with the most practicable structures to prevent unauthorized traffic, which includes ripping sections of the road or masking the road entrance. The open road density would then return to the current level.

Provisions in timber sale contracts would protect known denning sites and protect against any accidental "taking" (as defined in FSM 2670.5) of a lynx during harvest-related activities.

Cumulative effects on Canada lynx

The area on which we analyzed cumulative effects consists of the lynx analysis units on the Three Rivers Ranger District portion of the Kettle Crest, a total of about 127,856 acres. In addition to the DCEMP, there are planned and sold timber sales in several watersheds within the cumulative effects analysis area. All future harvest activities would be planned using the LCAS as the best available science, thus would not negatively affect lynx.

Foraging Habitat

Within the next 10 to15 years, about half of the areas currently classified as unsuitable habitat (past harvest units and most of the area burned in the White Mountain Fire) will grow into at least low-quality forage habitat. Cattle graze within these stands and reduce forage available to snowshoe hare, thus reduce the quality of the foraging habitat to some extent.

Denning Habitat

Denning habitat would continue to be in relatively short supply not because of lack of overstory but because of low amounts of down wood. No concentration of beetles currently exist in lodgepole pine stands in the cumulative effects analysis area, so beetle-induced mortality in lodgepole would not create much new denning cover in the near future. Blowdown will continue to create denning cover, especially in the White Mountain Fire burn area.

Travel Corridors

Current and future projects would change lynx movements in areas where harvest reduces travel corridor width, but because all existing corridors would remain at least 400 feet wide lynx should still use them. **In stands located on major ridges, saddles or corridors, residual stem densities would maintain cover. Harvest would not occur near streams, so these important corridors would remain virtually intact.**

Unsuitable lynx habitat

The over all amount of **unsuitable lynx habitat** in the 127,856 acres lynx range should decrease in the next 10 to 15 years, even though recent regeneration harvests and those proposed under the action alternatives would increase unsuitable habitat slightly in the short term. The

cumulative acres of regeneration harvest in the lynx range, including the two most recent timber sales and the DCEMP proposed actions, varies from 300 to 450 acres. Within the next 10 to 15 years, regrowth of vegetation on the 1,740 areas harvested in the 1980s and 1990s would offset harvest losses . Additionally, parts of the 10,000-plus acres burned during the 1988 White Mountain fire will soon grow out of **unsuitable habitat.**

Human Access

All current sales temporarily increase road density. The new roads probably would not negatively affect lynx movements during the period in which they are open, about 3 to 5 years (Ruggiero et al. 2000). They could negatively affect lynx because noxious weeds may invade along the road corridors and cause loss of snowshoe hare habitat. Though the loss of habitat due to noxious weeds could occur, the extent of the effects on snowshoe hare, thus lynx, is not known. Acres of soil disturbance are used as a surrogate measure for effects of the alternatives on noxious weeds (section 4.2.4 Noxious Weeds).

Risk Assessment for Canada Lynx

All action alternatives "may affect but are not likely to adversely affect" lynx because all affect some lynx habitat components.

The Likelihood of Adverse Effects is "Low" because the amount of unsuitable habitat will not exceed the 30 percent suggested in the LCAS in any alternative. Alternative B would create the most unsuitable habitat due to regeneration harvest (215 acres), which will also provide future forage habitat. However, it would also create the most permanent unsuitable habitat due to road construction (55 acres), so the positive effect of future foraging habitat would be offset somewhat by the permanent loss of habitat. Alternative E would create the second-greatest amount of unsuitable habitat due to regeneration harvest (145 acres) but would not create any permanent unsuitable habitat due to road construction. Alternative C would not create any unsuitable habitat, but doesn't improve the existing condition of the low amount of high quality foraging habitat. Alternative D also would not create any unsuitable habitat due to regeneration harvest, but it would create unsuitable habitat due to road construction (20 acres). No alternatives would eliminate travel corridors. No current high quality forage habitat would be affected by precommercial thinning. No alternative would affect existing denning habitat; all would affect potential denning habitat but the amount of remaining denning habitat would exceed 15 percent of the lynx habitat (suggested level is 10 percent).

The Consequence of Adverse Effects for all action alternatives is "Moderate" because lynx probably occupy the planning area and the lynx population is very low relative to historic numbers.

The Interim Management Direction Establishing Riparian, Ecosystem and Wildlife Standards for Timber Sales (also known as Screens) (USFS 1995), incorporated into the Forest Plan, frequently prevents managing for lynx because of the definitions of historic range of variability (HRV), structural stages, and biophysical environments. If a watershed is below HRV for late and old structural stages in any biophysical environment (typical of subalpine fir types), the guidelines state that management cannot be for earlier structural stages (i.e. young lodgepole pine). Therefore, the screens may affect lynx in a manner opposite that intended

by its drafters by preventing the creation of high quality forage habitat.

Effects on bald eagle (Haliaeetus leucocephalus)

For bald eagle, effects of the alternatives were determined by analyzing winter roost and potential nest sites.

Winter Roost and Potential Nest Sites

None of the alternatives will affect existing or potential nesting trees.

The DCEMP area does not contain much habitat used by bald eagles. Alternative A will not affect winter roost sites and thus will not affect bald eagles. Although the nearest important roosting habitat on the Columbia River lies more than four miles away from any harvest unit, all action alternatives would affect large trees and thus, "may affect but are not likely to adversely affect" bald eagle winter roost sites. Consequences of affecting a roost site in this area are low because if a site were harvested, few birds would be displaced. The risk of affecting a site is low because of the low potential of the area to support winter roost sites.

Cumulative Effects to Bald Eagle

The area considered for cumulative effects analysis consists of the entire ranger district. No current or proposed sales would affect nest trees. All current or proposed sales would affect large trees that have the potential to serve as roost trees. However, most units remain fairly distant from Lake Roosevelt. Surveys during planning for the Nancy timber sale, which contains units closest to Lake Roosevelt, indicated that bald eagles rarely used the planning area for roosting.

Risk Assessment for Bald Eagle

Alternative A would have no effect on bald eagles or their habitat. Alternatives B, C, D and E would have low consequences because if the alternatives were implemented, few birds would be displaced. None of the action alternatives would be likely to adversely affect bald eagles.

4.3.3 Management Indicator Species

Effects on big game

Effects to big game are analyzed for winter and summer range by examining effects to the quantity, quality, and distribution (effective habitat) of cover and forage areas, and changes in road miles.

Winter Range

Cover and Forage Quantity

All action alternatives propose silviculture treatments on 320 acres in big game winter range, (parts of units CS, CU, CZ, DD and GA). Approximately 90 acres of fair quality cover plus approximately 66 acres of cover in small blocks within forested non-cover would be harvested. This would constitute a short-term decrease in cover on approximately 5 percent of designated winter range (MA 6 and MA 8) reducing total big game cover acres from about 35 percent to about 30 percent. Harvest of these trees is necessary to manage for future cover by removing trees that are stressed or contain diseases or parasites and are not likely to provide quality cover in the future. The short-term effect to cover would

be a small decrease, but the long-term predicted increase in forest late structure should result in an increase in cover over time.

All stands proposed for harvest should show some increase in forage quantity. Underburns, restoration burns, and jackpot burns in the harvest units would increase the quantity of forage over that of unburned stands. The improvement in forage areas should help mitigate loss of cover.

Cover and Forage Quality

Treatments proposed in deer winter range under all action alternatives would support the management objectives of restoring late structure and reducing the risk of forest pathogen outbreaks. Big game cover quality will increase over time in units proposed for harvest because of the removal of diseased trees and the reduction in inter-tree competition which should lead to larger trees. Short-term decreases in cover quantity are mitigated, in part, by increases in forage quantity and quality on these same locations. Mitigation includes a 40-acre prescribed fire in winter range to regenerate woody vegetation and inducing sprouting of young, palatable stems in shrub species.

Quality of woody forage would benefit because much of this type of forage has grown out of reach of big game. Harvest and post harvest treatments including underburning and jackpot burning would regenerate the woody vegetation, making it more accessible and palatable to the animals. The increase in forage quality would be the same for all action alternatives because all propose the same treatments and post harvest treatments in big game winter range.

The risk of noxious weed encroachment as a result of management activities would be the greatest threat to forage quality and quantity. For analysis of noxious weeds, see section 4.2.4 Noxious weeds, of this SEIS. **Noxious weeds like diffuse knapweed and goatweed provide poorer forage quality than native vegetation. The risk of noxious weed invasion and subsequent decreases in forage quality and quantity is greatest in Alternatives B and D because they, in addition to the silviculture treatments, propose 10 acres of new road in winter range. Roads are the primary routes along which noxious weeds are spread. Alternatives A, C and E do not propose any construction of specified roads.**

Effective Habitat

The distribution of effective habitat (the interface zone between cover and forage areas) increases by about 10 percent in all action alternatives and remains unchanged in Alternative A. Increasing effective habitat would benefit big game species.

New road construction

Roads cause negative direct and indirect effects to big game and big game habitat. Direct effects are limited to near-permanent loss of habitat caused by the road construction. **Direct effects in all action alternatives are minimal; Alternatives B and D propose construction of 1.5 miles of new specified roads** (less than 10 acres directly affected) in big game winter range. No new roads are proposed under Alternatives C and E. **These roads will remain open during harvest activities and for a period of up to 5 years for post-harvest activities. Roads analysis identified about 2 miles of existing road in MA6 and MA8 that will be closed. Total open road density will not exceed the level identified in**

the Forest Plan (0.4 miles per square mile).
The greatest indirect effects are the potential for noxious weeds to encroach (loss of habitat), for vehicle traffic to increase (noxious weed vector, poaching potential, and disturbance), and for cattle to move into areas that they previously did not access (noxious weed vector and competition for forage).

Indirect effects are potentially greatest in Alternatives B and D. Though new roads would be closed under all action alternatives, their existence increases risk of noxious weed spread.

Cumulative Effects to Winter Range

The area considered for cumulative effects analysis consists of the entire ranger district. Several projects are proposed, or have recently been implemented on portions of big game winter range in the following watersheds: Sherman (various sales), Sheep, Nancy and Deep (McKinley Salvage), and in the Deadman Creek watershed, Corral Salvage. The Churchill Mountain big game winter range burn was conducted in the Toulou watershed. Past timber harvest within big game winter range probably contributes to the low level of cover in the Deadman Creek Watershed MAs 6 and 8**. Many of the past prescriptions removed most cover in the unit. However, these harvested areas are beginning to provide cover once again, and on most of the 785 acres, this trend is expected to continue.**

Cover and Forage Quantity and Quality

Harvest units in Sherman, Sheep and Nancy watersheds were designed to improve long-term cover quantity and quality, though would result in a minor decrease of existing cover district-wide, for about 10 to 15 years. Harvest units in the winter range in Deep were to control a Douglas-fir bark beetle infestation, which will not improve cover, but may prevent beetles from becoming epidemic and causing a drastic decrease in cover. In all these projects, prescribed fire is planned or has been completed, which should increase forage quantity and quality. Additionally, the Churchill Mountain and **Corral Salvage** winter range burns improved forage quantity and quality.

Effects to winter range effective cover varies by project, though change is minimal, mainly because little cover is harvested in each activity.

Some loss to forage areas are projected due to noxious weed invasions (see section 4.2.4 Noxious Weeds) on both NFS, State and private lands**. Mitigation measures and implementation of the CNF Noxious Weed Program EA for all future management activities would minimize these effects and the spread of noxious weeds in the DCEMP area.**

New road construction

In winter, after gates on certain roads have been closed, densities of open roads meet Forest Plan standards in all areas except for Nancy, through which run county and private roads. A temporary road 0.1 miles long will be constructed in Sheep, and existing roads will be reconstructed in Sheep (2.5 miles) and Sherman (0.9 miles). No new roads were constructed in winter range in the Nancy timber sale.

The road construction and reconstruction in planned and current projects have almost no direct negative effects to winter range. The indirect negative effects caused by noxious weed spread as

previously discussed.

Summer Range

The entire watershed is considered summer range for big game animals. Refer to Table 19 for proposed actions affecting cover and forage in the watershed.

Quantity of Cover and Forage

All of the action alternatives improve the cover:forage ratio and move it closer to the 50:50 considered optimum. The acres harvested do not all represent an acre for acre increase in forage and decrease in cover because most of the harvest prescriptions call for some form of partial cut leaving some cover.

Opening the stands and conducting prescribed fires should increase forage quantity. Alternative B has the potential to increase forage quantity the most, followed by Alternative E. Alternatives C and D would have about the potential to increase forage quantity, but less than Alternative E. No prescribed fires or other activities would be conducted under Alternative A.

Both harvest activities and prescribed fire may expand populations of noxious weeds, thus reduce quantity and quality of forage for big game. The magnitude of displacement and the level of negative effects to big game are not known, but are related to amount of soil disturbed. We roughly estimated the level of soil disturbance by comparing the amount of cable and tractor yarding to helicopter yarding (assuming that skid trails and drag lines of tractor and cable yarding disturb more soil than helicopter yarding). The negative effects of Alternative B will be over 2 times that of Alternatives C or E and about 1.5 times that of Alternative D. **Additionally, Alternative B proposes to construct new roads into areas that do not contain roads, thereby providing conduits for noxious weeds to colonize new areas.**

Quality of Cover and Forage

Harvest units outside winter range might affect cover quality in localized areas, but because of the excess of cover on summer range, overall quality will not be affected.

Both harvest activities and prescribed fire may expand populations of noxious weeds, thus reduce quantity and quality of forage for big game. Predicting the degree to which noxious weeds would invade new areas in this watershed is beyond the scope of this project. However, relative amounts of disturbance acres are used in this SEIS as a surrogate measure (see section 4.2.4 Noxious Weeds). Alternative B would create the most acres of disturbance, Alternatives D, about two-thirds of that, Alternative E about a half. Alternative C would create about one-third as much disturbed acres as B and so would have the least potential of all the action alternatives for weed spread and loss of big game forage habitat. Alternative A disturbs no additional acres.

Harvest and post harvest treatments including fire would stimulate growth of new, succulent vegetation. See effects of harvest and prescribed fire on noxious weeds and forage under *Cover and Forage Quantity* above.

Effective Habitat

Distribution of cover and forage (effective habitat) improves slightly in all alternatives. Alternative B, with the most acres of harvest, increases distribution of effective habitat the most

because it fragments large blocks of cover.

New Road Construction

The direct and indirect impacts of roads on big game were discussed above under winter range. Alternative B will have the greatest effect because of the magnitude and distribution of roads proposed for construction under this alternative: 13.9 miles that would directly eliminate about 70 acres of habitat. Alternative D would eliminate about 30 acres of habitat.

Construction of new roads into areas currently without specified roads would have the greatest impact on big game species. This is particularly true when roads are scattered over areas lacking classified roads, or penetrate areas without roads perpendicular from existing roads. Seclusion habitat, or core habitat (see Wolverine section 4.3.2 for methods) was analyzed using a spatially based model that measures acres as influenced by new road construction. Alternative B would decrease seclusion habitat by 15 percent in spring and summer and by 8 percent in autumn. Alternative D would decrease seclusion habitat by 10 percent in spring and summer and 2 percent in autumn. Alternatives A, C and E would not affect seclusion habitat with construction of new roads.

Indirect effects similar to those in winter range from new road construction would be expected to occur on summer range. Alternative B would have the greatest amount of new road construction, 13.9 miles accessible in spring and summer, and an additional 2.4 miles accessible in autumn. Alternative D would have 7.2 miles of new road construction accessible in spring and summer, and an additional 2.3 miles in autumn. Alternative C would have 2.1 miles of temporary road (skid trails) constructed and accessible in autumn, whereas Alternative E would have 2.3 miles of the same.

Road density indices reflect that all new roads will be closed at the end of harvest activity. Road construction and reconstruction for hauling provide corridors for noxious weed movement both during and after the sale. The Noxious Weed Management Prescription for Deadman Watershed (NWMPSW) of the Deadman EIS indicates that several measures should be taken to decrease conditions that are favorable to noxious weeds. **The selected strategies for treatment are prevention, early treatment, and correction and mainly suggest rather than require practices to reduce infestations. Loss of habitat due to noxious weed invasions can be lessened by pre-harvest techniques such as controlling noxious weeds on existing haul roads in the watershed starting a few years before harvest activities, and re-seeding roads with species that will aggressively compete with noxious weeds when the roads are built (D. Fagerlie, pers. comm.).**

Cumulative Effects to Summer Range

The area considered for cumulative effects analysis consists of the entire ranger district. Several projects are proposed, or have recently been implemented on portions of big game summer range in the following watersheds: Sherman (various sales), Sheep, Nancy and Deep (McKinley Salvage), and in the Deadman Creek watershed, the Corral Salvage. The Churchill Mountain big game winter range burn was conducted in the Toulou watershed.

Quantity of Cover and Forage

All projects would improve the cover:forage ratio by reducing the amount of cover. All projects will increase forage quantity by stimulating new forage growth through increased light

penetration, scarified ground, and, or prescribed fire. Additionally, the Churchill Mountain winter range burn also improved forage quantity.

Quality of Cover and Forage

In all projects either planned or implemented, harvest units were designed to reduce diseases and parasites in stands, thus improving cover quality in the remaining stands.

Forage quality of existing shrubs will increase in all projects because the disturbance from harvest, and/or prescribed fire will stimulate growth of young, more succulent stems. Noxious weeds are present in most areas. Activities related to harvest or prescribed fire have the potential to expand the distribution of noxious weeds and decrease the abundance of forbs and grasses, thus decrease overall forage quality.

Effective Habitat

Harvest district wide would improve effective habitat by fragmenting large blocks of cover.

New Road Construction

See general discussion of direct and indirect effects under *New Road Construction*, above. The road construction and reconstruction in planned and current projects have almost no direct negative effects to summer range**. The indirect negative effects caused by noxious weed spread would be minimized by implementation of the Colville National Forest Noxious weed EA.**

Effects on American pine marten

Effects of alternatives on American Pine Marten habitat were analyzed by looking at effects to large tree dominated mesic stands, downed woody debris, pine marten and pileated woodpecker Management Requirement areas (MRs) and travel corridors.

Table 32. Acres and % of good marten habitat to be harvested (of 5,890 acres of good habitat)

	ALT A	ALT B	ALT C	ALT D	ALT E
Shelterwood	0	43	0	0	36
Selective harvest	0	331	139	187	214
% good habitat affected	0%	6%	2%	3%	4%

Mesic Stands Dominated by Large Trees

All alternatives have about the same effect to existing marten habitat. If larger-diameter down wood remains in the stands after harvest, harvest in most of the units would have little negative impact to marten habitat over the long term. Because biophysical environments that support marten habitat fall below the historic range of variability for late structural stage, most harvest prescriptions for units in marten habitat are designed to move the stand towards late structural stage more rapidly than if selective harvest did not occur. Thus, over time, these areas should provide better marten habitat. Units CY and DA (all action alternatives) contain pockets of good marten habitat. Areas of these stands support abundant down wood, but the overstory is fairly open and consists primarily of western larch, not a choice species for marten habitat. The post harvest prescription in unit CY is for grapple pile and jackpot burning, which would reduce its

quality for marten habitat by removing woody debris. Unit CQ (all action alternatives) contains about 15 acres of good marten habitat, though overall canopy cover is low. **Those alternatives with the least post-harvest treatment in marten habitat would have the least negative effects to marten**.

No units proposed under any alternative would be located in stands with late structure in marten habitat.

Marten and pileated woodpecker Management Requirements

To maintain distribution of marten and pileated woodpecker MRs as directed in the Forest Plan, five marten MRs and two pileated woodpecker MRs would be established under all action alternatives. Management Requirement areas are located in the best available habitat within the constraints of the MR grid system**. These seven MRs would comprise a total of approximately 1380 acres. Of that, good marten habitat covers approximately 400 acres, fair habitat about 150 acres. The remaining acres are either non-habitat or poor habitat for pine marten. Because of the constraints of the grid system of MR establishment, one pine marten MR of 162 acres falls entirely outside marten habitat.**

Effects of harvest in marten or pileated woodpecker foraging areas will have minimal negative effects because no good or fair marten habitat will be harvested. Long-term marten habitat quality should improve because harvest prescriptions are designed to move the stands towards late structural stage more rapidly than if selective harvest did not occur. **Harvest might occur in MRs, but not in core or dedicated portions of MRs.**

Travel Corridors

Except for Unit DX (a poor-quality marten travel corridor proposed for harvest in all action alternatives), existing corridors would not be narrowed to less than 400 feet, and all streams would maintain their effectiveness as corridors because no-harvest buffers would be established according to Inland Native Fish Strategy Environmental Assessment (INFISH) direction. Some alternatives propose stream crossings that will interrupt stream corridors **(Alternative B proposes 13 new crossings, Alternative D proposes 5 new crossings and Alternatives A, C and E do not propose any new crossings).**

Cumulative Effects on American Pine Marten

The area considered for cumulative effects analysis consists of the entire ranger district. Planned or recently completed projects in the Sherman (various sales), Sheep, Nancy and Deep (McKinley Salvage) watersheds, and completed projects in the Deadman Creek watershed (Corral Salvage) would affect or may have affected marten habitat.

Harvest and post-harvest treatment of piling or prescribed fire can reduce or eliminate one of the most important components of marten habitat: ground structure provided by down wood. Following the screening criteria for down wood would probably reduce the number of pieces of large wood to below the minimum for habitat used by marten**. Additional fuels reduction under the National Fire Plan is expected to reduce existing, marten habitat within the urban interface.**

The Forest Service placed marten and pileated MRs throughout the Three Rivers Ranger District.

Habitat criteria cannot be met because of the restrictive grid arrangement. Habitat that forms travel corridors between MRs has been reduced but riparian areas are being retained which will allow marten movement. Old growth stands outside identified MRs have been reduced, but no current or foreseeable future management actions would further reduce them. **The small MA1 set up for old growth dependent species in the Deadman Creek watershed will likely be reviewed for expansion in the Forest Plan revision process.**

Summary for Pine Marten

All alternatives would have about the same effect to existing marten habitat. If larger-diameter down wood is not removed from the units for firewood, or other purposes, most of the units would have little impact to marten habitat over the long term. Large tree dominated mesic stands and travel corridors were issues identified in scoping. Because biophysical environments that support marten habitat fall below the historic range of variability for late structural stage, most harvest prescriptions for units in marten habitat are designed to move the stand towards late structural stage more rapidly than if selective harvest did not occur. Thus, over time, these areas should provide better marten habitat. Travel corridors would be maintained at 400 feet under all alternatives.

Effects on beaver

None of the alternatives would affect beaver habitat because no-harvest buffers (RHCAs) have been established around riparian areas (see Existing Management in Chapter 2 section 2.2).

Cumulative Effects to Beaver

The area considered for cumulative effects analysis consists of the entire ranger district. Proposed and completed projects in the Sherman (various sales), Sheep, Nancy and Deep (McKinley Salvage) watersheds, and completed projects in Deadman (Corral Salvage) watershed have little effect to beaver habitat because we established no-harvest buffers around riparian areas. Lack of disturbance in riparian areas, which maintains riparian hardwood species, could eventually eliminate beaver habitat.

Summary for Beaver

No alternative would affect beaver habitat. Without ground disturbing activities or fire events along streams, the potential to lose cottonwood and aspen over the long term, is possible. **No issues relating to habitat components for beaver were raised during scoping.**

Effects on blue grouse

All action alternatives would beneficially affect blue grouse habitat. Table 33 displays the potential acres affected by treatments in each alternative.

Table 33. Blue grouse habitat affected

ALTERNATIVE	ACRES
A	0
B	630
C	460
D	420
E	490

Alternative A, the no-action alternative, does not affect blue grouse habitat. All action alternatives affect some blue grouse habitat. All units should open the understory, which may enhance the existing stands for blue grouse. Harvest under none of the alternatives would remove live trees larger than 21 inches dbh, so larger roost and forage trees would not be affected. At least eight roost trees per acre would be retained as directed in the Forest Plan (p. 4-40), so none of the alternatives would adversely affect blue grouse.

Cumulative Effects to Blue Grouse

The area considered for cumulative effects analysis consists of the entire ranger district. Recently proposed or completed projects in the Sherman (various sales), Sheep, Nancy and Deep (McKinley Salvage) watersheds, and completed projects in the Deadman Creek watershed (Corral Salvage) should have minimal effect to blue grouse because roost trees would be retained and wetlands buffered. Past regeneration harvest in all watersheds severely reduced blue grouse habitat by removing large ponderosa pine or Douglas-fir, especially mistletoe-infested Douglas-fir, on open, dry, south-facing slopes.

Roads built into blue grouse habitat could increase the amount of noxious weeds decreasing forage for blue grouse. (See section 4.2.4 Noxious Weeds).

Summary for Blue Grouse

Blue grouse frequent open areas on upper slopes and ridges. The Deadman watershed was a popular blue grouse hunting area. Lack of fires and succession allowed shrubs to encroach on open areas that blue grouse seem to inhabit. The issue of the need for large trees, raised during public scoping, relates to blue grouse management because of their dependence on large "limby" trees. Commercial thinning units might have some beneficial effect to blue grouse by opening the understory. Harvesting mistletoe-infested, large Douglas-fir can be detrimental to blue grouse roosting habitat. Because the Forest Plan guidelines would be followed (retain at least 8 roost trees per acre and buffer wetlands), none of the alternatives would greatly affect blue grouse, either beneficially or detrimentally.

Effects on Franklin's grouse

Shelterwood or sanitation/shelterwood harvest prescriptions that regenerate lodgepole pine would have the greatest positive effect to Franklin's grouse (Table 34). Commercial thinning would have a minimal effect. Precommercial thinning proposed under all action alternatives on some of the 562 acres would have a negative effect (the number of acres covered by lodgepole pine was not identified). Retaining unthinned portions in precommercial units would reduce negative effects to Franklin's grouse foraging habitat**. Currently about 1,290 acres (10 percent of potential) of grouse habitat is growing toward dense conditions unusable by grouse. At the same time another 2,000 acres of more recent harvests are growing toward good habitat.**

Table 34. Acres of regeneration harvest in even-aged lodgepole stands

Harvest prescription	Alt. B	Alt. C	Alt. D	Alt. E
Sanitation/shelterwood	171	47	65	80
Shelterwood regeneration cut	215	0	0	145

Total	386	47	65	225

Cumulative Effects to Franklin's Grouse

The area of analysis for cumulative effects was the entire ranger district. Franklin's grouse habitat is likely to decrease due to the recent trend towards reduced levels of regeneration harvesting in lodgepole pine stands and continued precommercial thinning on the district. Though unthinned patches are left in thinning units, precommercial thinning in lodgepole pine decreases habitat quality for Franklin's grouse.

Summary Franklin's Grouse

All action alternatives propose some regeneration harvest (shelterwood and with sanitation harvest units), thus should initiate some new growth of lodgepole pine. **Additionally, Alternatives B and E propose to specifically regenerate lodgepole pine. Alternative B proposes to regenerate 215 acres, thus has the most beneficial effect to Franklin's grouse, and Alternative E proposes to regenerate 145 acres. No key issues or issues raised during public scoping involve analysis elements used to determine effects to Franklin's grouse**.

Effects on Northern three-toed woodpecker

Northern three-toed woodpeckers were chosen as a MIS because of their link to mature lodgepole pine and subalpine fir stands. Possible effects to northern three-toed woodpecker habitat was analyzed by examining lodgepole pine and subalpine fir stands with late or old structure, marten and pileated woodpecker MRs, and snag numbers.

Late-successional and Old Growth Lodgepole Pine and Subalpine Fir Stands

None of the late structural stage stands within the subalpine fir biophysical environments or identified old growth would be harvested. Prescribed fires would create more snags, thus benefit woodpeckers. **Treatments in subalpine fir biophysical environments would favor the woodpecker in the long term because treated stands would develop large trees, the source for large snags, sooner than untreated areas.**

Table 35. Acres of harvest in Northern three-toed woodpecker habitat

Harvest prescription	Alt. B	Alt. C	Alt. D	Alt. E
Shelterwood	32	0	0	20
Selection	49	9	10	19
Commercial thin	227	72	84	142
Total	308	81	94	181

Marten Management Requirements

See previous discussion of effects to *Marten and Pileated Woodpecker MRs* in the *Marten* section earlier in the chapter. Effects to northern three-toed woodpecker habitat by establishment of the MRs would be the same as those to marten habitat,

No Northern three-toed woodpecker habitat would be harvested in any MR in any alternative.

Snag Numbers

All action alternatives affect portions of existing habitat by reducing the number of snags. The extent of the reduction depends in part on the harvester's interpretation of OSHA rules. However, the proposed actions would have little negative effect because snags would be created in units that fall below standards in the Forest Plan. In harvest units, at least 4 large snags and 8 green trees would remain, or 12 large green trees (File code 1920 memo from Regional Forester to Forest Supervisors dated May 27, 1994). If the number of remaining snags is not sufficient, creating snags would mitigate the loss due to harvest. Even though action alternatives result in a reduction of available snag habitat over current levels (to meet OSHA safety rules), this reduction is consistent with Forest Plan standards and guidelines.

All alternatives meet Forest Plan direction regarding old growth management, MR management, and snag habitat availability. Therefore all alternatives meet the habitat capability objective.

Cumulative effects to Northern three-toed woodpecker

The area considered for cumulative effects analysis consists of the entire ranger district. Proposed or completed projects in Sherman (various sales), Sheep, Nancy and Deep (McKinley Salvage) watersheds, and completed project in Deadman Creek watershed (Corral salvage) have reduced or would reduce snag densities.

Past harvest has eliminated or reduced snags, especially large snags, on over 50,000 acres district-wide. Past road building and the firewood policy of allowing snags to be harvested within 200 feet of open roads eliminated or continues to suppress snag levels on another 22,500 acres. The White Mountain fire in 1988 and Copper Butte fire in 1994 created about 8,400 acres of dense snag habitat. About 700 of these acres were harvested. The proposed project would reduced snag levels only slightly because snags would be created in units that fall below standards in the Forest Plan.

Summary for Northern Three-toed Woodpecker

These birds are found at low population levels in large-tree and lodgepole pine cover found in the Deadman watershed. About one quarter of the potential Northern three-toed woodpecker habitat exists in large-tree cover. This habitat component relates to the issue raised during public scoping of the need for large trees.

Alternatives C and D, which propose the least harvest, would have the least effect to Northern three-toed woodpecker habitat. Alternative B would have the greatest effect. However, most of the units in all alternatives call for commercial thinning, which tends to have more snags left standing than regeneration harvests. In harvest units, at least 4 large snags and 8 green trees will remain, or 12 large green trees. If the number of remaining snags is not sufficient, creating snags would mitigate the loss due to harvest.

Effects on pileated woodpecker

Pileated woodpeckers were chosen as a MIS because of their dependence on old growth Douglas-fir and red cedar/western hemlock vegetation types. Effects of the alternatives on pileated woodpecker habitat were analyzed base on Management Requirement areas (MRs), old growth, and snag numbers.

Marten and Pileated Woodpecker Management Requirements

Two new pileated woodpecker MRs would be located in the watershed. Both contain a forage area and a reproduction area for the woodpeckers, though the constraints of the grid system places one of the MRs in a biophysical environment not preferred by pileated woodpeckers. In Alternatives B and E, Unit CJ would affect about 5 acres of good pileated habitat in the forage area of the newly selected MR13. The detrimental effects to pileated habitat would be minimal because this unit is small, and would have no post harvest treatment. If felled, the snags would be left in the unit, which provides future habitat for ants, an important food source for pileated woodpecker.

Old Growth

No alternatives propose to harvest identified old growth.

Snag Habitat

Given the constraints of OSHA regulations, we have yet to determine a good method of retaining large snags in harvest units. At maximum, with Alternative B, about 8 percent of the existing pileated woodpecker habitat would be affected. About 85 percent of these areas would be commercially thinned, which generally results in more snags being retained than regeneration harvests**. In order of the magnitude of effects to snags in pileated woodpecker habitat, Alternative B would have the greatest effect, then Alternative E, then Alternative D, and lastly Alternative C. Alternative A would not affect snag populations. However, the differences between the greatest and least effects are about 140 acres (about 3 percent of total existing pileated woodpecker habitat).** In harvest units, at least 4 large snags and 8 large green trees would be retained, or 12 large green trees (File code 1920 memo from Regional Forester to Forest Supervisors dated May 27, 1994). If the number of remaining snags is not sufficient, creating snags would mitigate the loss due to harvest.

Cumulative Effects to Pileated Woodpeckers

The area considered for cumulative effects analysis consists of the entire ranger district. Ground verification of pileated woodpecker MR units has followed Forest Plan direction by identifying the most suitable habitat given the constraints of the grid system. In future harvest units, total number of snags will decline, though values will remain at or above standards in the Forest Plan, so negative effects to pileated woodpeckers would be minimal. See *Cumulative Effects* under Northern Three-toed Woodpecker for effects of past harvest and roads. The White Mountain and Copper Butte fires did not create much habitat for pileated woodpeckers because the elevations are higher than that usually used by pileated woodpeckers.

Management Area 1 is designated as management for old growth species. It is likely that an expansion of the existing small MA1 in the Deadman Creek watershed would be considered during Forest Plan revisions. Expansion of the MA1 would benefit pileated woodpeckers.

Implementation of the National Fire Plan in urban interface areas could reduce snag numbers in lower elevation areas that pileated woodpeckers use.

Summary of Effects on the Pileated Woodpecker

Two new pileated woodpecker MRs would be located in the watershed. Both contain a forage

area and a reproduction area. In Alternatives B and E, Unit CJ would affect about 5 acres of good pileated habitat in the forage area of MR13. The detrimental effects to pileated habitat would be minimal because the felled snags would be left in the unit to provide future habitat for ants because the acreage is small and the unit would be commercially thinned.

This analysis element relates to the issue raised during public scoping of the need for large trees because large snags come from large trees. No alternatives propose to harvest identified old growth. All action alternatives would have a minor negative effect to pileated woodpecker habitat because though snags would be lost during harvest operations, mitigation requires that snags would be created in units where post-harvest number fall below Forest Plan standards.

Effects on other woodpeckers

Woodpeckers were chosen as MIS because of their activities as primary cavity nesters and the dependence of many secondary cavity nesters on them for nesting habitat. Woodpecker populations rely on snags in all biophysical environments. See previous discussions of effects to *Snag Habitat* and cumulative effects in the northern three-toed woodpecker and pileated woodpecker sections above.

Summary for Other Woodpeckers

In order of effects to snags, Alternative A would not impact snag habitat, Alternative B has the greatest effect, then Alternative E, then Alternative D, and lastly Alternative C. In harvest units, at least 4 large snags and 8 green trees will remain, or 12 large green trees. If the number of remaining snags is not sufficient, creating snags would mitigate the loss due to harvest.

Effects on barred owl

The US Forest Service selected the barred owl as an indicator of low elevation mature and old growth forests. Effects to barred owl habitat are discussed below in terms of management areas, large tree populations and old growth habitat.

Old Growth

No alternative proposes to harvest old growth.

Management Area 1 (MA1)

Management Area 1 is designated for management for old growth dependent species. **It is likely that an expansion of the existing small MA1 in the Deadman Creek watershed would be considered during Forest Plan revisions. Expansion of the MA1 would benefit barred owls.**

Harvest in all biophysical environments has been designed to move stands towards late structure and, long-term, this would benefit barred owl. According to the Forest Plan, stands outside the pileated MRs and the MA1 are not essential to meeting the habitat capability objective of a viable population of barred owls. However, monitoring of MA1s across the district indicates that habitat quality in most of these areas is below that projected in the Forest Plan, so stands outside the pileated MRs and MA1 areas remain important.

Cumulative Effects to Barred Owl

The area considered for cumulative effects analysis consists of the entire ranger district. Implementation of the MR system for barred owls was done at the Forest Plan level with the

designation of MA1s. Monitoring of MA1s across the district indicates that habitat quality in many of these areas falls below that projected in the Forest Plan. Thus, larger trees outside the MA1s, especially in riparian areas, remain important. Proposed harvests in all action alternatives would not affect riparian areas because of the RHCA buffers developed in the INFISH guidelines. Also, no harvest of trees greater than 20.9 inch dbh would occur, so harvest would have little effect to potential nesting trees.

Summary for Barred Owl

This analysis element relates to the issue raised during public scoping of the need for large trees. No alternative proposes to harvest old growth. Though all action alternatives reduce available older trees, these stands outside the pileated MRs and the MA1 are not, according to the Forest Plan, essential in meeting the habitat capability objective of a viable population of barred owls. However, monitoring of MA1s across the district indicates that habitat quality in most of these areas is below that projected in the Forest Plan. Harvest in middle structure in all biophysical environments would be designed to move the stand more rapidly toward late structure. Therefore, harvests in these biophysical environments probably would not greatly affect barred owls.

Effects on large raptors

Large raptors were selected as indicator species for the types of nest trees and nesting habitat they prefer. Accipiter hawks most likely affected by management activities are sharp shinned and Cooper's hawks and goshawks. Goshawks most often nest in mature tree stands. Few nests are found above 4,000 feet for goshawk, thus we did not analyze subalpine fir biophysical environments, which generally lie above this level. Cooper's and sharp-shinned hawks prefer to nest in overstocked sapling, pole and small tree stands.

We examined all harvest units that contain large trees. Units CL, DL, DR and GC, depending on alternative, contain between about 87 percent and 100 percent of the total potential goshawk nesting habitat proposed to be entered in the DCEMP. We located a nest about one half mile from unit GC and saw young goshawk in and near units CL and GC, which seem to be used as part of a post-fledging area. The harvest prescription calls for commercial thinning in these units. Depending on the degree of thinning, the harvest could deter the units' use as a post-fledging area. Timing of harvest in these units would be restricted to minimize direct effects to goshawk. Harvest in Units DL and DR would have minimal effects to goshawk or their habitat.

Table 36 lists the gross percent of Accipiter nesting habitat to be entered in each alternative. Because most harvest prescriptions call for commercial thinning and no trees larger than 21 inches dbh would be harvested, the effects to Accipiter hawks would be lower than the table suggests. **Alternative A would have no affect on Accipiter habitat.**

Table 36. Percent of existing accipiter habitat to be affected

	Alternative B		Alternative C		Alternative D		Alternative E	
ACCIPITER SPECIES	Good	Fair	Good	Fair	Good	Fair	Good	Fair
Goshawk	17	2	11	2	12	2	17	2
Cooper's/Sharp-shinned	2	0	2	0	2	0	2	0

Cumulative Effects to Large Raptors

The area considered for cumulative effects analysis consists of the western part of the Three Rivers Ranger District, from the Kettle Crest to the Columbia River. Several timber sale and prescribed fire projects are planned. All projects have been designed to move the landscape towards conditions that occurred historically. All projects would have direct and indirect effects to large raptors. All projects contain nesting and foraging habitat for large raptors, and all projects would result in a reduction of that habitat. The reduction is within the standards of the Forest Plan. All sites have been surveyed for goshawk, and no known goshawk nests would be affected.

Since the early 1990s we annually have conducted surveys to find and then monitor goshawk nests. In areas affected by timber sales, we protect known nests with a no-harvest buffer and establish a post-fledging area around the nest. Within these post-fledging areas, we enact timing restrictions for harvest activities. Prior to the Forest Plan, nests and habitat were not protected from harvest activities. Though much of the harvest prior to the Forest Plan occurred on dry sites that probably contained better red-tailed hawk nesting habitat than goshawk habitat, goshawk habitat was affected. Current Forest direction that emphasizes managing dense, smaller-diameter stands for larger-sized trees would probably impact sharp-shinned and Cooper's hawk habitat more than goshawk habitat.

Summary for Large Raptors

One Goshawk nest was located by District personnel about one half mile from Unit GC. Young were seen in and near units CL and GC, which seem to be part of a post-fledging area. The area has been monitored since the nest was found and in 2002 the nest blew out of the tree. However, it is anticipated that the adults will renest in the area next year. The harvest prescriptions for the stands near the nest call for commercial thinning. Depending on the degree of thinning, the harvest could deter the units' use as a post-fledging area. Timing of harvest in these units would be restricted to minimize direct effects to goshawk. **The District Wildlife Biologist will survey the area to determine if and where the adults renested. The new nest, if found, would be protected by a 40-acre no-harvest buffer. Goshawks prefer late structure stands, a condition that is deficit in the watershed. Harvest proposed under the action alternatives for all biophysical environments would be designed to move the stand more rapidly toward late structure.**

Effects on Neotropical migratory landbirds

Forest management, including prescribed fire and wildfire, affects nearly all of the migratory birds that occur on or near the Colville National Forest to some degree at some time of the year. Management affects each species differently and at different levels (individual, population, community and landscape), the response being driven by the interaction of the activity's timing, intensity and extent with each individual's mobility and escape strategies and a species' population size and habitat requirements. Thus, management activities set the stage to create, enhance or destroy habitat, depending on the species considered. Effects to individuals, populations and communities are in one narrative under each proposed action. Effects at the landscape scale to neotropical migratory landbirds

are discussed separately. The effects are displayed in response to proposed treatments rather than by habitat components like other species in the Wildlife section. .

Impacts to migratory birds are assessed based on an alternative's effect to overall habitat conditions due to road building, prescribed fire, and timber harvest on NFS lands affected by the Deadman project. In 2000 the US Forest Service published Effects of Fire on Fauna (Smith 2000); the following discussion and analysis for fire borrows heavily from that volume, which serves as a review of much of the recent literature that address the effects of fire on wildlife.

Road Construction

Table 37 displays the acres of habitat affected by road construction. Road construction represents a long-term and sometimes permanent loss of habitat.

Table 37. Acres of habitat affected by new road construction, considering specified and temporary roads

New Road Construction	Alternative				
	A	B	C	D	E
Acres affected by road right-of-way	0	56	8	39	9

Prescribed Fire

The objectives of prescribed fire are to begin to restore the landscape back to historic conditions, to reduce the risk of stand-replacing wildfire, and to reduce logging slash. Prescribed fire often takes place during hardwood vegetation's dormant season in spring (April–May) or late summer or autumn (August–November). Cooler, wetter weather conditions during spring and fall are targeted for prescriptions because higher fuel moisture allows better control of fire intensity. Under these conditions, soil moisture is higher and fire intensities considerably lower than if these sites burned during the hot, dry part of the historical fire season. Burning of individual piles will not affect migratory birds and will not be further discussed.

Fire would occur in units each less than 100 acres in size and includes underburning and jackpot burning. Depending on objective (hazard reduction, natural fuels reduction, site preparation), fire intensity varies from low to moderate (average flame lengths of 3 feet and less than 10 percent needle scorch in overstory trees). Most of the potential areas to burn occur in the warm, dry and cool, mesic Douglas-fir biophysical environments.

Fires kill or injure a small proportion of individual animals, and most birds can escape low-intensity fires. Fires can also immediately improve or habitat or food, but the magnitude of the effects depend primarily on the amount and extent of their habitat and food supply that the fire altered.

Table 38. Acres of prescribed fire, by alternative

Post-harvest Treatment	Alternative				
	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E
Jackpot burn	0	102	63	79	102

Restoration burn	**0**	**397**	**381**	**381**	**397**
Underburn	**0**	**607**	**525**	**607**	**607**
Total acres post harvest prescribed fire treatment	**0**	**1106**	**969**	**1067**	**1106**

The fires will occur before most migratory birds return for the summer and after many have left in the autumn. Adults and fledglings can avoid the flames. Few ground-nesting neotropical migratory birds would have established their nests before spring fires would be lit. Most if not all of the spring-season fires in the watershed would take place before the nesting season so few nests will be destroyed by prescribed fire. Nests of dark-eyed juncos and wild turkeys will be most affected. Both species have been documented to renest after their nests have been destroyed.

The proposed fires would be a low-intensity "cool" fire, so the probability of creating large snags that birds use for cavities is low, but the probability of killing smaller trees that draw insects for birds to forage on is high. Fires improve forage conditions by allowing seed-eaters to find seeds more easily on exposed ground. Because the intensity of the proposed fires would be low, the attraction for raptors would be more limited than for birds that forage by gleaning or drilling tree boles.

Because the fire would remove ground vegetation, some individuals of those species that depend on this habitat type (such as chipping sparrows and dark-eyed juncos) probably would move into areas less affected or unaffected by the fire. Neither of these species has experienced large population declines.

Researchers have conducted more studies on the effects of fire and timber harvest on populations than on individual animals. Most studies report density, but abundance estimates do not necessarily indicate habitat quality (Garshelis 2000). Reproductive success offers a better (though more difficult to obtain) measure, and thus is rare in the literature. Bird populations respond to changes in food and cover (hiding and nesting). Because the prescribed fires would occur either before or after the nesting season of most birds, they should have little direct effect on the populations of any species. Fires would eliminate cover for ground-nesting birds for at least one season, and in the immediate location of the fire, the populations of birds of these species probably would be lower at least until the nesting habitat grows back. Low-intensity ground fires probably would not affect populations of canopy-nesting birds.

Fires have been excluded from most of the area in the proposed project for several decades, and habitats have shifted along a successional gradient to taller shrubs and a more closed canopy. Fire suppression in stands historically associated with frequent fires, may benefit northern flicker and pileated woodpeckers; neither are neotropical migrants (Saab and Dudley 1998). When fires burn these areas it will essentially "reset the clock" on the successional pathways to more open stands and create a mosaic of habitat types in the process (for example, openings and dead trees). No studies have occurred in the northwest that examined these shifts in habitat, but a study in the southeast (Breininger and Schmalzer 1990) did. The results indicated that frequent fires that decreased the average height of shrubs would result in a decline of shrub-dwelling birds, but that the decline probably would not occur if patches of unburned habitat remained. Small portion of the proposed project area would be burned under any alternative, so shrub-dependent

birds should remain in the project area but probably at a slightly reduced level.

Fire severity seems to influence bird communities. As a result of low severity, "cool" fires such as those proposed, seed eaters, timber drillers and some aerial insect eaters increased, while timber and foliage gleaners decreased (Finch et al. 1997). Bock and Bock (1983) reported like results from a "cool" fire in ponderosa pine in the Black Hills. Two years after the fire they noted similar bird abundances in burned and unburned areas. Birds in the proposed project should respond similarly.

Timber Harvest

Felling of trees, if conducted during the nesting season, would cause direct mortality to young birds. All harvests reduce habitat for some individuals but create it for others. This may indirectly affect individuals because some must move to find the habitat that it requires. The regeneration harvest affects individuals by eliminating habitat for forest-dwelling species.

Table 39 lists the percent of the NFS land in the watershed that would be directly affected by both regeneration and partial harvest (removal of trees during nesting period resulting in loss of nest). This direct loss of trees serves as a proxy for the percent of failed nests and loss of habitat for those species that require the habitat type proposed for treatment. For partial harvest, the percent of loss would be lower because not all trees are removed from the site. Nest success for the few neotropical migrant forest birds for which data are available is less than 40 percent (Anders et al. 1997). Based on the loss of habitat from this project, the potential loss of nests, if harvest occurred only during the nesting season, falls within the annual variation for nest loss and probably would not result in a dramatic population decline of any neotropical migratory bird species (at the site of an activity the number of individuals after harvest might be lower). Short-term benefits of opening the canopy would be somewhat similar to fire (increased growth of ground vegetation), and the long-term benefit of providing more habitat for species that require larger trees, which already are somewhat uncommon on the landscape, offsets the immediate loss.

Table 39. Percent of NFS land in watershed affected by harvest

Harvest type	Alternative				
	A	B	C	D	E
Regeneration harvest	0	2.1	1.2	1.5	1.8
Partial harvest	0	9.3	5.4	5.6	6.8
Total commercial harvest	0	11.5	6.6	7.1	8.7

Past fires and more recent timber harvest probably have affected the existing bird communities due to the loss of large trees. In this project, no live trees over 21 inches dbh would be harvested. Proposed silviculture treatments affect at most 10 percent of the watershed and 11.5 percent of NFS land in the watershed. Most of the harvest would occur on warm, dry and cool, mesic Douglas-fir/grand fir sites. Harvests open stands so a localized shift away from species that require dense, single-story stands to those that occupy more open, but still forested stands is expected. None of the species that would be affected have experienced dramatic population declines.

Effects at the Level of Landscapes

Most studies examine the effects of some activity on a species over a relatively short period of time in some limited area. Examining spatial patterns at a landscape level started in the early 1990s, and few researchers have documented the effects of disturbance to wildlife at the landscape level. The combination of the proposed units would result in effects at the lower end of the landscape scale. The areas affected by the proposed project (at maximum 10 percent of the watershed) contain a mosaic of microhabitats driven by small changes in moisture, soils and sunlight. The system has never remained in equilibrium: throughout the landscape, as disturbance affected different patches, habitat for a particular species winked into and out of existence. Fire has not visited most of the sites for decades so the area has moved towards large, homogeneous patches of dense, shade-tolerant trees: habitat for those species that require parkland habitat winked out. Concomitantly, past harvest removed large trees, so that habitat type is uncommon.

The proposed activities would affect each of the microhabitats differently and inconsistently, depending on the timing and intensity of the activity. Harvest and fire would “wink on” more open and early successional habitat and improve the widely spaced, old stands on which white-headed woodpeckers (Marshall 1997) and flammulated owls depend (Wright 1996). Because the fire would not affect most riparian areas, these important linkage areas remain intact.

Cumulative effects to Neotropical migratory landbirds

The area considered for cumulative effects analysis consists of the western part of the Three Rivers Ranger District. Several timber sale and prescribed fire projects are planned. All these areas have nesting and foraging habitat for some of the species of migratory land birds. All projects have been designed to move the landscape towards conditions that occurred historically. All projects would directly and indirectly affect neotropical migratory landbirds. These effects would improve habitat conditions for those species that require conditions that occurred historically on the landscape, and reduce habitat for other species. The affected forest types are relatively common throughout the area, and the loss (or creation)

of even several hundred acres of habitat is not expected to have significant detrimental impacts to any neotropical migratory landbird species that occur in the area. The landbird species occurring in this area are relatively common throughout the mixed conifer upland forests found in the northern Rocky Mountains and are not considered scarce or rare within this area.

The condition and availability of habitats that these species use in migration or during winter significantly affects populations of neotropical migratory landbirds. However, these effects lie beyond the scope of this analysis.

Summary for Neotropical migratory landbirds

Impacts were examined at the level of individual, population, community and landscape. None of the species that occupy the area have experienced the dramatic population declines of some neotropical migratory landbirds. In the short-term, harvest and fire would change habitat to the detriment of those species that require small-to-medium sized trees in closed-forest conditions and to the benefit of those species that require more open conditions. This change affects at most 10 percent of the watershed. Direct loss of birds is expected, especially if harvest occurs during the nesting season. Indirect effects would occur because of the changed habitat conditions. The effects of management would not cause dramatic declines in any populations. In the long-term, management is attempting to move the landscape towards conditions that occurred historically, thus populations of neotropical migratory landbirds should respond to those habitat conditions.

4.4 Fire, Fuels and Air Quality

Fuel Treatments

Slash left from logging operations can be a management concern for several reasons. Slash, together with pre-existing fuels, can become a concern for fire managers. For several years following harvest there is a higher potential for uncontrollable wildfire should an ignition start in an area with high fuel loading. It is for that reason that fire managers treat logging slash. Ways to mitigate the risk of wildfire due to heavy fuel loading include jackpot burns or underburns, grapple piling and burning of slash, and yarding trees with tops attached from the unit. This contains the quantitative analysis of fuel treatments.

4.4.1 Fire and Fuels

Issues

One objective of the proposed treatments in the DCEMP is to reduce the risk of catastrophic fire in the watershed. The combination of stand and fuels treatment would reduce the risk of catastrophic wildfire in the Deadman Creek watershed by reducing ground fuels, ladder fuels, and crown bulk density. The disadvantage is there could be an increase in surface wind and surface fuels may become drier earlier in the year in those treated areas.

Direct and Indirect Effects of Fire and Fuels Treatments

The action alternatives all would result in increased amounts of woody debris material on the landscape, to be mitigated by post-sale fuels treatments. Because an amount of freshly created slash would exist on most units after harvest, there is an increased risk of intense wildfire should

a lightning strike or man-caused incident occur in the immediate vicinity of harvesting. This will be particularly true in the interim between harvest, post harvest treatments and post-sale fuels treatments.

The existing fuel loading within the proposed harvest units is approximately 13.5 tons per acre**. Proposed silviculture activities would add fuels as residue of the harvest operations. Criteria for evaluating whether or not to treat harvest slash, and the method of treatment, was based on several factors including but not limited to: forest-wide standards and guidelines, management area prescriptions, silvicultural prescriptions, slope and aspect, fuel loadings, leave-tree species, soils, accumulated fuel loading (existing/created/total), proximity of harvest units to one another, and cost of treatments. For a full list of units and proposed post-harvest treatments see Appendix C, silviculture treatment tables and the Fire/Fuels Management Analysis in the DCEMP Analysis File on file at the Three Rivers Ranger District office. Treatments are summarized by alternative in Table 40**.

Alternative A

Natural fuel reduction and prescribed fire would not be used; there would be no

Alternative B

The action alternatives are similar in their silvicultural prescriptions, utilizing a mixture of individual tree selections, commercial thinnings, and shelterwood methods of timber harvest.

Under Alternative B, 23,551 tons of logging residue would be created, an average of 5.7 tons per acre harvested, with a range from 2.4 to 13.4 tons per acre.

Using the criteria previously described in the desired fuels profile, 32 units were evaluated to need hazard reduction treatment of harvest activity slash. One unit would be jackpot burned, and 12 units grapple piled and the piles burned upon curing. Twelve units would have tree tops yarded to the landing, while 6 units were proposed to be underburned. Four sites have been proposed for natural fuels reduction by underburning.

Table 40. Summary of fuels management treatment acres by alternative

Treatment	Alt A	Alt B	Alt C	Alt D	Alt E
Grapple Pile	0	501	320	323	435
YTA	0	499	144	166	217
Rest Burn	0	397	381	381	397
Jackpot	0	102	63	79	102
Underburn	0	607	525	607	607
Natural Fuel	0	194	194	194	194
Total	0	2300	1627	1750	1952

An additional 14 units would have fuel loadings at reasonable levels following harvest, but would need site preparation treatments to meet silvicultural objectives. These include underburning, and grapple piling and later burning of the

grapple piles when curing has occurred.

Alternative C

Under Alternative C, 12,196 tons of logging residue would be created, an average of 5.2 tons per acre harvested, with a range from 1.7 to 9.5 tons per acre.

Using the criteria previously described in the desired fuels profile, 19 units were evaluated to need hazard reduction treatment of harvest activity slash. One unit would be jackpot burned, and 5 units grapple piled and the piles burned upon curing. Six units would have tree tops yarded to the landing, while 6 units were proposed to be underburned. Four sites have been proposed for natural fuels reduction by underburning.

An additional 10 units would have fuel loadings at reasonable levels following harvest, but need site preparation treatments to meet silvicultural objectives. These include underburning, and grapple piling and later burning of the grapple piles when curing has occurred.

Alternative D

Under Alternative D, 13,248 tons of logging residue would be created, an average of 5.2 tons per acre harvested, with a range from 2.4 to 9.5 tons per acre.

Using the criteria previously described in the desired fuels profile, 21 units were evaluated to need hazard reduction treatment of harvest activity slash. Two units would be jackpot burned, and 6 units grapple piled and the piles burned upon curing. Seven units would have tree tops yarded to the landing, while 5 units were proposed to be underburned. Four sites have been proposed for natural fuels reduction by underburning.

An additional 10 units would have fuel loadings at reasonable levels following harvest, but need site preparation treatments to meet silvicultural objectives. These include underburning, and grapple piling and later burning of the grapple piles when curing has occurred.

Alternative E

Under Alternative E, 16,940 tons of logging residue would be created, an average of 5.4 tons per acre harvested, with a range from 2.4 to 9.4 tons per acre.

Using the criteria previously described in the desired fuels profile, 23 units were evaluated to need hazard reduction treatment of harvest activity slash. Two units would be jackpot burned, and 8 units grapple piled and the piles burned upon curing. Eight units would have tree tops yarded to the landing, while 5 units were proposed to be underburned. Four sites have been proposed for natural fuels reduction by underburning.

An additional 14 units would have fuel loadings at reasonable levels following harvest, but need site preparation treatments to meet silvicultural objectives. These would include underburning, and grapple piling and later burning of the grapple piles when curing has occurred.

Other Disclosures

Wildlife Habitat

Unit GA (40 acres; common to all action alternatives) has been identified specifically for big game forage habitat enhancement as mitigation for changes to cover in big game winter range (see section 4.3.4 Management Indicator Species, Big Game). The site would be underburned using prescribed fire to stimulate the resprouting of forage species used by big game. Use of prescribed fire and jackpot burning in other units is also expected to increase forage for big game, and to some extent for livestock.

Biophysical Environments

Natural fuels reductions and prescribed fire are proposed in units NA, NB, NC and ND (194 acres; common to all action alternatives) within the warm, dry Douglas-fir/grand fir shrub biophysical environment with the objective of reducing fuels. Historically, these areas were subject to frequent, low severity fires that maintained them in relatively open, park-like conditions (stage 6 stands) with low fuel loading (see section 4.2.2 Forested Vegetation). Reintroduction of fire into this biophysical environment would have the indirect effect of moving them toward their pre-Euro-American condition, as per the screening process. Should a fire event occur, these areas would likely have lower fire intensities, and thus increase the ability of fire fighters to control fires in the watershed.

Direct and Indirect Effects to Fuels

Natural fuels for the DCEMP were recorded using the photo guide series books INT-96, INT-97, and INT-98. INT-96, INT-97, and INT-98. Activity fuels generated by timber harvest were calculated by using the Handbook for Predicting Slash Weights of Western Conifers (General Technical Report INT-37). The following table shows comparison of fuel loadings between the action alternatives. Alternative B would create the most harvest related fuels and Alternative C the least. Total fuel levels would increase slightly under all alternatives except Alternative C. In some areas, particularly where there is a lack of large woody debris, additional fuels would benefit wildlife and soil productivity. Natural fuels in the watershed are to be considered moderate and probably within historic conditions except in places of insect and disease outbreaks and storm damaged areas (like windthrow areas). Activity fuels would create a temporary fire hazard in areas of heavier natural loadings.

Table 41. Predicted fuels production and reduction due to treatments by alternative in total tons of fuels on treatment units

Tons of fuels	Action Alternative			
	Alt. B	Alt. C	Alt. D	Alt. E
Natural Fuels (existing) on proposed treatment units	56,414	31,959	33,668	42,422
Fuels created by treatments of units	23,551	12,196	13,248	16,940
Total post harvest fuels on units	80,100	44,154	46,916	59,497
Fuels removed with Jackpot Burning	1,639	559	1,078	1,639
Fuels removed with Underburning	6,477	6,044	670	6,477
Fuels removed with Grapple Piling/Burning	11,462	14,630	8,486	7,738
Total Fuels Remaining on units after project completion	60,522	22,921	36,682	43,643
Residual Fuels on units (per acre average)	14.7	9.6	14.3	13.9

4.4.2 Air Quality

Issues

No issues were identified concerning the effects of the proposed actions on air quality. The Federal Clean Air act and Washington State regulations do set standards with which implementation of the DCEMP would comply.

Direct and indirect effects to air quality

Sensitive Areas

The Deadman Project Planning Area is not in a non-attainment area. The city of Spokane, located approximately 90 miles to the southeast, is considered a non-attainment area. The risk of smoke intrusion from prescribed fire would be minimal due to the prevailing wind and the distance involved. Prescribed fire operations on days where weather conditions are conducive to smoke intrusion into the city of Spokane are not permitted by the State of Washington (Department of Ecology and Department of Natural resources).

The Clean Air Act contains a provision called the Prevention of Significant Deterioration (PSD). This provision was designed to prevent areas that currently have very clean air from being polluted up to the maximum point established by the NAAQS. Three air quality classes (I, II, and III) were established. Class I airsheds are subject to the tightest restrictions. The closest Class I airshed is the Pasayton Wilderness, on the Okanogan National Forest, approximately 75 miles west of the project area. The risk of smoke intrusion into this airshed from any prescribed fire operations in the project area would be minimal (distance and prevailing winds).

Smoke intrusion from a large wildfire, however, is possible in the aforementioned areas under the right atmospheric conditions.

Smoke Emissions

Particulate standards were originally defined in terms of Total Suspended Particulate (TSP). Recently, the Environmental Protection Agency (EPA) has changed the particulate standard to apply to small particulates less than 10 microns in diameter (PM10). This change was made because PM10 is too small to be effectively filtered by the human respiratory system and much of it penetrates deep into the lungs.

TSP and PM10 were calculated using figures prescribed by the Fire and Air Resource Management Department of the Pacific Northwest Research station. The following table displays the difference, by alternative, in smoke emissions produced in the DCEMP area.

Table 42. Tons of emissions predicted to be produced from post harvest fuel treatments and mitigations

Tons of emission BY TYPE	Action Alternative			
	Alt. B	Alt. C	Alt. D	Alt. E
TSP	294	217	227	259
PM10	208	153	161	183

Under average weather conditions, within a 24-hour period, any smoke produced from the project area would likely be concentrated in an area 2000 feet high by 1.5 mile wide by 144 miles long. This is an estimate of an average smoke column height and width, and drift with a 6 mph wind. This area may also be defined as an estimated smoke dispersal block.

National Ambient Air Quality Standards (NAAQS) for PM10 have been established to protect human health. The annual PM10 standard is 50 micrograms per cubic meter and the 24-hour standard is 150 micrograms per cubic meter. The 24-hour standard is the one that is most restrictive and was used to calculate how many acres of fuel could be burned within a 24-hour period and still stay within the standard.

Using the estimated smoke dispersal block, and the calculated tons of PM10 produced by prescribed fire, by alternative, an estimated number of acres that could be burned per day was established. The range for the action alternative is as follows: Alternative B is 502 acres, Alternative C is 545 acres, Alternative D is 555 acres, and Alternative E is 533 acres. An average one-day prescribed firing operation ranges between 100 and 150 acres of underburning, pile burning or a combination of both. Under this scenario the average amount of PM10 produced per acre by prescribed fire would not exceed the 24-hour NAAQ standard of 150 micrograms per meter. Normal prescribed fire activities could be conducted under any of the action alternatives without exceeding the 24-hour standards for PM10.

Cumulative effects to fire and fuels and air quality

Timber harvest, mining, and homesteading occurred in the watershed over a period of years in and around the turn of the century. The 1960s to the present era witnessed a variety of harvest prescriptions. Treatment of harvest activity fuels in the planning area included piling slash, whole-tree yarding, disposal of landing slash, fuelwood utilization, and the use of prescribed fire. Treatment of logging slash was in support of site preparation for regeneration by hand-planting seedlings and natural seeding. Fire hazard abatement in harvested areas was done

through a process of fuels modification similar to that used for site preparation.

Because of past fuels treatment the cumulative effect of past projects has not greatly impacted fire hazard.

The Colville National Forest will initiate a National Fire Plan project in 2003 with objectives to improve fuel conditions in the Wildland Urban Interface (WUI). National Forest Systems lands within two miles of known structures will be considered. Proposed activities include thinning of commercial and non-commercial trees, removal of brush and dead and down material, piling, and prescribed fire. Wildland Urban Interface areas not treated in the DCEMP SEIS would be analyzed in the NFP project.

4.5 Hydrology

4.5.1 Issues

The possible affects to water quality of entry into inventoried roadless areas, and new road construction (proposed actions) were identified as key issues during scoping (section 1.4). Public comments focused on the potential impacts from timber management activities and associated road construction. The analysis area includes the entire Deadman Creek watershed, unless noted otherwise. The effects that relate to water resources include:

- **Forest management activities may disrupt natural hydrologic patterns and affect surface and ground water flows (streamflow regime and created openings);**
- **Forest management activities may affect water quality in streams and wetlands by removing natural barriers and increasing cattle access to riparian areas (water quality, coliform).**
- **Past and future forest management activities may cause erosion and sedimentation that degrades aquatic habitat and violates state water quality standards (sedimentation and created openings in cumulative effects section).**

4.5.2 Direct and Indirect Effects to Hydrology

Streamflow regime

Peak Flows

Alternative A

Under Alternative A stream flows would not change significantly over the next 10 to 15 years, however older harvest units will continue to recover hydrologically. Without the influence of fire, and, or timber harvest, stand densities would increase. This would result in increased evapotranspiration rates and may eventually reduce surface flows. This would probably be most evident during dry years (during limited soil moisture) and in channels affected by low base flows.

Alternatives B, C, D, and E

Some localized increases in stream flows may occur from roads, landings, and skid trails that would be directly connected to the stream channel network. These increases would occur downstream from where these features intercept

subsurface flows, and, or create impermeable surfaces. They are most likely to occur during spring runoff and in response to storm events when soil moistures are high. Increased flows may cause downcutting and bank erosion on the steeper stream reaches and aggradation and bar building in the flatter downstream reaches with flows intensified directly downstream of undersized culverts that increase flow velocities. These effects would vary by alternative based on the amount of proposed timber harvest, new road construction, and stream crossings. Tractor yarded units will result in the construction of more skid trails and landings than either the cable or helicopter units. Jackpot burning and use of fire for natural fuels reduction and wildlife habitat improvement in the past has not caused mortality in the overstory vegetation except in small, localized patches. This type of burning usually affects only understory vegetation. Continued use of fire for this purpose is not anticipated to increase the amount of created openings in the DCEMP area and therefore will not have any detectable effect on streamflows.

Alternatives B and D propose the largest area of tractor yarding (2,307 acres and 1,870 acres respectively). Alternative E proposes to harvest more acres of timber than Alternative D and less than Alternative B, but uses less tractor yarding than either. Alternative C would treat the fewest number of acres, and use the least amount of tractor yarding. Alternatives B and D would construct new stream crossings (13 and 4 respectively) and additional miles of new road (13.9 miles and 7.2 miles respectively). Alternatives C and E would not construct any new specified road or stream crossings.

Based on this data, it appears that Alternatives B and D have the highest potential to impact streamflows. Alternative C has the least potential to effect streamflows, and Alternative E is somewhere between the two extremes.

Water quality

Alternative A

Floodplains and wetlands would continue to be affected by the existing road system, dispersed recreation, cattle grazing, and the ongoing effect of old timber harvest units. Sediment and fecal coliform bacteria would continue to affect water quality in these areas. Localized streamflows may be increased over reference conditions due to roads and old harvest units. These increases are expected to be small and will be masked by seasonal variations in flow. Short-term groundwater function is not expected to change from existing levels.

Alternatives B, C, D, and E

Fecal coliform levels will increase in streams and wetlands because of increased cattle access in riparian areas from new road construction and stream crossings. Mitigation measures would partially compensate for these impacts. State water quality standards should continue to be met in these areas regardless of which alternative is selected. Water quality monitoring and representative stream surveys should continue after sale operations are complete to validate these assumptions. No detectable changes to groundwater function are anticipated from any action alternative because of the short-term, localized nature of the activities.

Alternative B would create the greatest risk of increasing levels of fecal coliform bacteria, sediment, and turbidity levels since these are the water quality parameters most likely to be affected by proposed management actions in the

analysis area. Alternative C does not construct any new road or stream crossings and harvests the lowest number of acres (least timber haul) of any action alternative. It has the least potential to impact water quality. Impacts from Alternatives D and E would be between these two extremes. Mitigation measures intended to close new road access using slash barriers are expected to be moderately effective, so cattle access to streams may increase slightly as a result of the action alternatives. Even with these effects, the Forest Service anticipates that water quality would remain within Washington State standards under all alternatives. If mitigation measures implemented to control cattle access are more effective than anticipated, there could actually be a reduction in total fecal coliform loading from current levels. It is important that water quality monitoring be continued both during and after project implementation to verify these conclusions.

4.5.3 Cumulative Effects to Hydrology

Cumulative effects include those caused by Forest Service management activities as well as activities on other ownerships. This section of the SEIS considers the assessment of the current watershed condition adding the effects of proposed future activities as described in the action alternatives.

Sedimentation

Sedimentation from the Deadman Creek road system was modeled using the Washington State TFW procedure (Washington Forest Practices Board 1983).

The results of the model should only be used to compare the alternatives being analyzed. The temptation to interpret the sediment outputs generated by the model literally should be avoided. While every effort was made to match the data input with actual ground conditions, there are still too many variables missing to give a complete picture of this very complex puzzle. The results should be interpreted only in terms of what may happen, not what will happen.

Given the history of this watershed, it is likely that average annual sediment inputs are higher than natural baseline levels (except perhaps after the Dollar Mountain Fire in 1929). Effects on particle size distributions in the main channels are difficult to discern due to the variability in channel types and structural elements. Pebble counts indicate a higher proportion of fines on the North Fork (37 to 47 percent) compared to the South Fork (22 to 42 percent). Sands and gravels comprise a large component of these glacial soils; nevertheless, these proportions are high and suggest that previous management activities have affected channel embeddedness.

Alternative A

The transportation system in this watershed would continue to be used for recreation, livestock, and fire suppression access. Road-related sediments continues to be delivered to streams at crossings and adjacent points. Projected reductions in road maintenance levels are likely to maintain or exacerbate chronic sediment inputs. The sediment model indicates that roads in High Bridge Creek would contribute nearly twice the sediment as any other subwatershed within the analysis area. This is due to the higher road density and associated stream crossings within this subbasin.

Alternative B

Under this alternative, much of the projected sediment increase would be directly related to roads and the associated traffic on the roads. Most of this increase would end up as suspended particles in the wash load**. These are small, silt and clay-sized particles that will not settle out downstream until reaching slack water**. These particles contribute to increased turbidity levels rather than embeddedness and pool filling. **Turbidity levels increase because of increased road lengths located in stream influence areas. Most of this increase would occur during snowmelt runoff in the spring. This would occur in backwater eddies and extend perhaps as far as Lake Roosevelt at the mouth of Deadman Creek. Road construction, reconstruction, and maintenance during timber sale operations would contribute coarser sediments in the range of sand and medium-sized gravel. Some of these larger particles would add to the sediment transport and storage capacities. These capacities are already under pressure to adjust to beaver dam failures in the headwater reaches of the analysis area.** Short-term sediment loading due to timber sale activities would be greatest under this action alternative. **However, the effects will be slight (virtually undetectable) since riparian harvest within INFISH buffers is planned on only small areas within a few harvest units.**

In addition to these short-term increases in sediment levels, there would also be a permanent increase in chronic levels of sediment input due to new road construction and stream crossings in RHCAs**. Most of the new road segments would be located on mid- to upper-level slope positions**. **They are unlikely to intercept large amounts of subsurface water that increase the risk of mass wasting or flashy stream responses. Some segments are located on lower slope positions or on benches adjacent to the South Fork of Deadman Creek. Where these segments cross first order streams, they will probably cause some localized channel cutting and increase sediment. Sediment transport from these 1st and 2nd order streams is inefficient because the streams frequently cross alluvial fans where they lose flow and the ability to transport sediment prior to joining the mainstem. However, riparian functions may be affected on individual tributaries where subsurface flows would be increasingly subject to cutslope interception and surface runoff would be rapidly routed to channels. Proposed road CAS1 is an example because it crosses two small streams that drain indirectly to Upper Deadman Creek. The riparian soil on one of these tributaries has properties that may increase the risk of slumping. New road segments CCJ1 and CEY2 are both mapped on erosive soils (single-grain, non-cohesive sandy soils), however the risk of sedimentation remains low for these segments because they are not located near stream channels.**

The total length of Maintenance Level 1 roads is expected to permanently increase under this alternative. It is reasonable to assume that some Level 1 road closures would continue to be breeched by full-sized vehicles and ORVs. This would result in rutting of the travelway and limit the effectiveness of road drainage structures. Runoff from these road surfaces would cause surface erosion (sheet, rill, and gullies) and sediment transport to adjacent stream channels. These effects are not expected to be large, but they tend to increase sediment loading and possibly peak flows in the DCEMP area.

Alternative C

The potential effects from this alternative would be limited to short-term increases in fine sediment loading and turbidity due to log haul on existing roads**, and a possible long-term increase due to new stock access along streambanks.**

Alternative D

Most impacts to the Upper North Fork proposed in Alternative B are avoided in Alternative D. This alternative is similar to Alternative B in the remainder of the North Fork and the road-related sediment delivery would be similar to those described in Alternative B.

Sedimentation in the South Fork under Alternative D would be lower than from Alternative B, but other factors (like use of tractor and cable yarding) affecting sediment levels would probably result in differences that are undetectable.

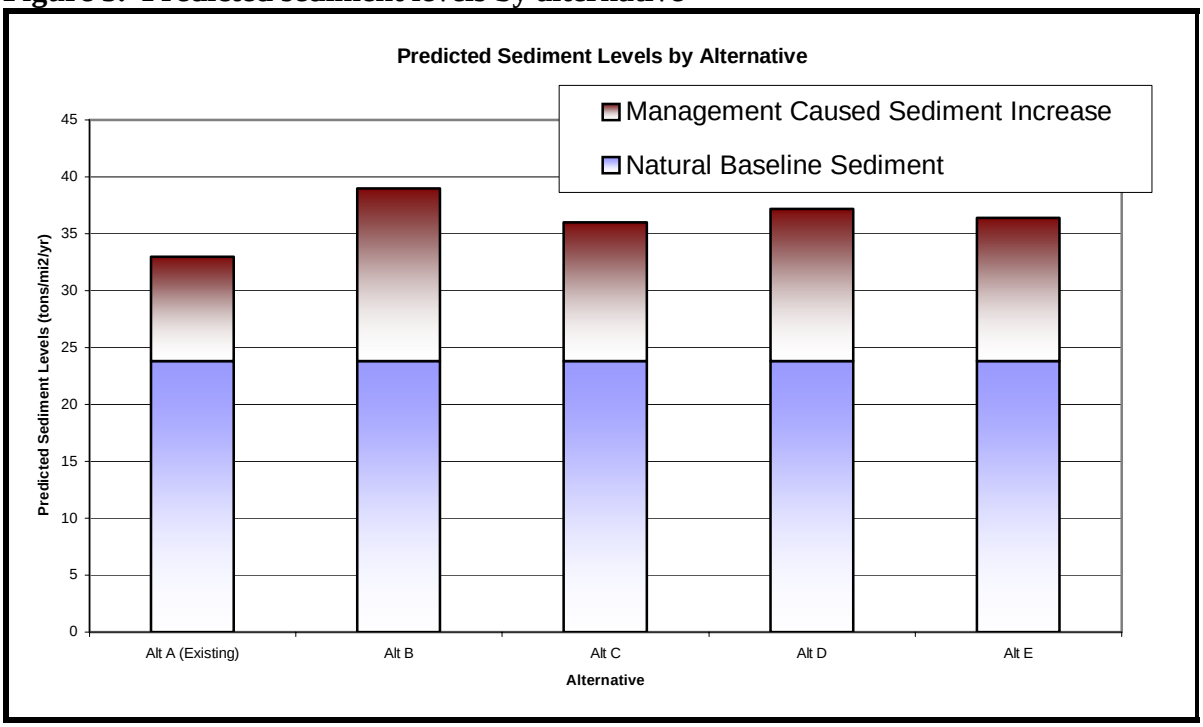
Alternative E

Because direct effects (from road building and tractor logging) are limited under this alternative, the cumulative effects of Alternative E are almost identical to Alternative C.

Summary about sedimentation

The most likely impacts to the watershed would occur because of increases in sediment due to road construction, reconstruction, maintenance, and traffic levels. There should be no effect to sediment levels from timber harvest since riparian harvest within INFISH buffers is proposed on only small areas within 3 harvest units. These RHCA encroachments have been examined in the field to verify possible effects (see Fisheries section 4.6). Sediment would be delivered to streams only at crossings and where contributing road segments are located within the zone of riparian influence. Alternative B would construct 13 new stream crossings and Alternative D would construct 4 new crossings. There are no new crossings proposed in Alternatives C and E. All alternatives (even the no action alternative) would result in increased levels of road-generated sediment. Alternative B would result in the highest levels of sediment and Alternative A the lowest. The other action alternatives (C, D, and E) fall between these two extremes. **Implementation of Alternative B would result in about a 18 percent increase over existing sediment levels. Alternatives C, D, and E would increase sediment levels in the analysis area by 9, 13, and 10 percents respectively over existing levels. Alternative A is considered the existing sediment level, but it is approximately 38 percent higher than estimated natural baseline sediment levels of the watershed.**

Figure 5. Predicted sediment levels by alternative



Equivalent Clearcut Analysis

The equivalent clearcut analysis (ECA) model for the existing condition as described in the Affected Environment section of this report was calculated for the year 2002. The ECA model for this section was calculated using 2004 as the base year for project implementation. Therefore, there are two additional years of hydrologic recovery shown between the existing condition shown in Chapter 3 and the description below. Past, present, and future activities on all ownerships within the watershed are used in the model calculations. DNR forest practice applications were used to analyze future harvest activities on non-federal lands within the watershed. No future private timber harvest applications had been received at the DNR office for the Deadman watershed at the time of this analysis.

This area of hydrologic cumulative effects is synonymous with the Deadman analysis area (watershed) boundary.

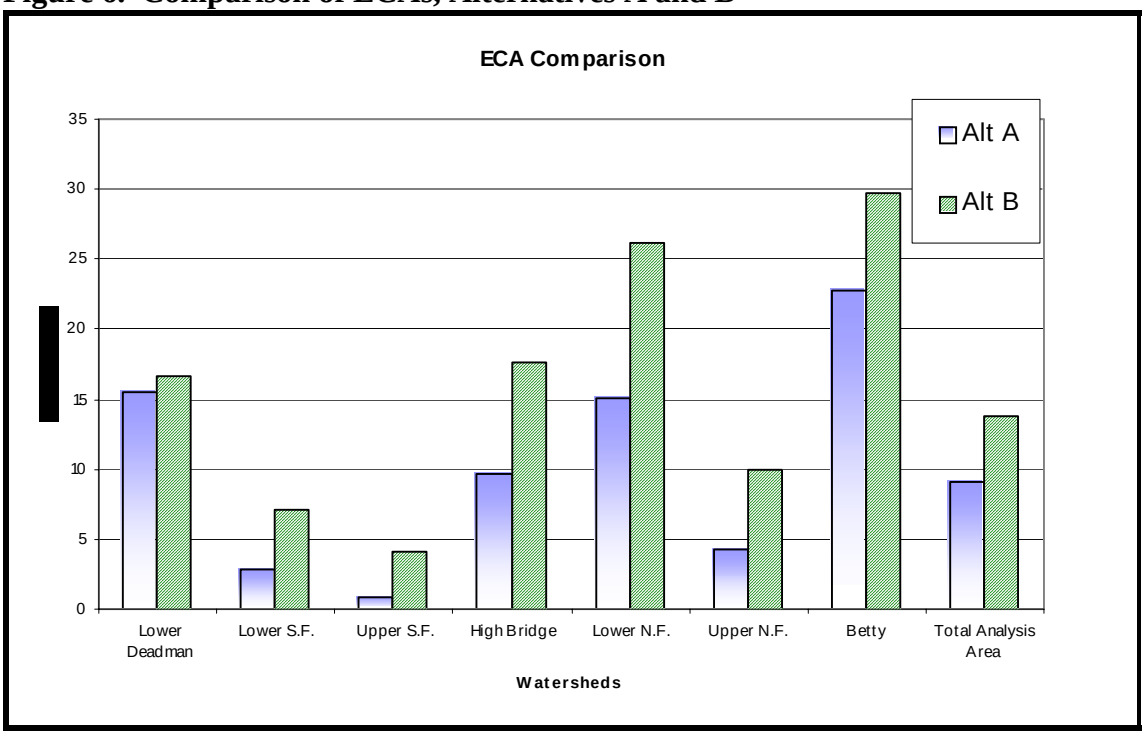
Alternative A

ECAs are not expected to change appreciably over existing levels. Logging on private land is expected to continue at the current limited rate. Vegetative ingrowth on federal lands would more than offset the effects of additional created openings on private land. Short-term ingrowth over the next 5 to 10 years would have an undetectable influence on streamflows. Long-term ingrowth, without the influence of natural disturbance regimes (such as fire) would eventually result in increased evapotranspiration rates and a corresponding decrease in surface and groundwater flows on NFS lands. These effects would be most noticeable during low flows and drought years. Without timber harvest, fuel levels and pathogen levels would increase. This would increase the risk of catastrophic fire in the future.

Alternative B

The timber sale(s) resulting from this proposal, when combined with previous sales and reasonably foreseeable harvest activities within the analysis area, would increase created openings by about 4.7 percent over existing levels. All subwatersheds except Betty Creek and the Lower North Fork would remain below the Colville National Forest threshold of concern (25 percent). The equivalent clearcut area in Betty Creek would increase about 7.1 percent (from 22.7 to 29.8 percent) as calculated by the CNF ECA process (Wasson, 1992). The equivalent clearcut area in the Lower North Fork would increase about 11.1 percent (from 15.1 to 26.2 percent). Field observations of channel morphologies on Betty Creek and the Lower North Fork show no effects from unusual peak flows. There is no evidence that existing roads and landings have compromised these basins' abilities to store and slowly release water. Deep, permeable soils in these basins are adequately buffering the effects of increased created openings. It is unlikely that the additional increase in created openings will result in detectable changes to flow regimes, and, or channel morphology. Thirteen new road stream crossings would be constructed under this alternative.

Figure 6. Comparison of ECAs, Alternatives A and B



Road densities in Betty Creek drainage would increase 0.2 mi/mi2 under this alternative from 4.5 to 4.7 mi/mi2. Road densities in High Bridge Creek would also increase from 4.7 mi/mi2 to 5.4 mi/mi2. High Bridge Creek is not a fishery, but is connected to the South Fork Deadman Creek. It is unlikely that, under normal climatic conditions, this increase would result in distinctly different hydrologic conditions. These densities may however be approaching a threshold where unusually large runoff events may begin to seriously affect stream channels. The forest has not established such a threshold, however both old and new literature considers these road densities to be high for wildland watersheds to provide clean, well-regulated flows. (Harr et al. 1975; King and Tennyson 1984; Jones and Grant

1996). Mitigation measure 28 that requires road obliteration within these basins to maintain total road densities at 4.5 mi/mi2 or less should ensure that runoff, storage, and routing functions are not further impaired.

Alternative C

The timber sale(s) resulting from this proposal, when combined with previous sales and reasonably foreseeable harvest activities within the analysis area, would increase created openings by about 2.6 percent over existing levels. All subwatersheds except Betty Creek remain below the CNF threshold of concern (25 percent). The equivalent clearcut area in Betty Creek would increase about 5 percent (from 22.7 to 27.7 percent) as calculated by the CNF ECA process (Wasson, 1992). Field observations of channel morphologies on Betty Creek show no effects from unusual peak flows. There is no evidence that existing roads and landings have compromised this basin's ability to store and slowly release water. Deep, permeable soils in this basin are adequately buffering the effects of increased created openings. It is unlikely that the additional increase in created openings will result in detectable changes to flow regimes, and, or channel morphology. No new crossings would be constructed under this alternative.

Road densities would not change under this alternative since there would be no new specified road construction.

Alternative D

The timber sale(s) resulting from this proposal, when combined with previous sales and reasonably foreseeable harvest activities within the analysis area, would increase created openings by about 2.7 percent over existing levels. All subwatersheds except Betty Creek and the Lower North Fork remain below the Colville National Forest threshold of concern (25 percent). The equivalent clearcut area in Betty Creek would increase about 5.1 percent (from 22.7 to 27.8 percent) as calculated by the CNF ECA process (Wasson, 1992). The equivalent clearcut area in the Lower North Fork would increase about 10.9 percent (from 15.1 to 26.0 percent). Field observations of channel morphologies on Betty Creek and the Lower North Fork show no effects from unusual peak flows. There is no evidence that existing roads and landings have compromised these basins' abilities to store and slowly release water. Deep, permeable soils in these basins are adequately buffering the effects of increased created openings. It is unlikely that the additional increase in created openings would result in detectable changes to flow regimes, and, or channel morphology. Four new road stream crossings would be constructed under this alternative.

Road densities in the analysis area would increase 0.1 mi/mi2 under this alternative from 2.4 to 2.5 mi/mi2. New road construction would be limited to the North Fork drainage. The road density in Betty Creek would increase 0.2 mi/mi2 and road densities in the North Fork drainage will increase the same amount from 2.7 to 2.9 mi/mi2. It is unlikely that, under normal climatic conditions, this increase would result in distinctly different hydrologic conditions. These may however be approaching a threshold where unusually large runoff events may begin to seriously affect stream channels. The forest has not established such a threshold, however both old and new literature considers these road densities to be high for wildland watersheds to provide clean, well-regulated flows. (Harr et al, 1975; King and Tennyson, 1984; Jones and Grant, 1996). Mitigation that requires road obliteration within these basins to maintain total road densities at 4.5 mi/mi2 or less should ensure that runoff, storage, and routing functions are not

further impaired.

Alternative E

The timber sale(s) resulting from this proposal, when combined with previous sales and reasonably foreseeable harvest activities within the analysis area, would increase created openings by about 3.5 percent over existing levels. All subwatersheds except Betty Creek and the Lower North Fork remain below the Colville National Forest threshold of concern (25 percent). The equivalent clearcut area in Betty Creek would increase about 7 percent (from 22.7 to 29.7 percent) as calculated by the CNF ECA process (Wasson, 1992). The equivalent clearcut area in the Lower North Fork would increase about 10.4 percent (from 15.1 to 25.5 percent). Field observations of channel morphologies on Betty Creek and the Lower North Fork show no effects from unusual peak flows. There is no evidence that existing roads and landings have compromised these basins' abilities to store and slowly release water. Deep, permeable soils in these basins are adequately buffering the effects of increased created openings. It is unlikely that the additional increase in created openings would result in detectable changes to flow regimes, and, or channel morphology. No new crossings would be constructed under this alternative.

Road densities would not change under this alternative since there would be no new specified road construction.

Summary of the Equivalent Clearcut Analysis

ECAs would increase over existing levels in almost all subwatersheds in all action alternatives from timber harvest. New road construction would also increase ECAs in Alternatives B and D. There is no reason to anticipate that any action alternative would result in changes to flow regimes that would result in damage to stream channels. There are large areas lacking classified roads with closed-canopy forest (much of it on north aspects) that would reduce the risk of rapid snowmelt events. Channel conditions along both forks of Deadman Creek are primarily affected by direct rather than upstream impacts. All subwatersheds except Betty Creek and the Lower North Fork would remain below the usual threshold of concern (25 percent) in all alternatives. The equivalent clearcut area in Betty Creek would increase a maximum of 7.1 percent (from 22.7 to 29.8 percent) and the Lower North Fork and maximum of 11.1 percent (from 15.1 to 26.2 percent) in Alternative B. Deep, permeable soils in these moderately sloping basins are adequately buffering the effects of increased created openings. Therefore, it is unlikely that additional increases in created openings of this magnitude would result in detectable changes to flow regimes, and, or channel morphology.

Road densities would only change under Alternatives B and D due to proposed construction of new specified roads within these alternatives (see Table 6). Road densities in all subwatersheds would be affected under Alternative B with High Bridge Creek undergoing the largest increase from 4.7 mi/mi2 to 5.4 mi/mi2. Much of this impact would be mitigated by obliterating an amount of road within this subbasin equal to the amount of new road construction. Alternative D only increases road densities in the North Fork subwatersheds. These proposed increases in Alternative D are less than those proposed under Alternative B and the impacts would be correspondingly less as well.

Other disclosures

Concurrent Actions

Wildland-Urban Interface (WUI) areas and treatment opportunities are being identified jointly between the Forest Service and the Norhteast Washington Community Coalition in the Kettle River watershed and includes the Deadman area. Fuel treatment projects will be located close to the national forest boundary and will reduce the risk of wildfire caused by overstocked timber stands and the accumulation of ladder fuels that have occurred since fires suppression was initiated. At this time it not anticipated that new system roads will be constructed during WUI projects and fuels will be reduced using a combination of commercial/non-commercial thinning and prescribed burning. Riparian buffers will be used to protect water quality and hydrologic processes. The Kettle River Community Fire Plan is in it's infancy and not specific projects have been identified. Therefore, its effects will not be analyzed further in this report.

The next scheduled Forest Service timber harvest activities will probably not occur for another 20 – 30 years. During this time period much of the watershed will be in an advanced state of hydrologic recovery due to vegetative ingrowth in stands harvested under this proposal. (See ECA discussion on previous page) Timber harvest on private land is expected to continue. The level of harvest on private ownerships is expected to be variable and difficult to predict since it is heavily dependent on the land management objectives of the landowner and market conditions.

Portions of the Deadman watershed are occasionally used for field training exercises by the U.S. Air Force Survival School. This training is intended to simulate conditions that may be encountered by combat air crews that are forced to eject and survive within hostile territory. The impact of these exercises on water yield, water quality and channel morphology is probably less than dispersed recreation impacts. They are assumed to be within the range of natural variation and would therefore be undetectable using current sampling/modeling techniques.

Road Maintenance (by county, state, and federal agencies) will probably continue at existing levels to serve private landowners in the lower watershed, and to maintain primary safe travel routes within the national forest. The forest policy of no net gain in open road mileage is expected to retain road sedimentation at existing levels after new roads are closed and revegetated. This data is included in the DNR erosion model.

Dispersed recreation use is expected to remain at existing levels in the watershed during the next 5 – 10 years.

Wetlands, Floodplains and Groundwater

No wetland "taking" is anticipated to occur from any action alternative. Short-term sedimentation and turbidity levels are expected to increase during road construction, reconstruction, maintenance, and timber haul. Some of this material will be deposited in downstream floodplains and connected wetlands.

Rock Pits

The Alligator Pit (in upper Betty Creek) is the only locations identified as a possible rock source for this project. This pit is located away from streams and

wetlands, and will have no direct, indirect, or cumulative effects on water resources based on the current operating plan.

Road Management

The Deadman Roads Analysis Report (RAR) identified several roads or road segments that were excess to the transportation needs of the area, and, or that were causing adverse resource impacts. These roads are identified for closure, obliteration, and, or removal from the transportation system (pages 32-33, Deadman RAR, 2002). The activities identified in this report are common to all action alternatives. Approximately 18 stream crossings and 10.74 miles of road would be removed from the current transportation system. Most of the affected crossings are on Class 4 streams, however many of these crossings are located within a short distance of the North and South Forks of Deadman Creek. Small inputs of sediment would occur for 1 to 3 years after implementation because soils and vegetation would be disturbed during the removal of culverts, ripping of compacted road surfaces, and installation of additional drainage structures. These short-term increases probably fall within the natural range of variability for sediment and would normally not be detectable using standard monitoring procedures. Long-term sediment levels from these areas would decrease over current levels as vegetation becomes reestablished, traffic levels decrease, and disturbed soils stabilize. Road closure devices would need to effectively exclude future use by full-sized vehicles. It is more difficult to limit the continued use of these road templates by ORVs and cattle. Some of this use would decrease as vegetation grows and makes access difficult. The history of similar areas in the watershed indicates that users continue to access their favorite areas despite excessive amounts of labor that may be required to maintain that access.

4.6 Fisheries

4.6.1 Issues

The effects of entry into inventoried roadless areas were identified as a key issue in the scoping process. There are no fish bearing streams within the inventoried roadless areas. New road stream crossings have been the main effect of new roads, since they lead to increased cattle access and sedimentation. There are no proposed new road stream crossings, and no harvest activities in the RHCAs in the inventoried roadless areas. There should be no effect to stream habitat and fisheries from entry into the inventoried roadless areas.

The effects of new road construction on water quality and wildlife habitat were identified as a key issues in the scoping process. The effects to fisheries vary by alternatives and are largely dependent on the number of new road crossings and miles of classified road construction. The effects of new road construction are analyzed qualitatively in regards to fish populations, changes in cattle access and haul on FS roads. The possible effects to sedimentation levels are quantified in the Hydrology section above, but discussed here in regards to fish populations.

The analysis below tiers to the INFISH Environmental Consequences sections. This is done to address the effects of implementing the INFISH standards and guidelines (1995 amendment to the Forest Plan). The analysis and research concludes that staying out of RHCAs would not impact any existing aquatic or riparian vegetation except that the risk of high severity fire in RHCAs may be reduced by fuel treatments in adjacent stands. Harvest activities are for the most

part outside of RHCAs and would have no effect on instream large woody debris or other instream structures. Most new roads would be located outside of RHCAs. This document also incorporates by reference the Colville National Forest Noxious Weed Environmental Analysis for effects of implementing noxious weed treatments.

4.6.2 Proposed Treatments Partially within RHCA

Direct sedimentation due to timber harvest operations is unlikely to occur when harvest units are buffered according to INFISH guidelines. Timber harvest is proposed inside of INFISH buffers in units within the analysis area. An ID Team of resource specialists visited Unit CO. This unit proposes to commercially thin trees within a Category 4 riparian zone to create site conditions that will optimize tree growth and stand health. The IDT determined that the risk of sedimentation was very low and the long-term benefits to the stand outweighed the risk. In unit DQ the main road is located within the riparian zone of influence at the topographic slope break between a steep upland slope (where the unit is located) and the RHCA. Most of the affected surface water in this RHCA is Category 4. A site review by the district hydrologist indicated this road effectively segregates any sediment delivery between the upland slope and the RHCA. The small portion of the RHCA that would have extended above the road was considered inconsequential to riparian function and was eliminated during unit layout. In Unit EC the proposed road location ends approximately 200 feet inside the unit boundary. At this point, both the road and the unit boundary are approximately 130 feet slope distance north of an INFISH Category 2 stream (perennial, non-fish-bearing). The standard INFISH buffer for Category 2 streams is 150 feet. The road and unit boundaries are located on gentle slopes (less than 20 percent) away from the topographic slope break and outside the inner gorge of the stream. At the current location, they would not influence delivery of course sediment, organic matter, and woody debris to the stream. They would not affect root strength for channel stability, nor shading since they are located on the north side of the stream. Existing water quality in this stream would be maintained in spite of the 20-foot incursion into the RHCA.

Table 43. Units partially within riparian habitat conservation areas

Action Alternative	Units partially within a RHCA
B	CO, DQ, EC
C	CO, EC
D	DQ, EC
E	CO, DQ, EC

Post-harvest Treatments

Jackpot burning and use of fire for natural fuels reduction and wildlife habitat improvement in the past has not created ground disturbance nor caused increased erosion except in small, localized areas of concentrated fuels. Continued use of fire for this purpose is not anticipated to increase sediment delivery to streams in the Deadman analysis area. Any surface erosion from these areas would be buffered by vegetation prior to reaching the streams (mitigation measure 25). INFISH buffer widths would be used on all burn projects.

4.6.3 Direct and Indirect Effects to Fish Populations

Table 44. Summary of impacts to fish populations in DCEMP area

SPECIES (Listing*)	PRE-FIELD REVIEW	FIELD REVIEW	RISK ASSESSMENT (Likelihood x Consequences)	
			Alternative A	Alternatives B, C, D, E
Bull Trout (T)	Habitat present	Species not present	No Effect	NLTAA**
Westside Cutthroat Trout (S)	Habitat present	Species not found	No Effect	NLTFL***
Redband Trout (S)	Habitat present	Species present	No Effect	NLTFL
Eastern Brook Trout (MIS)	Habitat present	Species present	No Effect	Meets Forest Plan Direction

* T = Threatened, E = Endangered, P = Proposed, S = Sensitive, MIS = Management Indicator Species
** NLTAA Not Likely To Adversely Affect
*** NLTFL Not likely to lead to a trend toward Federal listing.

Alternative A

The fisheries habitat would continue to be dominated by a brook trout population in South Fork Deadman Creek (Deadman Creek) and redband trout in the North Fork Deadman Creek (North Fork) and its tributaries. There is an effort underway to remove fish barriers to the Kettle River. This may allow bull trout populations to return. A few bull trout have been found at the mouth of Boulder Creek. However degraded habitat within the DCEMP analysis area such as overall low habitat complexity, marginal summer water temperatures, limited winter rearing and spawning habitat, interbreeding (between brook and bull trout), and competition with brook trout reduces the success of native fish re-establishment.

The major landscape process in this watershed is fire. Because of past fire suppression efforts, fuel loadings in the watershed are high especially in Upper South Fork around King Creek. This increases the risk of high severity fire. Based on analysis from the Quartzite Ecosystem Management Project Hydrology Report and modified by personal observations in the DCEMP area a scenario for a catastrophic fire event was developed and is contained in the Fisheries report in the DCEMP Analysis file, located at the Three Rivers Ranger District office. The potential effects to fisheries from catastrophic fire are summarized in the following paragraph.

> **Sedimentation from streambank instability would cause fish habitat to decline as spawning gravels become embedded with fine sediments that decrease the intergravel dissolved oxygen. Riparian wildlife habitat would decline as beaver ponds fill in with sediment or if dams are breeched due to high flows. Stream temperatures would also increase due to increased sediment loads and the removal of vegetative shade. The fisheries population would decline due to degradation of habitat after the fire. As the streams recover the fisheries population would increase over the immediate post-fire conditions.**

Alternative B

Alternative B would have the most affect to fisheries from cattle access and road related sedimentation. Thirteen new road stream crossings would be constructed on first and second order streams, including a temporary bridge on a fish-bearing reach of upper Deadman Creek, and 4 other new crossings on nearby tributaries.

A short-term increase in sedimentation would occur during log haul due to increased traffic levels on existing roads.

The primary reach that would be affected by any increase in stock access is the upper North Fork (reach 5). **It is important habitat for the native redband trout population.** Potential hazards are direct impacts such as redd and bank trampling, which would result in egg mortality, channel widening and lower habitat diversity. **A decrease in habitat diversity would decrease the numbers of large spawning fish, and the number of eggs lain. In this reach, emergence from egg to fry is already low due to sediment, so that full seeding is important in maintaining population viability.** Best management practices and mitigation measure 22 is specified to minimize such effects. In particular**, because no new attractive crossing opportunities would be created (mitigation measure 23), damage to the fish populations is not anticipated**.

Implementation of Alternative B would contribute to the shift of the fisheries population from the native redband population to the brook trout population in reaches 3 and 4 of Deadman Creek (South Fork) and reaches 1 and 2 of North Fork Deadman Creek**. This alternative may impact threatened and sensitive fish species and their habitats but is not likely to lead in a trend towards federal listing or loss of viability.**

Alternative C

Except for temporary roads (common to all alternatives), no new specified roads would be constructed under this alternative. Cattle access to, and disturbance at, crossings would not increase over existing conditions. **A short-term increase in sedimentation would occur during log haul due to increased traffic levels on existing roads**.

The medium term increase in sediment mobilization and input to streams due to haul would occur, but the total amount of increase is lower than Alternative D and would almost certainly not be detectable. **This alternative would not retard or prevent attainment of Riparian Management Objectives. This alternative would not adversely affect the fishery. This alternative may impact threatened and sensitive fish species and their habitats but is not likely to lead in a trend towards federal listing or loss of viability**

Alternative D

Implementation of Alternative D would create **4 new stream crossings**. Most of the new road segments would be located at mid slope where they are less likely to intercept subsurface flows that increase the risk of mass wasting or increase surface flows to streams. Only one segment is located on a bench above Deadman Creek. Any disruption of riparian integrity and function in upper South Fork under Alternative B is eliminated in this alternative.

Additional sediment loading to Deadman Creek would be lower than in Alternative

B, but the other factors affecting sediment loading (yarding methods) there probably mean that any difference would be difficult to detect. As in Alternative B, the ultimate effect on fisheries would be to contribute to the shift of the fisheries population from the native redband population to the brook trout population in reaches 3 and 4 of Deadman Creek and reaches 1 and 2 of North Fork Deadman Creek. This alternative may impact threatened and sensitive fish species and their habitats but is not likely to lead in a trend towards federal listing or loss of viability.

Alternative E

Like Alternative C, this alternative constructs no new specified roads. Harvest units within the inventoried roadless areas would be yarded by helicopter to reduce impacts to these areas. The larger harvest volume to be hauled compared to Alternative C would result in slightly higher predicted sediment delivery to streams (over Alternative C). Other impacts to fisheries would be similar to those described in Alternative C.

This alternative would not retard or prevent attainment of Riparian Management Objectives. This alternative would not adversely affect the fishery. This alternative may impact threatened and sensitive fish species and their habitats but is not likely to lead in a trend towards federal listing or loss of viability

4.6.4 Direct and Indirect Effects to Channel Morphology

Assumptions

This document incorporates the INFISH analysis by reference. Basically the analysis states "Non-channelized sediment flow rarely travels more than 300 feet and that 200 to 300 foot riparian "filter strips" are generally effective at protecting streams from sediment from non-channelized flow." The RHCAs would be treated to direct sediment laden flows away from water bodies. Sediment may be transported in a ditch or on the road surface outside of the RHCA. Since the RHCAs would be treated, the sediment should not be getting into streams.

Large woody debris

The function of the riparian habitat (providing instream large wood, shade, detritus, bank stability and acting as a sediment filter) is expected to remain stable along most of the streams. Improvement of riparian function is expected as vegetation matures in past riparian harvest units and provides shade and wood recruitment over time. The overall recruitment sources for large instream wood are expected to slightly improve throughout the watershed. Over time, the new instream woody debris is expected to increase the number of pools and available spawning, hiding, resting and feeding habitat for trout. However, large instream wood is expected to remain low next to open roads. The current road system has eliminated a portion of the historic recruitment sources for woody debris for approximately four miles of fish-bearing stream. Firewood cutting in RHCAs and removal of hazard trees may also prevent recruitment of instream LWD.

Road management

The Deadman Roads Analysis Report (RAR) identified several roads or road segments that were excess to the transportation needs of the area, and, or that were causing adverse resource

impacts. These roads are identified for closure, obliteration, and, or removal from the transportation system (pages 32-33, Deadman RAR, 2002). The activities identified in this report are common to all action alternatives. Approximately 18 stream crossings and 10.74 miles of road would be removed from the current transportation system. Several of these road segments are located adjacent to streams. Future ingrowth of riparian and upland vegetation would increase shade, species diversity, and the future recruitment of large woody debris for channel structure. Aquatic habitat is expected to improve after these recommendations have been implemented, however the degree of improvement will be small and difficult to discern at the watershed scale.

Alternative A

The risk of catastrophic fire is expected to increase so slowly that it would not pose a material risk to the hydrologic system within the next 10 years. Bank erosion and downcutting would continue in Deadman Creek South Fork reaches 8, 9, and 10 where beaver dams failed in 1996. These channel adjustments would continue to contribute substantial amounts of fine sediment to the lower reaches. These channel conditions may change in the future to reflect cyclical channel impacts as beaver populations fluctuate. Livestock and recreational users would probably continue to access and impact riparian areas already affected by timber harvest (particularly in the vicinity of regeneration cuts and landings). Sediment delivery from bank erosion due to cattle and recreation use is expected to continue at existing or increased levels.

Alternative B

Thirteen new crossings would be constructed on first and second order streams within the analysis area. This includes a temporary bridge on a fish-bearing reach in the upper Deadman subwatershed. Most of these new road segments would be located on mid- to upper-level slope positions. They are unlikely to intercept large amounts of subsurface water that increase the risk of mass wasting or flashy stream responses. Some segments are located on lower slope positions or on benches adjacent to South Fork Deadman Creek. Where these segments cross first order streams, they will probably cause some localized channel cutting and increase sediment. **Sediment transport from these 1st and 2nd order streams is inefficient because the streams frequently cross alluvial fans where they lose flow and the ability to transport sediment prior to joining the mainstem**. However, riparian functions may be affected on individual tributaries where subsurface flows would be increasingly subject to cutslope interception and surface runoff would be rapidly routed to channels**. Proposed road CAS1 is an example because it crosses two small streams that drain indirectly to South Fork Deadman Creek. The riparian soil on one of these tributaries has properties that may increase the risk of slumping**.

Road segments on gentle slopes close to streams may increase cattle access into riparian areas. Decompaction, debris mulching, and slash dispersal on temporary roads would help discourage cattle and minimize the effects of additional cattle access. Existing system roads would probably not be treated accordingly since continued administrative access would be required for implementation of post harvest activities. **Also, because new roads such as CAF1 (5 crossings on upper South Fork) would offer additional cattle access, they would probably result in increased levels of detrimental soil impacts in riparian areas adjacent to these crossings. Typical impacts include soil compaction, bank**

trampling, sedimentation, and direct delivery of fecal coliform bacteria to surface waters. BMPs and mitigation measures 23 and 39a are specified to minimize such effects. In particular, because no new attractive crossing opportunities would be created (mitigation measure 23), we do not anticipate damage to the fish population.

Cattle caused impacts would probably occur in the North Fork watershed from proposed road CFP1 due to increased access. The 1972 North Fork Deadman Inventory describes streambank trampling damage due to cattle even before roads were constructed into this area. Proposed spurs CDA1 and CDK1 will create 3 new crossings on 1st or 2nd order tributaries of the lower North Fork. This would result in increased sedimentation due to increased traffic levels from log haul and cattle access at road stream crossings. Existing sediment loading from FS Road 9565.800 is already high due to the long lengths of road draining directly to tributary stream channels .

Alternative C

Except for temporary roads (common to all action alternatives), no new specified roads would be constructed under this alternative. Cattle access and direct disturbance at crossings therefore, would not increase over existing conditions. A short-term increase in sedimentation would occur during log haul due to increased traffic levels on existing roads. This increase would be small enough to be undetectable within the natural range of variation.

Alternative D

Road segments on gentle slopes close to streams may increase cattle access into riparian areas. Decompaction, debris mulching, and slash dispersal on temporary roads would help discourage cattle and minimize the effects of additional cattle access. Existing system roads would probably not be treated accordingly since continued administrative access would be required for implementation of post harvest activities. Also, because new roads would offer additional cattle access, they would probably result in increased levels of detrimental soil impacts in riparian areas adjacent to these crossings**. Typical impacts include soil compaction, bank trampling, sedimentation, and direct delivery of fecal coliform bacteria to surface waters. BMPs and mitigation measures 21 and 22 are specified to minimize such effects. In particular, because no new attractive crossing opportunities would be created, we do not anticipate damage to the fish population.**

Proposed road CEN1 would extend access into the upper North Fork basin, but its constructed length is shorter under this alternative than under Alternative B. Cattle access in the upper North Fork is reduced under this alternative compared to Alternative B. Mitigation measures are still proposed to minimize cattle impacts in this redband habitat.

The increased sedimentation due to road construction, reconstruction, and maintenance due to this alternative would probably last 3 to 5 years during and after timber sale operations. With the exception of High Bridge Creek, the sediment increases predicted by the Washington State TFW procedure would be temporary and would not substantially affect turbidities. High Bridge Creek turbidity levels are expected to increase over existing levels due to log haul traffic. These would be short-term and decrease after the timber sale contract is completed. Chronic sediment loading to the mainstem of Deadman Creek (downstream of High Bridge Creek) is not expected to

increase over existing levels since there is no new road construction in High Bridge Creek under this alternative.

Road densities would only increase in the North Fork basin, so increases in chronic sediment levels due to road construction would be restricted to the North Fork basin.

Alternative E

Like Alternative C, implementation of this alternative would construct no new specified roads. Harvest units within the roadless areas would be yarded by helicopter to reduce impacts to these areas. The larger harvest volume to be hauled compared to Alternative C would result in slightly higher predicted sediment delivery to streams (over Alternative C). Other impacts to channel conditions would be similar to those described in Alternative C.

4.6.5 Cumulative Effects to Fisheries and Channel Conditions

The streams in the area have been heavily impacted from past riparian harvest, cattle damage, and roading. Riparian harvest has reduced LWD levels to below RMO levels. Cattle damage has broken down banks and increased BFWD ratios. Recent changes to, and enforcement of grazing permits are allowing for recovery of some riparian conditions. Cattle are having a negative impact to the fisheries in many areas, however management is taking an active role in improving the existing situation. Impacts due to grazing are likely to decrease somewhat over time, in some areas. Roading has increased the amount of fines traveling through the system, which affects pool quality and BFWD ratios.

The fisheries distribution and species composition in the area is heavily influenced by past stocking, habitat quality, and barriers. Past stocking introduced brook trout into the Deadman Creek watershed. Brook trout have thrived in the poorer quality habitats resulting from past timber harvest, cattle damage, and roading. Redband trout are thriving in the upper portions of the watershed especially where barriers have kept brook trout out of the stream.

Alternative A

If we do nothing, the risk of large fires would increase. The cumulative effect of large fires in these watersheds is uncertain. Streamflows and water temperatures may take up to 30 years to recover from the effects of high severity fires. Effects from sedimentation would probably improve faster, while channel morphologies may remain altered for longer periods of time. Redband trout are able to survive in very small headwater streams and are able to weather large changes like those that would occur from a fire event.

Alternatives B and D

Deadman Creek's sediment transport and storage capacities (already under pressure of adjusting to beaver dam breakouts in the upper watershed) would be further loaded by sale activities, and the loading would be largest under these alternatives.

With erosion from haul activities, reconstruction, and new construction there would be a short-term increase in sedimentation to the streams in the area.

However mitigations and BMPs should reduce the sedimentation amount so that it transports through the system and does not form large bars, fill pools, or make other channel changes. Bankfull width to depth ratios are formed over many years. Since the sedimentation is small and short-term, it is expected to pass through the system to the Kettle River before any bankfull width to depth ratio changes occur. The amount of sedimentation would not be noticeable in the Kettle River. Sedimentation would not affect LWD amounts.

Therefore these alternatives would not retard or prevent attainment of Riparian Management Objectives. There may still be some short-term effects to fisheries as localized filling of spawning gravels may reduce spawning success. The ultimate effect on fisheries would be to contribute to the shift of the fisheries population from the native redband population to the brook trout population in reaches 3 and 4 of Deadman Creek and reaches 1 and 2 of North Fork Deadman Creek. These alternatives may impact threatened and sensitive fish species and their habitats but is not likely to lead in a trend towards federal listing or loss of viability.

Alternatives C and E

Cumulative effects from these alternatives are limited to short term increases in fine sediment loading and turbidity due to haul on existing roads, and a possible slight long-term increase due to new stock access to streambanks. **There should be no noticeable effects to trout and trout habitat from this alternative. This alternative would not retard or prevent attainment of Riparian Management Objectives. These alternatives would not adversely affect the fishery. These alternatives may impact threatened and sensitive fish species and their habitats but are not likely to lead in a trend towards federal listing or loss of viability.**

4.6.6 Other Disclosures

Noxious weeds

Generally shading and healthy plant communities keep noxious weeds out of the forested stream reaches. Noxious weeds on road right of ways and new construction usually do not extend into forested riparian areas because of this. However the heavy cattle use along the Deadman Creek road maintains fresh soil and good light conditions for weed invasion and noxious weeds can be found along the road. Another exception is hawkweed, which has been found on the Colville National Forest in shaded riparian conditions. This noxious weed is a priority for treatment (pers. comm. Forest Noxious Weed Coordinator). Noxious weeds were not found to be affecting streambank stability. However in some cases other non-natives plants such as crabgrass and dandelions have replaced the native communities. The Integrated Noxious Weed Prescription for the Deadman Watershed proposed under all alternatives would reduce the risk of noxious weed spread in riparian areas. There should be no noticeable increase in noxious weed effects to stream channels.

Air Force Survival School activities

The Air Force Survival School uses portions of the DCEMP area for training. These activities have been looked at in 2000 (USDA, Forest Service, Colville National Forest Environmental Analysis, Air Force Special Use Permit). Group Operating Instructions were revised at that time. Because of the update to the Group Operating Instructions (GOI 60-1), all activities, except road use would be outside

of the RHCAs. The road use would not increase under the new Air Force Permit. Therefore sediment levels would remain at current levels. If road use increases, dust abatement in RHCAs would be required to mitigate additional sedimentation. The activities of the Survival School were given a "No Effect" to bull trout, and a "No Impact" to redband trout and cutthroat trout in the Biological Assessment done. Furthermore, MIS aquatic species (which include salmonid species occurring on the Forest), and INFISH Riparian Management Objectives, and riparian vegetation would not be impacted by the Survival School activities. The effect of the proposed action alternatives may displace Air Force activities to other watersheds for the duration of the activities. No effects to fisheries or channel conditions would occur because of this.

Recreation

Most of the dispersed camping sites are located along the main Deadman Creek Road. Sites vary from heavy use to occasional use. Off-highway vehicle (OHV) use is becoming a growing activity in this area, which is indicative and typical for the urban wildland interface. OHV users drive on logging roads, meadows, and county roads, and create new paths throughout the area. This activity is largely unregulated at this time.

The Forest Fisheries Biologist visited many of the dispersed sites along Deadman Creek and North Fork of Deadman Creek. Dispersed recreation sites are typically located on the flat riparian bottoms. Use of the sites impacts riparian vegetation the most. Typical damage results from chopping down trees, using trees for target practice, clearing areas for tents and vehicles, and creating paths to other areas. Cattle also heavily use these areas. No management has taken place to reduce the impacts from these sites. LWD in these areas is typically low, since trees that fall in the creek are usually used for firewood. These sites have poor fish habitat from the impacts of recreationists. Management activities are expected to temporarily reduce recreation use in the watershed, which may allow recovery of the riparian vegetation in some of the streamside, dispersed sites.

4.7 Geology and Soils

The soils and geology analysis is based on in part on data from field data collected on all units, unit-specific estimate of detrimental impacts and improved soil-nutrient discussion (potassium).

4.7.1 Issues

The effects of new road construction and entry into inventoried roadless areas on soil quality were identified as key issues during public and internal agency scoping. The concerns focused on the potential impacts to soils from silviculture treatments and road building.

- **Forest management activities that use heavy equipment during ground-based yarding are typically associated with three primary adverse impacts: compaction, erosion and displacement (see Forest Plan EIS; Harvey et al. 1994).**
- **Forest management activities that employ fire have potential to detrimentally burn soils (R6 Soil Quality Standards).**
- **Forest management activities that remove biomass can adversely affect site productivity by removing nutrients, and by removing large organic material that holds water and provides refugia for soil microorganisms.**

- New road construction removes land from the productive landbase.
- Cumulative effects of forest management on areas previously treated can increase potential impacts of proposed activities.

4.7.2 Direct and Indirect Effects to Soils

Compaction

The degree of compaction can vary widely depending on soil conditions (moisture content, frozen soil conditions, rock content, soil texture), the type of equipment used (including the size, weight, type of tracks or tires, and pounds per square inch of the tires), and the logistics of the operation being performed (number of passes over the same piece of ground, amount of slash or snow under the equipment, operator skill). Tractor yarding, forwarder-processor systems, mechanical felling machines, and grapple piling are expected to result in some compaction. Cable and helicopter yarding are expected to have a negligible effect on compaction.

Table 45 displays the acres to be treated using heavy equipment. All the acres proposed for grapple piling are also proposed for tractor yarding. Mitigation is proposed to prohibit grapple piling on soils with a high compaction potential.

Table 45. Acres of treatments most likely to cause soil compaction by alternative.

Treatments	Alternative				
	A	B	C	D	E
Tractor yarding (total acres)	0	2,322	991	1,826	1,198
Tractor yarding proposed on soils identified as having a high compaction potential	0	1,760	870	1,300	770
Grapple piling	0	500	320	320	430

The alternatives were analyzed by comparing the acres of high compaction potential soils proposed for tractor yarding. Units with less than 1 acre of sensitive soil were not listed because the inclusion is likely the result of mapping errors.

Detrimental compaction is held to levels that would meet the Forest Plan standards through the use of mitigation measures and BMPs for all action alternatives. For a list of mitigation measures see Section 2.6 - Mitigation measures. BMPs for the DCEMP are in the Analysis file on file at the Three Rivers Ranger District office.

The assumption is made that mitigation measures and BMPs would be employed and that they are highly effective in keeping detrimental compaction to less than 20 percent of the activity area. This project employed two mitigation strategies. The first strategy is to reuse areas that are already compacted, thereby minimizing the compaction of new areas. Mitigation is included to reuse existing landings and skid trails. In theory, if new activities use only existing skid trails, compaction of the project area would not increase over current levels. Based on observations, the Soil Scientist estimated this mitigation to be about 50 percent effective. The most major skid trails and landings are generally easily recognized. Unfortunately, many old skid trails and landings are located in inappropriate areas, like adjacent

to streams. It is the responsibility of the timber sale administrator to identify the existing trails best suited for reuse. In this project, only a few units have existing skid trail systems and in the units I visited, it appeared reasonable to reuse these trails and landings.

The second strategy is to minimize the compaction of new areas. This is accomplished by a combination of several mitigation measures and BMPs. Mitigations in brief are; (1) designate and limit the number of skid trails and landings; (2) minimize heavy equipment operating off skid trail; (3) when equipment is operating off of designated skid trails, buffer the soil with logging slash; (4) buffer the soil with snow or frozen ground. Additionally, mechanized cutting equipment would be approved on a case-by-case basis. The controls in the Forest Service contract should ensure mechanized cutting equipment does not increase detrimental conditions, primarily compaction, above the limits in the Forest Plan.

Erosion

Surface erosion is not expected to be widespread in this planning area primarily because of the use of mitigation and best management practices. Two activities are most likely to cause accelerated erosion, tractor yarding and prescribed burning.

The following table displays the activities and soils most prone to surface erosion from this proposal. Most of the soils in this planning area have a surface horizon of volcanic ash that provides stable aggregates that are not prone to erosion. Torboy and Wapal soil series lack this protective horizon. These soils are often found on steep slopes such as escarpments. Tractor yarding is proposed on about 160 acres of Torboy and Wapal soils. These soils were mapped in units AE, AF, AS, AT, BD, BF, BG, BO, BQ, BR, BU, BW, BX, BY, DG, DH. In many of the field-checked units, it appeared that the inclusion of these areas in a tractor unit was due to mapping errors. These soils occur on the escarpment on the edge of flat terraces. The tractor yarding is proposed on the terraces, not on the escarpments.

Monitoring on the CNF has seldom found erosion in areas large enough or severe enough to meet the criteria for detrimental surface erosion (Nancy Glines, Forest Soil Scientist, personal observation). The BMPs limit the slopes on which tractors may operate, require revegetation of disturbed areas, require erosion control measures on skid trails, cableways and landings, and require suspension on cable, skyline and helicopter yarding. These measures combine to minimize erosion from harvest units and prevent detrimental surface erosion. Timely implementation of erosion control seeding, as specified in BMPs would help to mitigate the detrimental effects of mechanized harvest equipment.

Displacement

Based on the experience of the CNF Soil Scientist, it is rare to find displacement that is either large enough or severe enough to constitute a detrimental condition under the Forest Plan that is not associated with compaction. Historically, machine piling logging slash with a tractor using a straight blade sometimes caused detrimental displacement. Grapple piling seldom results in detrimental displacement. Therefore displacement is unlikely to occur and will not be analyzed further.

Table 46. Acres of treatments most prone to surface erosion by alternative

Treatments	Alternatives				
	A	B	C	D	E
Tractor yarding (Total)	0	2,322	991	1,826	1,198
Tractor yarding on Torboy and Wapal soil series	0	160	100	100	110
Prescribed fire (Total)	0	1,100	970	1,070	1,000
Prescribed fire on Torboy and Wapal soil series.	0	40	40	40	40

Detrimentally burned soils

The effects of fire on soils are numerous and highly variable depending on the type and intensity of the fire and the amount of surface fuels consumed. Severe burns can cause loss of plant cover, consumption of the organic litter layer, reduction of the macroscopic pore space in the surface soil layers, and short term increases in bulk density. Prescribed and natural fires can also cause accelerated erosion and overland flows due to removal of the soil litter layer, and, or reduced infiltration rates. Soils with coarse sandy surface textures, few coarse fragments, little duff and thin surface ("A") horizons are prone to erosion following fires that remove soil litter. This applies to Torboy and Wapal. Mitigation is included to retain duff through prescribed fire. These mitigation measures are estimated as moderately to highly effective.

Hungerford et al. (1991) suggests that light to moderate intensity burns may have little long-term negative effect on soil microorganisms. Harvey et al. (1994) suggest that, if the forest floor material is not entirely destroyed, the effects of fire on soils are usually minimal. Tiedemann and others (1999) cautions against the adverse effects of prescribed fires that are too intense or too frequent. Several researchers recommend maintaining soil carbon to maintain biologic activity (Harvey et al. 1994; Stark and Hart 1999), and recommend maintaining a lot of heterogeneity in burn area to provide the microorganisms needed to reinvade burned areas (Moldenke 1999).

Mitigation measures and BMPs are included to keep fire intensity low to moderate, limit the aerial extent of higher intensity fire, and retain duff heterogeneity. Detrimentally burned soils are not expected to occur as a result of implementing the alternatives. Restoration, jackpot and underburning on south facing slopes should occur in the spring or when soil moistures are high to prevent damage to the soil surface and retain soil productivity. Jackpot burning and grapple piling and burning can include areas of high intensity, but generally these areas are neither hot enough nor large enough to meet the criteria for detrimentally burned soils.

Soil nutrients and microorganisms

All of the proposed silviculture treatments would only harvest a proportion of the trees available, leaving the larger trees. The total amount of nutrients removed is expected to be small, and the larger material that provides refugia would be left.

Mitigation measures are included to retain large trees and down woody material in sufficient quantities to meet the screens direction. Therefore, none of the alternatives is expected to have an adverse effect on nutrient cycling and site productivity.

None of these alternatives propose to simplify composition. Logging and tree removal alone does not remove the organic material on the forest floor. All alternatives retain the larger trees, which when they die and fall provide the refugia needed especially on drier sites.

While all alternatives are expected to change soil biology, the resulting vegetation (density, species, forest floor) is within the natural variability for these sites, and the micro flora and fauna are expected to be similar to naturally occurring stands with the same vegetative characteristics.

None of the activities proposed would have significant long-term effects on site productivity due to changes in microbiology or nutrient cycling.

New road construction and rock pit development

Road construction and rock pit development remove land from the productive landbase. An estimated 2,500 cubic yards would be needed for the proposed construction and reconstruction of classified roads in the planning area. The Alligator Pit would not be excavated and developed beyond its present boundaries within the Deadman Creek planning area. The use of this resource is common to all alternatives. Recreation specialists from the Three Rivers Ranger District are interested in utilizing the floor of the pit as a parking area for the trail that runs adjacent to the pit. While space is not a concern for use as a parking area, the fact that the material is mined from the pit may create a dangerous conflict during times of pit use. This would be mitigated through the timing of pit activities and coordination with recreation users.

The following table displays the total acres estimated to be removed from the productive landbase due to road construction, reconstruction, and pit development.

Summary of effects by alternative

Methods

The effects of combined treatments on soil productivity were analyzed using A Method for Evaluating Soil Disturbance for Various Timber Harvest Alternatives (Dipert, 1990). The purpose of this method is to integrate the effects of various activities into a single value. This combined value is an estimate of the total percent of the treatment acres that would be detrimentally disturbed. It combines the effects of a combination of treatments on the harvested or treated acres and the effects of road construction.

Table 47. Acres removed from the productive landbase by road construction, reconstruction, and pit development

Area Removed from the Productive Landbase	Alternatives

	A	B	C	D	E
Estimated acres removed from the productive landbase due to classified road construction, reconstruction, and pit development	0	68	5	39	5

For example, a unit of tractor thinning (5 percent) followed by grapple piling (2 percent) and jackpot burning (2 percent) would have a combined value of 9 percent. This is the estimated percentage of the unit that would have detrimental soil condition after the combined treatments are completed. This model adds all the detrimental conditions expected to occur due to logging, fuel treatment, burning, road construction, and rock pit development into a single value of the total acres expected to be detrimentally disturbed by implementation of an alternative. This number is divided by the total acres treated to obtain a percentage of the treated acres that are expected to be detrimentally disturbed.

This model does not address the Forest Plan standards that are applied on an activity area or stand-by-stand basis. It is used as a way of comparing alternatives. In general, alternatives that propose more tractor yarding, grapple piling and road construction have higher levels of detrimental soil conditions than alternatives that emphasize skyline or helicopter yarding and do not construct new roads.

Table 48. Factors used in the model for assessing the total effects of harvest and burning

Treatment	Burning			Grapple Piling	Commercial timber sale -- yarding method		
	Under-burn	Restor-ation	jackpot		Tractor	Cable/ Skyline	Heli-copter
Commercial thinning	2%	2%	2%	2%	5%	2%	2%
Shelterwood	2%	2%	2%	2%	14%	5%	2%
Individual tree selection	2%	2%	2%	2%	5%	2%	2%
Salvage	2%	2%	2%	2%	5%	2%	2%

Alternative A

Two possibilities may occur under the No Action Alternative. The first possibility is that no catastrophic fire(s) would occur within the analysis area and the second assumes that some type of stand replacement fire(s) would occur. The prediction of such a fire event is beyond the scope of this analysis.

Without fire, erosion processes would not change over existing levels because the amount of vegetative cover remains essentially constant. Existing problem areas like roads that contribute sediment to streams and erosion from cut and fill slopes, would continue to erode at current levels over the short term. Eventually some of these areas would revegetate as they find their natural angle of repose and erosion rates would decrease toward baseline levels. Areas associated with open

roads would probably continue to serve as sediment sources over the long term since funding levels for maintenance continue to decline.

The location, size and intensity of future wildfires are difficult to estimate, though some generalizations can be made. Generally uncontrolled wildfires occur during the driest time of the year, yielding a more intense fire that would occur under prescribed fire conditions. The adverse effects of an intense fire including loss of forest floor material, increased erosion and changes in soil biota, would be more widespread in an uncontrolled wildfire than under a prescribed fire.

After a large catastrophic fire, stream flows may increase as evapotranspiration by trees decreases and induced non-wettability increases the water repellency of soils. Sheet, rill, and gully erosion from upslope soils exposed by extreme burning conditions (steep slopes and heavy concentrations of fuels) would directly increase sediment delivery to streams. Mass wasting (slides, slumps, and debris torrents) may increase in size and frequency. This would further increase sedimentation in streams and wetlands. The impacts of this scenario would indirectly affect downstream users by increasing turbidity and sedimentation levels. Fish habitat would decline as spawning gravels become embedded with fine sediments that decrease the intergravel dissolved oxygen. The magnitude of these changes would depend upon the timing, location, size, and intensity of the fire. However, the impacts would decrease over time as vegetation becomes reestablished.

Alternative B

Overall, about 6 percent of the treated acres may be detrimentally disturbed. The primary cause of disturbance is compaction from ground-based logging systems. Detrimental conditions due to erosion are expected to occur, but they are not expected to be as widespread as those due to compaction. Mitigation is included to minimize accelerated erosion. Some detrimental conditions are expected due to pile burning, but the area affected is expected to be quite small. Because of mitigation, detrimental conditions from prescribed fire and displacement are not expected to occur. All of the proposed treatment areas are expected to meet the Forest Plan standard for detrimental soil conditions; less than 20 percent of the activity area (including roads and landings) is expected to be detrimentally disturbed.

This alternative would construct about 13.9 miles of new classified road. Portion of the proposed road construction occur on highly erosive soils, but most occurs in the Merkel soil series which is not expected to produce an increase in sediment production beyond the second year. There are 0.52 miles of new classified road construction that will cross soil units of moderate to severe erosion potential (Edds loam, 15 to 35 percent slopes) and may be chronic sources of sediment. These occur on proposed segments CCS1 and CDC1. In addition two temporary road segments (TCB1 and TCZ2) are proposed that will cross the same soil series. Proper road design and drainage will minimize the effects of soil erosion on the watershed.

Alternative C

Overall, about 4 percent of the treated acres may be detrimentally disturbed. The primary cause of disturbance is compaction from ground-based logging systems.

Detrimental conditions due to erosion are expected to occur, but they are not expected to be as widespread as those due to compaction. Mitigation is included to minimize accelerated erosion. Some detrimental conditions are expected due to pile burning, but the area affected is expected to be quite small. Because of mitigation, detrimental conditions from prescribed fire and displacement are not expected to occur. All of the proposed treatment areas are expected to meet the Forest Plan standard for detrimental soil conditions.

No classified road construction is proposed under this alternative.

Alternative D

Overall, about 7 percent of the treated acres may be detrimentally disturbed. The primary cause of disturbance is compaction from ground-based logging systems. Detrimental conditions due to erosion are expected to occur, but they are not expected to be as widespread as those due to compaction. Mitigation is included to minimize accelerated erosion. Some detrimental conditions are expected due to pile burning, but the area affected is expected to be quite small. Because of mitigation, detrimental conditions from prescribed fire and displacement are not expected to occur. All of the proposed treatment areas are expected to meet the Forest Plan standard for detrimental soil conditions.

This alternative would construct about 7.5 miles of new classified road, creating 4 new stream crossings. About 0.5 miles of new classified road would cross soil units of moderate to severe erosion potential (Edds loam, 15 to 35 percent slopes) and may be chronic sources of sediment. These occur on proposed segments CCS1 and CDC1. In addition two temporary road segments (TCB1 and TCZ2) are proposed that would cross the same soil series. Proper road design and drainage would minimize the effects of soil erosion on the watershed.

Alternative E

Overall, about 4 percent of the treated acres may be detrimentally disturbed. The primary cause of disturbance is compaction from ground-based logging systems. Detrimental conditions due to erosion are expected to occur, but they are not expected to be as widespread as those due to compaction. Mitigation is included to minimize accelerated erosion. Some detrimental conditions are expected due to pile burning, but the area affected is expected to be quite small. Because of mitigation, detrimental conditions from prescribed fire and displacement are not expected to occur. All of the proposed treatment areas are expected to meet the Forest Plan standard for detrimental soil conditions.

No classified road construction is proposed under this alternative.

4.7.3 Cumulative Effects to Soils

The cumulative impacts of proposed actions on soil resources were evaluated on Forest Service lands within the Deadman Creek watershed. The impacts of past, present, and reasonably foreseeable actions occurring on private lands within the watershed were not included since they do not normally affect soil productivity on federal ownership. Private lands in the watershed are primarily located at the lower elevations and downslope of most national forest areas. Soil compaction, the most common detrimental impact, does not move off-site and therefore will not affect adjacent landowners.

Cumulative effects to national forest soils using past, present, and proposed actions were evaluated using the following criteria:

- **Acres of timber harvest,**
- **Yarding systems,**
- **Prescriptions,**
- **Post-harvest activities,**
- **Miles of road construction**

Past Actions

Most of the cumulative effects to soils will result from compaction (personal observation from monitoring other Forest Service timber sales). Compaction from past activities can last for many years (over several cutting cycles) and result in a cumulative effect when past activities are combined with proposed future activities. The soil effects of other management activities such as prescribed burning and pre-commercial thinning are of shorter duration and usually do not combine to create cumulative effects.

Past timber harvest units that could be affected were identified by two methods. First, maps of the proposed treatment units and known past harvest activities were overlain. Ten proposed units occur in previously harvested units. A qualified field crew examined these units to determine the percent of detrimental compaction. The second analysis was the manual examination of the 1998 and 1995 ortho-photos (aerial photos corrected for distortion and joined together to one large photo) of the Jacknife and Boyds quadrangles. These photos were inspected for highly certain evidence of past logging activity such as landings and obvious skid trails and less certain evidence such as uneven crown closure and openings. Five proposed units showed skid trails indicating past logging, and another showed less certain evidence. Two of these units were examined in the field. A total of 660 acres of proposed harvest areas were identified as likely to have experienced past harvest activities. About 600 acres of this were field reviewed. The amount of existing compaction was low (generally 2 to 6 percent), 118 acres were found to have compaction levels of 10 percent. The identified units with a history of harvest are in all action alternatives.

Present Actions

The cumulative effects of recreation and livestock grazing are negligible on the soil resources at the stand level. Most of the recreation and livestock effects are in riparian areas that are protected by RHCAs (see section 4.7 Fisheries, other disclosures). Therefore, cumulative effects are determined by combining the residual effects of past harvest activities with the proposed actions and known future actions.

Mitigation measures that stipulate the reuse of existing skid trails to the extent possible are also in all action alternatives. With the low levels of existing compaction on previously logged sites, and the implementation of mitigation measures, additional compaction due to the proposed actions should not result in compaction exceeding the Forest Plan standard.

Future Actions

Reasonably foreseeable future actions were also considered during this phase of the analysis. These include:

- **aircrew survival training by the U.S. Air Force.**
- **Wildland Urban Interface (WUI) project to reduce the risk of catastrophic fire.**
- **continued cattle grazing and dispersed recreation.**

No additional timber sales or road construction are proposed by the Forest Service in the Deadman Creek watershed in the next 5 to 10 years. The next entry for timber harvest will probably occur in 20 to 30 years.

Cattle grazing and dispersed recreation were already analyzed in the original Deadman Soils Report. Cattle grazing and dispersed recreation are expected to continue at existing levels of use over the next 5-10 years. No significant cumulative effects were identified for either in the original soils report.

The effects of the survival school training are anticipated to be less than the effects of dispersed recreation. This conclusion is based on personal observations of other survival school training sites (N. Fork of Chewelah Creek) on the national forest. Cumulative effects from these training exercises are anticipated to be very small and undetectable using current soils monitoring techniques. The detrimental soil effects of cattle, recreation, and Air Force training often overlap with the natural effects of wildlife and are often difficult to differentiate.

Site-specific proposals and timelines have not been determined for the WUI project/s in the Deadman watershed, but it will probably be concentrated along the forest boundary adjacent to private lands. WUI projects may include a combination of thinning/pruning (both manually and mechanically) and the use of prescribed fire. It will likely not include construction of additional specified roads, but may result in the removal of commercial wood products. Some proposed harvest units in the Deadman EIS are already located adjacent to private lands. The effects of subsequent WUI activities in these areas may cumulatively affect soil productivity by increasing compaction and displacement especially where mechanical equipment is used. Detrimental burning may also occur in areas of heavy fuel concentrations. Soils monitoring and analysis prior to WUI implementation will determine if additional mitigation measures are warranted. It is possible that current harvest proposals under the Deadman EIS will reduce forest fuels to an acceptable level of risk and cancel the need for WUI in some areas of the watershed.

4.7.4 Other Disclosures

Wet and seasonable wet soils

Wet soils are not suitable for heavy equipment because the structure breaks down and they become muddy. Soil structure is important for air and water and infiltration necessary to support soil processes. Structureless soils are also more prone to overland water flow and subsequent erosion. Shaskit and Gahee are soils mapped within proposed harvest units that are considered wet, and, or seasonally wet. Table 49 shows which alternatives would treat units with Gahee soils. Shaskit soil is mapped as a very minor component (less than 1 acre) in three units (AE, CQ, DP); it appears to be located entirely within the RHCA. In unit DX the area of Shaskit is larger (15 acres) but a large portion is located within the RHCA and would be avoided. Unit DX is common to all action alternatives. Mitigation

measures (#33, 34) limiting harvest activities to periods during which the soils are dry, and the restrictions for harvest in wet areas (INFISH), would prevent negative effects to these soils.

Table 49. Tractor units with high or perched water tables

Soil	Stands	Alternatives				
		Alt A	Alt B	Alt C	Alt D	Alt E
Gahee	AA		X			
	AE		X		X	
	DO		X	X	X	X
	DP		X	X	X	X
	DR		X		X	X
	DS		X			X
	DU		X			X
	DW		X	X	X	
	DX		X	X	X	X
	EC		X	X	X	
	ES		X			
	EX		X			X
	EZ		X		X	
	FP		X			
	FR		X		X	

4.8 Range Management

4.8.1 Issues

Management of grazing by domestic livestock and maintenance of range improvement are guided by project level allotment plans. These plans generally determine grazing practices in such a manner as to protect resource values of forage and non-forage vegetation, water and wildlife in both upland and riparian areas (Forest Plan p. 4-44 to 4-47). Range improvements would be protected under all alternatives, and additional fencing kept to a minimum unless determined to be the only solution for controlling cattle.

The effects of the alternatives to grazing management were identified as an issue during public and internal agency scoping. This was not considered a key issue and was treated similarly for all action alternatives. New road construction and silviculture treatments have the potential to reduce the effectiveness of natural and artificial allotment boundaries. Loss of control of livestock under a management system due to loss of effective allotment or pasture boundaries can impact other resources such as wildlife, fisheries, recreation facilities, sensitive plants, and riparian areas. The effects of grazing on other resources are discussed in Chapter 4 under those affected resources. Mitigations for those potential impacts are listed in section 2.6. The degree to which the alternatives could affect livestock management is discussed in terms of impacts to barriers, and other range structures, and creation of transitory range.

Livestock tend to concentrate on private lands along the county roads, especially the Jackknife Cutoff Road in the Boyds allotment. Currently there are people that are relocating to this rural area. With this influx, there are an increasing number of complaints from private landowners about range cattle use of private property. The private lands are within open range. In open range areas the burden of constructing barriers to livestock is with the private landowners. There is also a recurring problem with livestock using the Deadman pasture of the CC allotment all season long every year. While this use amounts to only about a dozen cow/calf pairs, damage to Deadman Creek aquatic resources is occurring.

4.8.2 Methods

Environmental Assessments (EAs) were conducted and approved, updating allotment plans for Boyds and CC Mountain allotments in 1980 and 1979, respectively. The following analysis relies heavily on these documents, and GIS mapping techniques to determine locations of proposed treatments relative to livestock use and management. Additional on the ground experience and knowledge of the allotment permittees were considered.

4.8.3 Natural Barriers

Allotment and pasture boundaries are designed to use natural barriers where possible to minimize the amount of fence construction and maintenance. However, fencing has been necessary in order to hold livestock on the CC Mountain and Boyds Allotments and within pastures of the CC Mountain Allotment. Past road construction, harvest activity, and recreation trails have reduced the effectiveness of the natural barriers and fences.

Boyds and CC Mountain Allotments

Proposed road construction and harvest units are located throughout the two cattle allotments (Boyds and CC Mountain). These activities could affect natural barriers between allotments, pastures, and lands of mixed ownership. These roads and harvest units are listed in the following table.

Unit GC lies on the administrative boundary between Boyds and CC Mountain allotments. However, natural barriers have been created east of this line due to the dense timber and steep terrain. These natural barriers are functioning as the allotment boundary. The harvest of Unit GC would not affect the management of livestock on these two allotments. No mitigation is necessary.

Units GA, CZ, DC, and DD lie adjacent to private lands and state lands, portions of which are fenced. Harvest of these units would increase the likelihood of livestock entering and leaving NFS lands. Construction of temporary and specified roads to units CZ and DD further complicate the loss of natural barriers between NFS and private or state lands. Under the open range laws, it is the responsibility of the private landowners to fence their property if they do not wish livestock to graze upon their lands. It is also the responsibility of livestock owners to keep livestock off the National Forest unless permitted under a National Forest grazing permit.

Table 50. Roads and harvest units affecting natural range barriers by alternative

LOCATION and ACTIVITY	Alt A	Alt B	Alt C	Alt D	Alt E

LOCATION and ACTIVITY	Alt A	Alt B	Alt C	Alt D	Alt E
Between Boyds and CC Mountain Allotments					
Unit GC		X	X	X	X
Between Boyds Allotment and Private Lands					
Units GA		X	X	X	X
Units CZ, DC, and DD		X	X	X	X
Temporary road #1 to unit CZ		X	X	X	X
Temporary road #2 to unit CZ		X		X	
Specified road to unit DD		X		X	
Between Pastures in CC Mountain Allotment					
Units DA, DF, DV, DK, CY, CV, CW, CX		X	X	X	X
Units FO, FH, FI, FG, FN, BL, FE, FD		X			part

The block of harvest units, DA, DF, DV, DK, CY, CV, CW, and CX, lies across a pasture boundary between the Betty and the CC pastures of the CC Mountain Allotment. Past harvest in the Bailey timber sale created avenues for livestock to pass between these two pastures. The harvest of this block of units would open up this area, creating skid trails and other potential corridors between the transportation systems on CC Mountain and in the North Fork Deadman drainage. It is expected that livestock would readily move through this area from one pasture and into the adjacent pasture, making it difficult to use the pasture rotation system. Mitigation would be necessary because these activities are expected to increase livestock movement between these pastures **(see mitigation measures 67, 68, and 69, Chapter 2).**

The block of harvest units, FH, FI, FG, FN, FO, BL, FE, and FD lies across boundaries of Betty, CC, and Mack pastures. This block does not tie together past harvest and road systems, so is less likely to draw livestock from one pasture into the next. If livestock do move across pasture boundaries in this block, it is likely to be from the Mack pasture back into the CC pasture. Mitigation may be necessary (**see mitigation measures 67, 68, and 69, Chapter 2).**

It is anticipated that most proposed new road construction or harvest may create new opportunities for access to streams and riparian zones by livestock. However, not all stream crossings would be avoided under all alternatives for this project. For further discussion of effects on streams refer to the sections on effects to Hydrology and Fisheries earlier in this chapter.

4.8.4 Range Structures

Harvest activities and road construction could affect water developments and allotment fences. These harvest units and roads are identified in Table 51.

Several sections of fence between the CC Mountain Allotment and the Boyds Allotment lie adjacent to harvest units CS, CU, and DC. Part of this fence line relies on natural barriers, either timber or terrain. Harvest of these units may affect the utility of this fence if gaps are created between the fence and natural barriers. This may require mitigation. Temporary roads YCU1 and TCU2 to unit CU are planned to cross this same fence line, which may diminish the effectiveness of this fence**. A mitigation measure is included in all alternatives to prevent movement of cattle between allotments during project implementation.**

Table 51. Range structures affected by harvests and roads

AFFECTED STRUCTURE and ACTIVITY	Alt A	Alt B	Alt C	Alt D	Alt E
CC Mountain/Boyds Fence					
Units CS, CU, and DC		X	X	X	X
Temporary roads #1 & #2 to unit CU		X	X	X	X
CC Mountain Pasture Fences					
Units BD and BE		X	X	X	X
Swamp Spring Development		X	X	X	X
CC Spring Development		X	X	X	X
Bear Wallow Spring Development		X	X	X	X
Dipper Spring Development		X	X	X	X
Ridge (Bernice) Spring Development		X	X	X	X

.

There are cattleguards and drift fences adjacent to harvest units BD and BE. These cattleguards and fences are part of the boundary between the CC pasture and the Mack pasture. This boundary was impacted by the Bailey Timber Sale and may be further impacted by the harvest of these two units. This may require mitigation if the timber sale activities increase the movement of livestock between pastures or damage fences. **Mitigation measure aimed at holding livestock on designated pastures and allotments are included for all action alternatives**.

No effects to water developments are expected. However, five water developments in the CC Mountain Allotment lie within or immediately adjacent to harvest units, DW, BV, BU, BT, BO, CP, and BH. These water developments are at risk from the felling of trees directly on the structure or fence, from the skidding of trees adjacent to the structure or fence, and from accidental damage from equipment. Indirect affects may occur if the harvest activity changes the hydrology of the spring itself. If timber sale activities directly affect water developments, mitigation is required in the form of repair or replacement

4.8.5 Transitory Range

Proposed harvests have the potential to produce transitory range for livestock and wildlife use. Transitory range is generally created by clearcut, shelterwood, and seedtree harvests. Sanitation cuts have the potential to provide forage depending upon the amount of trees removed. Uneven-aged management, such as single tree selection, may provide forage depending upon the site, existing vegetation, existing total tree volume, and volume to be harvested. Commercial and precommercial thinnings are unlikely to create additional transitory range and will not be considered in the analysis of transitory range.

The following table displays the potential Animal Unit Months (AUMs) of transitory range that may be created in the Boyds Allotment and the CC Mountain Allotment.

Table 52. Animal unit months of transitory range created

HARVEST PRESCRIPTION	Alt A	Alt B	Alt C	Alt D	Alt E
Shelterwood	0	49	0	0	34

Single tree selection	0	23	12	13	15
Sanitation/Shelterwood	0	61	52	61	61
Total	0	133	64	74	110

4.8.6 Summary of Effects by Alternatives

Alternative A

There would be no effects on existing natural barriers or improvements above existing condition. No new transitory range would be created and existing transitory range would continue to decline.

Alternative B

This alternative would have the greatest impact to natural barriers between allotments, pastures, and private lands. Allotment and pasture fences would be affected, and water developments could be affected. The greatest amount of transitory range, 133 AUMs, would be created. There would be short-term benefits to the Boyds Allotment by the creation of 50 AUMs of transitory range. There would be no increase in transitory range in the Deadman pasture of the CC Mountain Allotment. There would be 78 AUMs of transitory range created in CC, Betty, and Mack pastures of the CC Mountain Allotment.

Alternative C

The impacts to natural barriers would be slightly less than under Alternative B. Allotment and pasture fences would be affected. Water developments could be affected. The least amount of transitory range, 64 AUMs, would be created. There would be short-term benefits to the Boyds Allotment by creating additional transitory range. There would be no increase in transitory range in the Deadman, CC, Betty, and Mack pastures of the CC Mountain Allotment.

Alternative D

This alternative would have the least impact to natural barriers between allotments, pastures, and private lands. Allotment and pasture fences would be affected. Water developments could be affected. Slightly more transitory range, 74 AUMs, would be created than under Alternative C. There would be short-term benefits to the Boyds Allotment by creating additional transitory range. There would be no increase in transitory range in the Deadman pasture of the CC Mountain Allotment. There would be 19 AUMs of transitory range created in the CC, Betty, and Mack pastures of the CC Mountain Allotment.

Alternative E

This alternative would impact natural barriers slightly more than Alternative D. Allotment and pasture fences would be affected. Water developments could be affected. This alternative creates more transitory range, at 110 AUMs, than Alternative D and less than Alternative B. There would be short-term benefits to the Boyds Allotment by the creation of additional transitory range. There would be no increase in AUMs in the Deadman pasture of the CC Mountain Allotment. There would be approximately 55 AUMs of transitory range created in the CC, Betty, and Mack pastures of the CC Mountain Allotment.

4.9 Scenery and Recreation

4.9.1 Introduction

While it is not possible to meet all resource objectives, while addressing all of the public concerns within the Deadman Planning Area, progress can be made towards providing a sustainable forested landscape that allows for the previously discussed opportunities to view and recreate within a natural appearing landscape.

Within the Management Area 3A along Deadman Creek Road, there are opportunities to reduce overstocked stands and open up views of the unroaded forested slopes and rocky outcrops. There are also opportunities to provide dispersed camping locations where they would not conflict with riparian objectives.

The major portion of land designated as Management Area 5 within the Planning Area is viewed from either the Kettle Crest Trail (#13), which is outside of the Planning Area, the King/Mack mountain area, or the Deadman Creek Road. Large openings would be unacceptable, but there are opportunities to move the stands towards a more resilient composition. Harvest openings that mimic the size and shape of natural openings, or broad natural appearing thinnings that vary the stand density relative to aspect and terrain, would move the stands towards an uneven-aged landscape pattern more resistant to infestation and stand replacing fire.

The management allocations attributed to a Recreation and Scenery management emphasis for the Deadman Timber Sale planning area are in Table 53.

Table 53. Management areas in Deadman project where visuals are a concern

Management Area	Emphasis	Total Acres Within Planning Area	Activity Proposed Under this Analysis on All or Part of the Following Acres
3A	Recreation	2057	248
5	Scenic/Timber	3137	175
6	Scenic/Winter Range	92	0
10	Semi-Primitive, Motorized Recreation	3007	0
11	Semi-Primitive, Non-Motorized Recreation	4164	0

4.9.2 Analysis of Effects upon Scenic Resources

Concern for the quality of the viewed landscape was determined through an evaluation of the area "seen" from travelways and viewing locations of importance to the public.

Seen area

Views from main travel routes (roads and trails) as well as key viewing locations (interior and exterior to the planning area) were reviewed and analyzed. This included analysis of the potential seen area using Forest Plan Visibility Inventory overlays done from identified Sensitivity Level I and II sites and key viewing locations, 3D projections in ARCINFO, field verification and slope maps.

The three sensitivity levels for identifying the different levels of concern rank as follows: Level I, Highest Sensitivity; Level II, Average/Moderate Sensitivity; and Level III, Lowest Sensitivity.

The travel routes (roads and trails) and viewing locations used to analyze the Deadman Planning Area, were identified during the Forest planning process, and are listed in Table 54, as well as the Sensitivity Level associated with that viewing location.

Table 54. Travel routes and viewing locations

Sensitivity Level I Roads and Trails	Sensitivity Level II Roads and Trails	Viewpoints and Viewing Locations
Hwy. 395	Deadman Creek Rd. (9565 and CR 460)	Trout Lake Area
Hwy. 25	Hoodoo Canyon Trl. (#17)	Cabin-Trio Area
Kettle Crest Trl. (#13)	Albian Hill Rd. (2030 and 6110)	Merkel Canyon
Trout Lake Rd. (020)	Old North Fork Deadman Rd. (320)	Davis Lake Area
		Mack Mtn. Trl.
		Twin Sisters Trl.

Unit discussion

Not all of the Travel Routes and Viewing Locations analyzed resulted in views of proposed units. The following table displays those units that have the potential to be seen, all or in part, from the various travel routes and viewing locations. This is based on computer simulation that models this seen area by the distance zones of foreground (fg), middleground (mg), and background (bg)(fg 0 to 1/2 mile, mg 1/2 mile to 3-5 mile, and bg 3-5 mile to infinity). The dense vegetative screening and rolling terrain of the Deadman Planning Area make it difficult to predict the actual situation, and therefore, the information is used here to determine "potential" to be seen. The information can then be used during unit layout to achieve desired scenery objectives. The units are listed by the Management Area they fall within (where the unit falls within two Management Areas, it is listed under both).

Analyzing potentially seen activities by slope classification is important, primarily from the standpoint that introducing the elements of line and color can have long term visual impacts on the landscape. Certain percent slope breaks represent where noticeable differences could occur, especially where the proposed crown closure is less than 60 percent. Those differences are described as follows:

0 – 35 Percent - Generally tractor harvest units, visual concerns can be mitigated. Proposed crown closure is less of a factor.

35 - 60 Percent - Skyline or helicopter units, visual concerns difficult to mitigate but much can be done through careful road and skyline corridor layout. Proposed crown closure becomes an important factor.

Over 60 Percent - Skyline or helicopter units, visual concerns regarding roads cannot be

mitigated, and skyline corridor mitigation is difficult. Proposed crown closure is critical to mitigation.

Table 55. List of proposed units by viewing location/travel route, by management area

TRAVELWAY OR VIEWING LOCATION	DISTANCE ZONE	MA 3A	MA 5	MA 6	MA 7	MA 8
Highway 395 (Sensitivity Level I)	bg		DL DO			
State Hwy. 25 (Sensitivity Level I)	No Proposed Units are Seen					
Kettle Crest Trail #13 (Sensitivity Level I)	mg	AA AE AF	AA AE AF			
Trout Lake Rd. 020 and Recreation Area (Sensitivity Level I)	No Proposed Units are Seen					
Deadman Creek Rd. 9565 and C.R. 460 (Sensitivity Level II)	fg	AA AE AF AJ AS AT BE BF BG CA CE CL CN CO CS	AA AE AF		AJ AS AX BD BF BG BH BI BJ CB CF CL CN CO	CS GA
	mg		AF CK		AB AG AM AP AQ AR AU AV AW AZ BJ BK BL BO BP BQ BR BS BT BX CG CJ CL CP FD FG FN GC	
	bg				BU BV BW BY CT CV CW CX CY	
Hoodoo Canyon Trail #17 (Sensitivity Level II)	fg	CA			CB CF CG	
	mg				BO BU BV BW BX BY CP CT DC DD	CZ DD
Albian Hill Rd. 2030 and 6110 (Sensitivity Level II)	No Proposed Units are Seen					
North Fork Deadman Rd. 320 (Sensitivity Level II)	fg	CQ CU			CG CQ CR DA DB DV	CU
	mg	CL	CK		CG CJ CK CL CV CY DK FD FG FN FP GC	CZ DD
Cabin-Trio Area	bg				CT CW CX FD FE FG FH FN FT	
Merkel Canyon	fg		DC			

TRAVELWAY OR VIEWING LOCATION	DISTANCE ZONE	MA 3A	MA 5	MA 6	MA 7	MA 8
Davis Lake Area (Sensitivity Level I)	No Proposed Units are Seen					
Twin Sisters Trail	mg	DC	DC		BL CW CY DA DB DF DK DV EH EK EL ES EZ FG FH FI FN FP FR	
Mack Mountain Trail	fg	BE BF			AZ BF BG BH BI BK BN	
	mg	AA AE AF AJ AS AT	AA AE AF		AB AG AJ AM AP AQ AR AS AU AV AW AX BJ BK BO BP BQ BR BS BT BU BV BY CB CG CJ CK CL CP EH EI EJ EK	

Proposed treatment units were laid over the Slope Classification Map, and analyzed by the Recreation and scenic allocations within the planning area (MA 3A, 5, and 6). Again, this is a consideration during unit layout and determinations on where tree stands may remain in denser clumps to achieve scenery management objectives by screening road cut or fill slopes.

In the following table, the units that contain road construction having the potential to be seen from sensitive viewing locations or travel routes are in *italics*.

The National Environmental Policy Act requires that key issues identified during the public scoping process be analyzed. The possible effect of proposed activities on roadless areas was brought into this analysis. Because of the relationship between a roadless condition and the landscape character of the Deadman Planning Area, there is an effect from both action and no-action.

Within Management Areas 10 and 11, there are limited opportunities to address stand health. Natural processes are expected to dictate, and in the Deadman Planning Area this presents challenges for management of the MA7 where that designation lies adjacent to MA 10 or 11. For example, the broad slopes of the previously described *Deadman Creek and Hoodoo Canyon* area are made up of a mix of MA 5, 7, and 11. These slopes are not viewed as distinctly different areas of the landscape, but instead as part of a long forested ridge, with rocky outcrops and folds in the terrain. A similar conflict occurs in the headwaters of North Fork Deadman Creek where Management Areas 7, 5, 1, and 10 lie in an area dominated by dense stands of lodgepole pine spreading to a sparser vegetated ridgeline. The area is actually viewed as a whole, and current Forest Plan direction limits management options here that could address a desired landscape character respective of the total *Twin Sisters and Mack Mountain* area.

Table 56. List of potentially seen units by slope classification and management area

SLOPE CLASSIFICATION	MA 3A	MA 5	MA 6	MA 7	MA 8
0 - 35 %	***AA, AE, AF, AT***, BE, BF, BG, CA, CE, ***CN,*** CO, ***CQ, CS, DC***	***AA, AE, AF,*** DC, DL, DO		AM, ***AQ***, AR, AU, AV, ***AX,*** BD, BF, BG, ***BJ, BK, BO, BP***, BR, BS, ***BT, BU, BV, BW***, BX, BY, CF, ***CN***, ***CO, CP, CQ,*** CT ***,DA, DB, DC, DD, DF, DK***, EJ, EK, EL, **ES, EZ**, FI, ***FP, FR***	***CS, CZ, DD***, GA,
35 - 60 %	AJ, ***AS,***CU	***CK***		**AB, AG,** AJ, ***AP, AS***, AW, AZ, BH, ***BI, BL***, BN, ***BQ, CG, CJ***, CR, CV, CW, CX, CY, DE, DQ, DS, ***DV,*** DW, EB, ED, EF, ***EH***, EI, EN, FD, FE, FI, ***FG***, FH, ***FN,*** GC	CU
Over 60 %	CL			AG, CL	

Effects on scenery under Alternative A

Under this alternative, no timber harvest or prescribed fires will result from this planning effort. Fire suppression policy will not change.

There will be no short term effects to the scenic condition of the area as a result of this alternative. Implementation of this alternative will result in the deferral of activities which could improve the resiliency of the landscape. Infestations and stand replacing fires could create landscape character changes, that would alter the human use patterns, and potentially the scenic value placed on the area, until regrowth.

There will be no direct effects to the important recreation and scenic Management Areas within the planning area. Opportunities to resolve conflicts between recreation use and resource damage occurring at identified locations along streams, will be deferred until another time.

Effects on scenery under Alternatives B, C, D, or E

Under any of the action alternatives, the overall appearance of the planning area will still be of natural appearing forest lands, with some undisturbed broad slopes typical of the landscape character for the area. The activity proposed under any of the action alternatives is not going to heavily alter the Existing Landscape Character or detract from how the area is seen or used, but Alternatives C and D do leave more of these slopes and ridges undisturbed and in a natural condition. Alternative E treats some of these stands without altering the roadless condition. Alternative B risks altering the landscape character in site specific locations, such as CC Mountain and the north facing slopes above Deadman Creek.

In the areas proposed for prescribed burning, vegetative recovery is expected to occur within 1-2 years and it is anticipated that, over the long-term, the visual condition of the area from a vegetative standpoint will improve as a result of the burning program.

None of the units proposed in management areas 7 or 8 have the potential to be seen from a

Sensitivity Level I travel route or viewing location. Generally, activity proposed in management areas 3A and 5 will have a positive effect on user experience and opportunities.

The following alternative discussion will focus on how proposed activities would directly affect the Sensitivity Level I and II travelways. **Differences in alternatives are discussed relative to the site specific landscape characterizations and possible impacts from proposed roading.**

Highway 395 - Sensitivity Level I

Under all action alternatives, units DL and DO will treat a small portion of the area viewed in background from the Highway as you travel west from Colville. No roads will be visible and the proposed thinning of these units will meet the Forest Plan Visual Quality Objectives and maintain the landscape character.

Kettle Crest Trail #13 - Sensitivity Level I

Under Alternative B, units AA, AE, and AF will be treated through individual-tree selection. The textural change as viewed from the trail will be compatible with the Forest Plan Visual Quality Objectives and maintain the landscape character.

Alternatives C and E do not contain these units.

Alternative D contains only unit AE.

Deadman Creek Road 9565 and County Route 460 - Sensitivity Level II

Under Alternative B, most of the units proposed in MA 3A and 5 are visible from this road. Unit location and design will address the needs of the recreating public and open views to the positive features of the landscape, while increasing opportunities for dispersed camping away from riparian zones. The proposed thinnings will meet the Forest Plan Visual Quality Objectives and maintain the landscape character. Specified road construction within or accessing units AG, AP, BQ, BL, CG, CJ, FG, and FN is of concern due to the steep terrain. **The introduction of line and color contrast into the landscape can easily occur on steeper slopes, where soils have the chance to ravel and slump**.

Under Alternative D, the road accessing Unit CG is still of concern, but alternatives C and E do not propose any road construction.

Hoodoo Canyon Trail #17 - Sensitivity Level II

Proposed units are viewed the same under all alternatives as you travel north along the trail. The proposed thinnings will meet the Forest Plan Visual Quality Objectives and maintain the landscape character. Under alternatives B and D, the specified road construction and harvesting will have the greatest potential to be viewed from the trail.

North Fork Deadman Road 320 - Sensitivity Level II

Under Alternative B, units FN, FG, FP, and the roads accessing these units have a high potential to be seen from the road. Because of the steep terrain, the introduction of line and color contrast into the landscape can easily occur. The visible thinnings are in Management Area 7 (VQO

Modification) and will meet the Forest Plan Visual Quality Objectives and maintain the landscape character.

Alternatives C, D, and E do not contain the units of primary concern from a visible roading perspective.

4.9.3 Analysis of Effects upon Recreation

Effects on recreation under Alternative A

There will be no change to the recreation use patterns in the Deadman Creek area if this project is not implemented. The roads that are open will continue to be open. Any increase in recreation would be a result of an upswing in overall recreation usage in the Stevens/Ferry County Area and not related to any action alternative. Access for hunters, berry-pickers, and campers and other recreationists would remain the same.

Effects of road construction on recreation - Alternatives B or D

The largest potential for change of effects to recreation comes from proposed road construction, particularly specified roads. All newly constructed specified roads will be closed, either by earthen berm, or by existing gates, after management activities authorized for this project cease. These roads will remain a part of the Colville National Forest road system in closed status. Construction of specified roads in the Deadman Project Area will result in wide pathways being extended into areas where they did not previously exist. Although all proposed specified roads would be closed, closed roadways still may be accessible by some ATV or snowmobile operators who carve out trails around closures. Most certainly, wildlife, cattle, hunters, and hikers will be able to access these newly constructed roads. The earthen closures, which include pits, large boulders, and large woody debris spread out along hundreds of feet after the initial closure berm, deter most operators, who are content to travel open roads. Because new specified roads will be closed, new landing sites along newly constructed roads created during timber harvest operations are highly unlikely to become dispersed recreation sites because of poor access. See wildlife report for effects upon animals and plants.

Effects of temporary road construction on recreation - Alternatives B, C, D, or E

Temporary roads will be constructed under all action alternatives. These roads would be closed and obliterated following use in harvesting operations. Obliteration includes pulling roadways back to slope, seeding with grass, and placing debris over the length of the roadway. These roads would not become part of the Colville National Forest transportation system. Because of the obliteration and the debris pulled back into these areas, the only increase in use of these trails would be by wildlife, and possibly the occasional hunter. Cattle and hikers could find easier places to walk. See wildlife report for effects upon animals and plants.

Effects of road reconstruction on recreation - Alternatives B, C, D, or E

All action alternatives would require road reconstruction. The reasons for this reconstruction is to provide for safe travel along routes proposed for log hauling, to fix design problems in existing roads, and to reduce sedimentation by adding or

repairing culverts, adding drain dips, and rocking areas adjacent to flowing water. The recreating public would benefit from this work in terms of improved and safer access on existing system roads. These improvements are not of the magnitude to draw in additional recreationists simply because of the improvements. Roads will not be upgraded in Class as a result of this reconstruction.

The effects of opening up currently closed roads during reconstruction are very temporary in nature. The intent is to not establish public use on a new road or by opening one up that was previously closed. In most cases these roads would be opened just prior to timber harvest activities and closed immediately after, except in cases where there is firewood in cull decks available to the public. In that case the road could remain open for up to a year, but then closed. Effects from hunters, berry pickers, firewood cutters, and other recreationists would be temporary.

Effects of harvesting on recreation - Alternatives B, C, D, or E

There will be no change to the setting or use patterns within the acres managed for Semi-Primitive Motorized or Non-Motorized experience. Since projections of occupancy within the Roaded Natural MA3A during previous analysis of the area (USAF permit renewal) did not indicate use levels close to threshold, it is unlikely that use of any new dispersed sites will exceed the capability of the area.

Recreation users may be displaced from areas of active timber harvest due to safety concerns or may choose themselves to be elsewhere because of the noise and increased traffic associated with logging. Prohibition of log haul during weekends and holidays should reduce the number of recreation users displaced by eliminating increases in noise and traffic during the period of highest recreation use.

Harvest units along existing open roads may change some of the recreation opportunities in the Project Planning Area. In some stands where huckleberries are present, there may be an increase in plant vigor and huckleberry production due to opening up of stands to allow more sunlight into the forest floor. This could cause an increase in recreation visitors during berry-picking months (late June, and July). Few of the prescriptions along open roadways will open up stands beyond the commercial thinning prescription (80-100) residual stems. However, increased visible distance, particularly over the first few years after treatment, may attract more hunters to the area. These numbers are not expected to be substantial. On occasions, harvest treatments open up stands to the point that receptionists will venture into once-dense stands in ATVs or snowmobiles. Again, the type of prescriptions that are proposed along open roads are not expected to open these stands to the degree that appreciable numbers of hunters will be newly drawn to the area.

An additional effect is that newly created landings sometimes become dispersed recreation sites. This has some potential positive and negative effects. A few landings have residue piles left in tact for wildlife use, and where there is a noticeable amount of firewood available in the residue piles, it is left for woodcutters. Most landings are blocked to the public, but a few, by necessity are along used travelways, where the public may find ways to access the landings, and often it is impossible to barricade. The possibility of additional available dispersed recreation sites is compatible with use in the Deadman Creek

Watershed, particularly since most of the dispersed sites lay unused during the majority of the year. Peak usage comes during summer weekends, particularly Memorial Day, the Fourth of July, and Labor Day, as well as major hunting seasons. However, the creation of these sites will be monitored to insure no setting inconsistencies affecting user experience are created and that other resource management objectives are met. If a new landing begins to get use and it is not in a desirable location from a resource management perspective, additional steps will be taken to restore the site to a natural condition using boulders and other debris, so that it is not available as a camping site.

4.9.4 Mitigation Measures Relating to Recreation and Visuals

These measures can be found in Chapter 2, Section 2.6 Mitigation Measures.

4.9.5 Suggestions and Opportunities

Rockpits - Preserve any oversize rock generated during pit development for use as barriers or on rehabilitation projects.

4.9.6 Cumulative Effects of Implementing Alternatives B, C, D, or E

Cumulative effects to recreation and scenery may include effects from the recently logged Nancy Timber Sale and development on private land.

Cumulative effects of specified road construction

No specified roads were constructed under the Nancy Timber Sale, parts of which are in the Deadman Creek watershed. Therefore, there was no increase in visitors based on construction of new roads due to this recent government action. New private roads were constructed on private land adjacent to National Forest System land near proposed unit CZ in the past 5 years. There have been a few new roads put in to reach new resident sites on other private landholdings within the watershed in the past 5 years. This increase in private roads is not expected to have an effect on outdoor recreation on National Forest Lands within the watershed, as most of the recreation begins on major feeder roads, which take recreationists miles inside the Forest Boundary, where recreation can occur with little fear of accidentally trespassing on private land. Private roads within the watershed are well posted to prevent use by the public. There is little need to trespass when many established roads already reach the Forest Boundary and public lands.

Cumulative effects of temporary road construction

The number and amount of temporary road constructed on other landownerships within the Project Planning Area is unknown. There is little need to create temporary roads by private individuals. Some temporary roads may have been created by private companies or on State of Washington Lands, of which there are several parcels in the watershed. Creation of these roads has not and is not expected to contribute in any noteworthy amount to the amount of outdoor recreation.

Cumulative effects of road reconstruction

Other than the US Forest Service and Ferry County, the only other known road

reconstruction in the watershed in the past 5 years took place on private land south of unit CZ. Recreation use of this road is unknown. Reconstruction generally can improve travel and safety attributes of existing roads but is unlikely to cause an increase in visitation to the watershed.

Cumulative effects of harvesting

The Nancy Timber sale was recently completed within the Nancy Creek and Deadman Creek watersheds. Nancy Creek shares a common ridge system with Deadman Creek and empties into the Columbia River several miles downstream from Deadman Creek. Sixty-three percent, or 223 acres of the Nancy Timber Sale were in the lower part of the Deadman Creek watershed. The prescriptions included commercial thinning, individual tree selection, and sanitation treatments. Only the sanitation treatment, which was visible from a county road, resulted in stands being opened up to a point that recreationists might enter the stand, when they wouldn't have before. That one stand, Nancy Unit 3, is bordered on three sides by private land. It receives very little recreational use. A variety of other prescriptions were used on private land in the watershed, but the cumulative effect of those treatments would have little effect upon recreation on National Forest System Land.

Overall cumulative effects

No loop routes would be created by proposed treatments under the Deadman Creek Ecosystem Management Projects. No additional grooming of snow routes will take place as a result of proposed treatments. Any increase in recreation use is likely a reflection of overall increases in outdoor recreation in Northeastern Washington. The rate of increase of visitation in the Deadman Project Area is very likely to be directly proportional to any overall increase in visitation in the Ferry/Stevens County area. The Colville National Forest is monitoring current recreation use levels through participation in the National Visitor Use Monitoring survey. This is a year-round random survey of recreation activities across the Forest. Information gathered through this survey will be utilized in National and Forest planning efforts. It is not anticipated that results of the survey would alter this analysis, but rather it is expected to confirm the observed use levels and patterns.

The Albion Hill Road (FS2030) is outside the Deadman Watershed and Project planning area. Use of this road by snowmobiles is known in the wintertime, with the vast majority of use being in and back out to the parking area near Highway 20, or occasionally across to the Boulder-Deer Forest Highway. Two spur trails (King Mack Mountain and Twin Sisters received lesser traffic, and again are in and out trails, with the snowmobiles returning to the Albion Hill road and back to the parking area. Few, if any, try to make a loop through the Deadman Creek watershed. The proposed harvest and road construction activities proposed in the Deadman Project will have little effect upon this use pattern. Units are not in position where it would open a new throughway for snowmobile use out one of the trail systems. New roads to be constructed are generally short spur roads, with no "loop" possibilities, and will be closed by berms and pits after harvest. With no road maintenance applied after closure, these roads tend to close back over with brush and downed trees fairly soon.

Summary

Due to the slow growth in recreation activity within the planning area, and that no changes in the existing recreational use patterns are proposed by activities in the Deadman Creek Ecosystem Management Projects Environmental Impact Statement, the effect of these activities is consistent with Forest Plan standards and guidelines.

Since the proposed vegetation treatment activities are oriented towards providing a sustainable forested landscape and will create opportunities to view and recreate within a natural appearing setting, the effect of these activities is consistent with current scenery management goals.

4.10 Heritage Resources

4.10.1 Alternative A, No Action

There would be no change from the current condition. Heritage sites would continue to gradually deteriorate over time, subject primarily to natural forces.

4.10.2 Alternatives B, C, D and E

There are eight heritage sites located within or adjacent to harvest units in all action alternatives.

Project activities have the potential to damage or destroy these six sites directly, by heavy machinery, falling trees, road building, etc., or indirectly as a result of discovery and increased access to each site.

Management class 3 sites must be protected and preserved as is. There are two protection options available. Either provisions must be made to avoid direct impacts to the site during the planned activities (e.g. delete entire unit or a sufficient amount of the unit to avoid impacts to the site) or if it is determined this is not a viable option, a plan for mitigating the adverse effects to the site must be developed with the Heritage staff. There are several mitigation options that can be explored including, research, interpretation, public education, site enhancement or a combination of these and other options. The State Historic Preservation Office (SHPO) concurs with these actions.

Having a buffer left around each one of the sites will protect the management class 3 sites. The size of the buffer will vary based on site-specific circumstances dealing with yarding methods and site vulnerability. With the buffering, each site will be protected. This will reduce the volume available in each unit by a small amount, and may influence how the logs are yarded adjacent to each site. Logging on snow is also an effective mitigation. These mitigation measures are common to the action alternatives, therefore the heritage resource will not be impacted.

4.11 Transportation

4.11.1 Proposed Road Construction and Reconstruction

Table 57 shows the kilometers and average costs of Forest Service roads to be constructed and reconstructed under each alternative. It should be noted that these are planning estimates and are subject to change during project layout and sale prep.

Table 57. Road construction and reconstruction by alternative20

ALT.	NEW CONST.	LIGHT RECONST.	MEDIUM RECONST.	AVG. CONST.	AVG. RECONST.	TOTAL COST
	mi.(km)	mi.(km)	mi.(km)	$/mi.	$/mi.	$/mbf
B	13.9(22.4)	7.1(11.4)	6.8(11.0)	$35,330	$9,795	$57.68
C	0.0(0.0)	5.8(9.3)	3.1(5.0)	$0.00	$7,349	$30.59
D	7.2(12.1)	6.5(10.4)	7.4(10.8)	$30,908	$9,801	$49.33
E	0.0(0.0)	6.4(10.3)	2.2(3.5)	$0.00	$9,782	$35.84

Specified road construction

All roads proposed to be constructed will be traffic service level D, functional class - local, with an intermittent service life unless otherwise noted. Design vehicle for all roads will be a log truck. The critical vehicle will either be log truck or yarder depending on the logging system that is planned for use for treatment of the units the road is accessing. All new construction will be closed to traffic after harvest, administrative, and firewood removal unless otherwise noted on the Road Management Objectives (RMOs), **completed by the IDT after the Deciding Official makes a decision of which alternative to implement.**

Road design and location will be such that the roads will have a “free-flowing” alignment and “rolling” grades. The goal of these strategies is for the road to match existing topography thus minimizing excavation. Rolling drain dips will be used to shed water off of roadbed at regular intervals to minimize erosion from roadbed.

All planned specified construction will be re-evaluated at time of layout as to its need to be built as “specified” or “temporary”. District specialist input will be sought for help in this decision making process. See section ***Alternative Totals and Average Costs*** for an estimate of total miles of construction and reconstruction for each alternative.

Road reconstruction

In preparation for proposed activities in the Deadman Creek Ecosystem Management Projects, existing National Forest System roads were analyzed for compliance with stated Road Management Objectives (RMOs) for each individual road. Included in that analysis was concerns over public safety, road widths commensurate with target equipment that would travel over the road, sight distances along major travelways, and insurance that proper drainage design and structures were in place.

Reconstruction definitions

- Light - Occasional drain dip construction with associated light blading and brushing, which is beyond the scope of prehaul maintenance requirements needed to facilitate commercial haul. The objective of the drain dips is to reduce long-term sedimentation by forcing water to be moved off of the roadbed at regular intervals thus minimizing the distance water can travel

20 Total cost/mbf is the sum of fixed and variable costs. Variable costs are the combined haul and maintenance cost. Fixed costs represent the total estimated construction and reconstruction costs

down the roadway. All Forest Service roads planned for haul will be reviewed on the ground for light reconstruction at time of sale layout.

The roads identified as definitely needing light reconstruction at this time are: 9565820 (1.5 mi., 2.4km), 9565830 (0.6 mi., 1.0 km), 9565832 (0.5 mi., 0.8 km), 9565834 (0.8 mi., 1.3 km), 9565840 (2.5 mi., 4.0 km), 9565160 (0.8 mi., 1.3 km), 9565370 (0.3 mi., 0.5 km)

- Medium - Light reconstruction plus: occasional excavation of cutbank and roadbed for width. Spot rocking of roadbed for erosion control and subgrade strength. Culvert replacement or installation and full width clearing and grubbing of roadbed is also anticipated.
  Roads identified as needing medium reconstruction as the result of preliminary ground verification are:
  9565075 (1.4 mi, 2.3 km), 9565078 (0.7 mi., 1.1 km), 9565079 (0.6 mi., 1.0 km), 9565170 (0.9 mi., 1.5 km), 9565305 (0.3 mi., 0.5 km), 9565310 (0.1 mi., 0.2 km), 9565330 (0.2 mi., 0.3 km), 9565331 (0.7 mi., 1.1km) 9565535 (0.5 mi., 0.8 km), 9565590 (0.9 mi., 1.1 km), and the existing non-system road into Unit AE, which will also require the placement of a temp bridge to cross the upper reaches of Deadman Creek. **This old road template will be assigned a number and brought on to the Transportation Management System for tracking if it is decided at time of layout that there is a future need for this road. Should there be little future need for this road, consideration will be given to treating this as an existing temporary road and obliterated after use**.

- Major - Medium reconstruction plus: Re-alignment of curves with an existing radius less than 50' (15.2 meters), but final centerline is within 40' (10 meters) of the existing centerline. **Full width widening of the road template by excavating the cutbank is needed to accommodate the design vehicle**.

  Note - During field reconnaissance no roads were identified for major reconstruction, but during sale preparation this may change. If so identified, the Road Designer will notify the District Planning Assistance to coordinate any additional NEPA analysis.

Temporary road construction

For each action alternative it is assumed that some temporary roads will be constructed. The term "Temporary" is a Forest Service Timber Sale Contract term used to define those roads planned to be constructed by the timber purchaser for the sole purpose of aiding in the harvest of a specific unit.. The cost of this temporary construction is included in the cost associated with the logging of the unit it accesses. **Temporary roads are designed to be open only for the amount of time needed to harvest the unit. In many cases the entire road template is within the unit boundary. Most of them are open no longer than it takes to log the unit. If units are started but not finished in one entry, generally any temporary roads are closed during the time that the purchaser has his equipment moved away from the unit.** Temporary roads are also closed and obliterated by the purchaser. **When closed, temporary roads are usually brought back to slope where built on sloping ground, and rocks, logs, and other debris are dragged across the**

roadway to discourage use by animals as well as humans. The intention is to minimize the amount of disturbance caused by road construction and then to promptly revegetate with desirable vegetation that will occupy the site. Roads will be surveyed for potential noxious weeds and treated if necessary. By doing these activities the impact of noxious weeds will be minimized. With this type of post-harvest treatment, brush and seedlings typically take over temporary roads shortly after they are closed. It is expected that livestock, wildlife, and a few forest visitors may use the cleared corridor initially, but less and less as brush and trees re-establish on the obliterated roadbed.

The roads that can be considered for temporary construction are those that generally meet the following standards.

1. **Short term, single purpose road needed for one project or resource activity.**
2. **Road will not be used in the next twenty years.**
3. **Difficulty of construction is low with an acceptable level of resource impact. The road has little or no rock blasting, located on flatter side slopes, and no need for tight control of construction or location. No special design standards are needed for construction such as special sediment reduction methods, lowboy access, aggregate surfacing, large culverts/bridges.**
4. **Length under 0.5 miles (0.8 km)**
5. **Road will not be extended in future entries.**

Roads not meeting the above criteria would be constructed as specified roads. A main criteria for determining whether a road will be temporary or specified is its future use. If a road will have future use and/or be extended in future entries then it should be constructed as specified, and maintained in the Transportation Management System, (TMS). Those roads currently planned as temporary construction will be assessed during implementation and its category adjusted as needed, as well as any planned for specified construction may shift to temporary based on field conditions and specialist input provided at time of layout. Any road that shifts from planned temporary construction to specified construction will need to have additional analysis culminating in a change letter signed by the deciding official.

4.11.2 Cost Share Needs

Due to mixed patterns of ownership in some planning areas, it is often advantageous and prudent to utilize existing cooperator roads to access secluded FS timber stands. At this time no opportunities to cost share in road systems have been identified.

4.11.3 Right-of-Way Needs

Two existing roads have been identified as desirable for right-of-way acquisition in the Deadman Project Planning Area. Negotiations with the current landowners have been ongoing, and are not complete. The existing plan proposes roads to insure access, in case these rights-of-way are not finalized. These roads are included in this analysis. If the haul agreement or right-of-way is finalized, the proposed roads will be dropped in the Record of Decision, or by a subsequent change letter.

4.11.4 Sources of Aggregate

Approximately 2,500 cubic yards (cys) of aggregate are needed for spot rocking and placement in drain dips in this planning area. Economical sources for this needed aggregate are very limited in this area. Following is a brief description of the existing pits within a reasonable haul distance of this planning area.

Alligator Ridge #1288 - T37N R35E Sec. 11 SE1/4 SW1/4

This pit is composed of granitic bedrock (tonolite). Access to this existing pit is via 9565822. Currently there is a stockpile of crushed aggregate of about 1,500cys. Additional yardage could be produced here but further development would require the use of a rock crusher. It is likely not to be economically feasible to mobilize a crusher to produce only the additional 1,000 cys needed in the short term for the upcoming planned timber sales. It would also be unreasonable and uneconomical to burden a timber sale solely with the cost of developing and stockpiling enough yardage to justify the mobilization of a rock crusher into this pit. It is recommended that supplemental road maintenance/development funds be sought for this so as not to financially burden the planned timber sales unnecessarily. The pit would not be enlarged as an effect of this Proposed Action.

Mattsen Creek #1318 - T37N R36E Sec. 1 NW1/4 NE1/4

Records for this pit show that it is comprised of glacial till 1' and under in size. Use of this pit will likely require the screening of material to remove the larger component. Access to this pit is by way of road 9500705. This pit may be considered for use on the roads, new and existing, that access timber stands in Units CZ, DC, DD, and DE due to the relatively short haul distance to these units when compared to the haul distances to these units from the Alligator Ridge Pit. The pit will not be enlarged in the project.

4.11.5 Effects of Dust upon Nearby Residents

Depending on alternative, between approximately 2700 and 4700 extra trips would be made up and down the county roads in the area by logging trucks and heavy equipment over a five year period. It would also mean an approximate extra 700 to 1000 trips by pickup/passenger vehicle over a 5 year period. Trips made in the winter or wetter weather would not be a factor in increased dust levels. Given that most of the logging occurs in the dry season when dust is more likely, approximately 1900 to 3300 heavy equipment trips and approximately 500 to 700 pickup trips would be made over a five year period during dry weather. This would amount to an average of 4.75 to 8.25 logging truck trips per work day (week-days) and 1.25 to 1.75 pickup trips per work day. Given that a trip is a round trip, or two passes by a residence, it would mean a logging truck or heavy equipment 9.5 to 16.5 times entering or leaving the sale area per work day July-October for a 5 year period, and a pickup 2.5 to 3.5 times a day entering or leaving the sale area over the same period. Broken into hours and minutes it would mean a logging truck entering or leaving the sale area every ¾ to 1 ¼ hours, and a pickup entering or leaving the sale area every 3 1/6 hour to 4 ¾ hours on average during daylight hours on weekdays during June through October for a five year span. Not all residences would receive the same amount of passes, depending on what county road system along which they reside. The Forest Service has no control over dust created along county roads, and no legal responsibility for dust abatement along county roads

4.11.6 Roads Analysis Results

Identified issues and effects

The following issues and environmental road effects were identified from a combination of public and internal agency scoping. The effects are discussed in more detail under each listed section:

- Construction of new roads in areas that currently do not contain classified roads can disrupt the natural characteristics of solitude, especially for wildlife**. (See Section 4.12.1 Effects Upon Inventoried Roadless Areas and Section 4.12.2 Effects On Areas Greater Than 1,000 Acres Lacking Classified Roads)**

  Actions proposed under the Deadman Creek Ecosystem Management Projects FEIS do not include road construction into any Inventoried Roadless Areas, nor is road construction proposed in areas lacking classified roads greater than 1,000 acres. The limited scale of proposed road obliteration and closures would have little effect on this situation. A Recreation Use Survey will be conducted in 2003. The survey results may help define some user needs. Several local environmental organizations have expressed an interest in areas that lack classified roads for remote recreation. Construction of new roads into areas that presently do not have classified roads is a positive effect for some forest visitors who seek increased access for hunting and other forms of recreation.

- Some roads are located in sensitive or unstable areas and serve as initiation points for landslides, debris flows, and other sources of sediment that degrade aquatic habitat. **(See Section 4.5 Hydrology and Section 4.6 Fisheries)**

  Approximately 2.4 miles of the 9565-320 road below Merkel Canyon has been identified by resource specialists as a source of sedimentation due to the close proximity of this open road to the stream channel of the North Fork of Deadman Creek. This old road is in a poor location; however it provides vehicle access to a unique landscape feature (Merkel Canyon) and several dispersed camp sites. A portion of the sediment contribution from this area is due to cattle use along the road/stream corridor. Closing the road to vehicles will not mitigate the effects of cattle. ATV's will also probably continue to use the road since effective closures are difficult to establish and historical use patterns have already been established. This road is proposed for reconstruction under the Deadman Timber Sale to partially mitigate the effects of log haul and timber harvest on sedimentation in this drainage. The 9565.320 road between Merkel Canyon and Betty Creek has already been decommissioned using ripping, fillslope pullback, construction of additional drainage structures, culvert removal, and revegetation of disturbed slopes.

  The only other potential landslide area identified in this report is the #9535.360 road. In 1997, poor road drainage resulted in a debris flow that delivered an estimated 500 cubic yards to the mainstem of Deadman Creek. This road segment was reconstructed the following year using aggregate surfacing, insloping and additional drainage structures. The face of the debris flow was also revegetated using native grass and conifer species. The IDT identified these two areas as presenting the highest risk to aquatic resources in the watershed.

- Detrimental effects continue from cattle and OHVs even after roads have been closed to vehicular traffic. **(See Section 4.8 Range, Section 4.6 Fisheries, and Section 2.6 Mitigation Measures)**

  Approximately 4.5 miles of open system roads were identified by the IDT as candidates for closing, and or obliteration. Approximately 10.1 miles of Forest Service roads (open and closed) were identified for possible removal from the road system. Closure devices have been improved over the past several years, including the building of more effective berms and obliteration of the road for several hundred feet beyond the closure to discourage use by ATVs. As use by full-size vehicles decreases, many roads tend to "brush-in", and if not frequently brushed out, or used annually by ATVs/snowmobiles, will revert to narrow trails or close in altogether. Effective closures are difficult where the terrain is flat or the vegetation is sparse. In some cases, a more suitable closure location may be established some distance from the desired point of closure.

  There is little that can be done to prevent livestock use on closed roads. Some management tools include the construction of slash windrows to deter livestock movement or installation of salt blocks in key locations to attract livestock into areas where resources will not be impacted by their presence.

- Roads can serve as barriers to fish passage. **(See Section 4.6 Fisheries and 2.6 Mitigation Measure # 12)**

  The Deadman EIS Fisheries Report has identified one barrier to fish passage on the North Fork of Deadman Creek (Road #9565.800 a.k.a. #6144). Colville National Forest fish biologists have determined that a population of redband trout is located above this location. This barrier isolates them from the non-native brook trout located downstream. According to Forest fish biologists, this culvert should not be reconstructed to restore fish passage.

- Roads can serve as portals of entry for non-native vegetation. **(See Section 4.2.4 Noxious Weeds and Section 2.6 Mitigation Measures)**

  Roads are prime vectors in the spread of noxious weeds. Roads allow for the mechanical transport of noxious weed seed from areas of infestation to other areas, which may or may not be infested with noxious weeds. Reducing the number or miles of roads within the Deadman Creek watershed is one way to reduce or mitigate this effect. Another measure that can reduce the amount of noxious weed seed moved on the road system is the required cleaning of off highway vehicles (OHVs) and mechanical equipment used during timber harvest and fire suppression. The equipment cleaning requirements of Forest Service contractors can be implemented through standard contract clauses. Compliance on the OHV requirement is very difficult to enforce.

Proposed reductions in open roads, and in miles of Colville system roads

As listed under section 2.5.2 Features Common to All Action Alternatives, the Roads Analysis Report identified some segments of existing classified road system that are no longer needed either as full-time open roads or as system roads altogether. The Roads Analysis Interdisciplinary Team identified approximately 4.5 miles of open system roads as needing closing, and, or obliteration. Approximately 10.1 miles of Forest Service classified roads (open or closed) were identified for possible removal from the road system (See Table 5 and map in Appendix F). Additional replacement and, or, maintenance of gate closures on some classified roads is also proposed. Long-term water quality would be improved through road closures and designed road improvements. Wildlife seclusion habitat and some recreation opportunities would also be improved through the road closures.

4.12 Inventoried Roadless Areas and Other Areas Lacking Classified Roads

4.12.1 Effects upon Inventoried Roadless Areas

Alternatives B and E both propose harvest treatments within the Twin Sisters Inventoried Roadless Area. No harvest treatments are proposed within the Hoodoo Inventoried Roadless Area. No road construction or reconstruction is proposed within the Twin Sisters or the Hoodoo Inventoried Roadless Areas.

The effects of harvesting or building spur roads that will be closed upon completion of harvest activities is not expected to cause an increase in use by ORV's in the Roadless Areas. Most of the proposed harvesting inside Inventoried Roadless Areas (only in Alternatives B and E) would be done by helicopter, with no link to the road system and on steeper ground, few, if any ORV's would reach or have any desire to get to these units. A few units on the edge of the Roadless Areas would be accessible by new road, but those roads are scheduled to be closed upon final harvest treatments. These spurs are all short, dead-end roads. Because of this, the effect of ORV's upon the roadless areas is not greater than would be expected under normal or existing conditions.

Table 58. Analysis of proposed units within Twin Sisters Roadless Area

Unit	Mgmt. area [21]	Alternatives	Average Harvest Diameter	Average Height	Avg. Age (avail-able data)	Tree Species *	Prescription**	Purpose of Unit
AJ	7	B, E	7.3	50		LP	HTH/HSL	Enhance structure
AP	7	B, E	8.2	60		LP	HTH	Enhance structure
AR	7	B, E	8.7	60		LP	HTH	Enhance structure
AS	7	B, E	9.4	60	55	LP	HTH/HSL	Enhance structure
AT	3A	B, E	7.2	50	52	LP	HSL	Enhance structure
AU	7	B	8.2	60		LP	HTH	Enhance structure
AV	7	B, E	9.8	60		LP	HSH	Enhance structure (regenerate)
AW	7	B, E	8.7	60		LP	HSH	Enhance structure

21 Listed management area reflects only that part of the unit that is within the Inventoried Roadless Area. Unit may be partially in another management area, outside of the Inventoried Roadless Area.

Unit	Mgmt. area 21	Alternatives	Average Harvest Diameter	Average Height	Avg. Age (avail-able data)	Tree Species *	Prescription**	Purpose of Unit
								(regenerate)
AX	7	B, E	9.2	60	52	LP	HSH	Enhance structure (regenerate)
AZ	7	B, E	10.5	70	62	LP	HTH	Enhance structure
BI	7	B	7.3	50		DF	HTH	Enhance structure
BJ	7	B, E	8.2	50		LP	HSH	Enhance structure (regenerate)
BK	7	B	7.3	50	49	LP	HTH	Enhance structure
EB	7	B, E	8.8	70	80	LP	HTH	Enhance structure
ED	7	B, E	8.7	70	80	LP	HSH	Enhance structure (regenerate)
EG	7	B	8.3	60	96	LP	HTH	Enhance structure
EJ	7	B, E	9.1	60	96	LP	HSH	Enhance structure (regenerate)
ES	7	B	7.3	60		LP	HSH	Enhance structure (regenerate)
EZ	7	B	7.6	70		LP	HTH	Enhance structure
FD	7	B, E	8.5	60		LP	HTH	Enhance structure
FE	7	B, E	8.0	70		LP	HTH	Enhance structure
FH	7	B	7.0	60		WL	HTH	Enhance structure
FP	7	B	7.0	60		LP	HTH	Enhance structure
FR	7	B, E	7.0	60		LP	HTH	Enhance structure
AVG			8.2	60	69			

* LP = lodgepole pine, WL = Western larch, DF - Douglas -fir
** HTH = Commercial thin, HSL = Uneven-aged management, HSH = Shelterwood

Management Area 3A is - *Recreation Emphasis* - where the goal is to provide roaded and unroaded recreation opportunities in a natural appearing setting. Within the Deadman Project Planning Area these areas are along major travelways along the north and south forks of Deadman Creek.

Management Area 7 is - *Wood/Forage Emphasis* - where the goal is to manage to achieve optimum production of timber products while protecting basic resources.

Proposed harvest treatments within Inventoried Roadless Areas

The proposed silvicultural treatments in Alternatives B and E that are inside of the Twin Sisters Inventoried Roadless Area are generally treatments of stands of small diameter trees. The intent of the harvest treatments are to maintain or restore desirable characteristics of ecosystem structure through commercial thinning or to regenerate stagnant stands of lodgepole pine into species that are far more capable of reaching late structural stages. A bi-product of those regeneration treatments would be the creation of lynx foraging habitat. The following table is a compilation of information regarding proposed units in Alternatives B and E. No units in Alternatives C or D are proposed for treatment inside of Inventoried Roadless Areas. The following table is a synthesis of the

proposed units:

The following table shows the total treatment acres proposed and the approximate acres affected within Inventoried Roadless Areas in the Deadman Project Area.

Table 59. Effects on Inventoried Roadless Areas*22*

ROADLESS AREA	TOTAL ACREAGE OF ROADLESS AREA	ACRES OF TOTAL WITHIN THE DEADMAN PROJECT AREA	APPROXIMATE ACRES OF PROPOSED HARVEST WITHIN ROADLESS AREA	APPROXIMATE ACRES AFFECTED BY HARVEST WITHIN ROADLESS AREA23
Hoodoo	**7,103**	**5,596**	**No harvest proposed**	**No harvest proposed**
Twin Sisters	**13,311**	**7,992**	**Alt B = 570 Alt E = 324**	**Alt B = 1569 Alt E = 1301**

Effects to Hoodoo Inventoried Roadless Area

Alternative A

No activities would be conducted in the Hoodoo Roadless Area, or adjacent to the Roadless Area. The area would remain unchanged from a ROS perspective, as well as from a wilderness attributes perspective.

Alternatives B, C, D, and E

No activities are proposed within the Hoodoo Inventoried Roadless Area. Some harvest activities will affect areas lacking classified roads adjacent to the Roadless Area. There will be no effect to the access, remoteness, social encounters, visitor management, or on-site development should any of the alternatives be enacted. The natural integrity, apparent naturalness, opportunity for solitude, and primitive recreation opportunities within the Roadless Area will remain unchanged by implementing any of the alternatives**.**

Effects to Twin Sisters Inventoried Roadless Area

Alternative A

No activities would be conducted in the Twin Sisters Roadless Area, or adjacent to the Roadless Area. The area would remain unchanged from a ROS perspective, as well as from a wilderness attributes perspective.

Alternative B and E

Under Alternative B, 570 acres of vegetation manipulation in the form of timber harvest is proposed. Under Alternative E, 324 acres are proposed. The treatments would be a combination of commercial thinning and shelterwood prescriptions

22 No proposed specified or temporary road construction in these areas.
23 This number represents the approximate acres that may be affected by the harvest treatment, realizing that there are additional effects, beyond the unit boundaries, from the standpoint of visuals and due to sound travel, and also caused by multiple units in the same proximity.

designed to improve structural characteristics in relation to progressing toward late stand structure, or for improved lynx foraging habitat. (See Table 22 of this report for details). No road construction is proposed (temporary or specified) within the Roadless Area. The effects to the Twin Sisters Inventoried Roadless Area are as follows.

Comparison to ROS designations:

1. **Access: Public access would change very little. One new road would be constructed near the edge of the Roadless Area, but would be closed with an earthen berm at the end of proposed activities. Most of the treatments proposed are helicopter harvesting, which would not change the access to the Twin Sisters Roadless Area.**

2. **Remoteness: The area would remain in the same situation as before treatments, in terms of being within one mile of existing roads or motorized trails, but with topography limiting sights and sounds associated with these roads.**

3. **Social Encounters: There would be no change in the likelihood of encountering other forest users, except briefly during harvest treatments when workers involved in helicopter harvesting of timber would be working within the Roadless Area. There remains a high likelihood of encountering other forest users along established roads and trails in MA-10. Probable encounters in a single day will remain rated low, which is 0-6 per day.**

4. **Visitor Management: Trails and roads are identified with signposts corresponding with available trail maps. There would be no change to visitor management, except during brief periods during harvest-related treatments when some roads on the perimeter of the Roadless Area may be temporarily closed.**

5. **On site development: ATV/Jeep trails will remain in the same situation as before the proposed activities. No roads proposed for construction will remain open. Recreational travel patterns would not change.**

Wilderness Attributes

1. **Natural Integrity: As no road construction is proposed within the Twin Sisters Roadless Area, there will be no change in Natural Integrity from that standpoint. The 570 acres of harvest treatments proposed will result in residual logging slash and stumps within units. This will affect the integrity of the wilderness experience within those units and between units when they are close together. The total estimated acreage to be affected due to silvicultural treatments within the Twin Sisters Roadless Area is 1569 acres. Approximately 11,750 acres of the Twin Sisters Inventoried Roadless area would remain in exactly the same condition from the standpoint of "natural integrity". The two motorized trails and several dispersed campsites will remain the only on site "permanent" alterations to the natural integrity of the area. The effects of these areas are only apparent in the area immediately adjacent to the trail and do not affect the majority of the area.**

2. **Apparent Naturalness: Approximately 570 acres would be visually affected when viewed within the Inventoried Roadless Area. When viewed from**

outside of the Roadless Area, only the shelterwood units, approximately 140 acres, would lose the apparent naturalness. This effect would last for at least 25 to 30 years.

3. **Opportunity for Solitude: Other than a brief time when the proposed logging and post-sale activities were taking place, the opportunity for solitude would not change within the Twin Sisters Roadless Area. Vehicle traffic patterns outside the Roadless Area would remain similar to the existing condition. Created openings for lynx habitat would be in remote areas. The public would not seek out these areas, and within a few years it is very likely that the openings would be covered with a dense stand of lodgepole pine, which would be difficult to maneuver through.**

4. Primitive Recreation Opportunities and Unique Features: These opportunities and features would not change due to implementation of Alternative B. Primitive recreation opportunities are limited by the size of the area and the ease of access to existing roads. Considering the rough terrain and the dense vegetation, the entire area can be reached within two hours.

Alternatives C and D

No activities are proposed within the Twin Sisters Inventoried Roadless Area under Alternatives C or D. Some harvest activities will affect areas lacking classified roads adjacent to the Roadless Area. There will be no effect to the access, remoteness, social encounters, visitor management, or on-site development should any of the alternatives be enacted. The natural integrity, apparent naturalness, opportunity for solitude, and primitive recreation opportunities within the Roadless Area will remain unchanged by implementing either of the alternatives.

4.12.2 Meeting Inventoried Roadless Area Management Direction

The Final Rule for Roadless Area Conservation, dated January 12, 2001, does not currently apply to the Deadman Creek Ecosystem Management Projects due to a court injunction. The applicable areas of 36 CFR, Part 294 that would apply, should the injunction be lifted are listed in Chapter 3 under section 3.14.4. The Colville National Forest Land and Resource Management Plan contains the current direction that is applicable to this project. All alternatives within this project are in full compliance with the Forest Plan, and if the injunction is lifted, would be in full compliance with the Final Rule.

The proposed silvicultural treatments in Alternatives B and E that are inside of the Twin Sisters Inventoried Roadless Area are generally treatments of stands of small diameter trees. Some of the treatments are proposed to improve lynx foraging habitat, and the remainder are to maintain or restore desirable characteristics of ecosystem structure through commercial thinning. The proposed projects meet the intent of the rule. (See Table 58).

4.12.3 Effects on Areas Greater than 1,000 Acres Lacking Classified Roads

Alternative A

No activities would be conducted in these areas. The areas would remain unchanged from a ROS perspective.

Alternative B

Under Alternative B:

1. **59 acres of vegetation manipulation in the form of commercial thinning is proposed in the area east of the Hoodoo Roadless Area**
2. **16 acres of vegetation manipulation in the form of commercial thinning is proposed in the area in the vicinity of Katy Creek**
3. **94 acres of vegetation manipulation in the form of commercial thinning and sanitation/shelterwood treatment is proposed in the area in the vicinity of Alligator Ridge (all treatment on the heavily managed south side of Alligator Ridge)**
4. **186 acres of vegetation manipulation in the form of commercial thinning, shelterwood, and individual tree selection treatment is proposed in the area west of the Hoodoo Roadless Area**

Effect upon ROS designations:

1. **Access: Public access would change very little. One new road would be constructed approximately three-quarters of a mile from the area, but would be closed with an earthen berm at the end of proposed activities. A temporary road of 0.15 mile would be constructed to facilitate harvest in unit DE, but would be obliterated at the close of the activities. Most of the treatments proposed are either helicopter harvesting, or tractor skidding to an existing road, neither of which would change the access to this area.**
2. **Remoteness: The area would remain in the same situation as before treatments, in terms of being generally within one mile of existing roads or motorized trails. Areas where visitors presently would experience sights or sounds that originate outside of areas lacking classified roads would be unaffected by implementation of Alternative B.**
3. **Social Encounters: There would be no change in the likelihood of encountering other forest users, except briefly during harvest treatments when workers involved in helicopter harvesting of timber would be working in the area. Probable encounters in a single day would still be rated low to moderate, which is 6 to 15 per day. The number of people occupying the area at a single time would still range from a low of 1 person per 125 acres to a high of 1 person per 12 acres, which would probably be rarely reached. The amount of visitation is highest during hunting season in the fall.**
4. **Visitor Management: Trails and roads are identified with signposts corresponding with available trail maps. There would be no change to visitor management, except during brief periods during harvest-related treatments when some roads on the perimeter of the area may be temporarily closed.**
5. **On site development: No specified roads are proposed for construction in the vicinity of the area lacking classified roads. One temporary spur road of**

0.15 mile is proposed in unit DE. Recreational travel patterns would not change.

Approximately 77 acres of the treatments would be shelterwood treatments, which would be visible when viewed from a distance. The remaining 278 acres of treatment would be made up of commercial thinning, sanitation, or single-tree selection treatments, which would be visually subordinate to the landscape, when viewed from a distance. No specified road construction is proposed within these areas.

Within the areas of concern, stumps and logging slash would be evident across the 355 acres in four areas lacking classified roads. Due to the proximity of some of the units to each other, the size of area that will remain totally unaffected by management within these four areas will be reduced.24 The visual effect of the slash would last possibly ten years or more, however much of the fuel hazard would be reduced after a few years of winter snowpack. The visual effect of the stumps, when viewed on-site would last longer, possibly 40 years or more on large stumps, until they deteriorated to a point where they were visually subordinate to the surrounding landscape. Approximately 0.15 mile of temporary road in Unit DE, some cable corridors in Unit DE, and some skid trails in units DL, GC, and CK would also be visible from an on-site perspective (skid trails would lead to an existing road). These trails, corridors, and roads may take 30-40 years to become totally blended with the landscape, although they will be waterbarred and seeded with grass upon completion of harvest activities.

Alternative C

No activities are proposed within this area that lacks classified roads. Alternative C would not have altered ROS characteristics.

Alternative D

Under Alternative D:

1. **16 acres of vegetation manipulation in the form of commercial thinning is proposed in the area in the vicinity of Katy Creek**

2. **94 acres of vegetation manipulation in the form of commercial thinning and sanitation/shelterwood treatment is proposed in the area in the vicinity of Alligator Ridge (all treatment on the heavily managed south side of Alligator Ridge)**

Effect upon ROS designations:

1. **Access: Public access would change very little. One temporary road of 0.15 mile is proposed to aid in cable harvesting. This road would be obliterated upon closure of activities. Most of the treatments proposed are either helicopter harvesting, or tractor skidding to an existing road, neither of which would change the access to these areas.**

2. **Remoteness: These areas would remain in the same situation as before treatments, in terms of being generally within one mile of existing roads or motorized trails. Areas where visitors presently would experience sights or sounds that originate outside of areas lacking classified roads would be**

24 See Table 4.42: *EFFECTS ON AREAS GREATER THAN 1,000 ACRES LACKING CLASSIFIED ROADS*

unaffected by implementation of Alternative D.

3. **Social Encounters: There would be no change in the likelihood of encountering other forest users, except briefly during harvest treatments when workers involved in helicopter harvesting of timber would be working in the area. Probable encounters in a single day would still be rated low to moderate, which is 6 to 15 per day. The number of people occupying the area at a single time would still range from a low of 1 person per 125 acres to a high of 1 person per 12 acres, which would probably be rarely reached. The amount of visitation is highest during hunting season in the fall.**

4. **Visitor Management: Trails and roads are identified with signposts corresponding with available trail maps. There would be no change to visitor management, except during brief periods during harvest-related treatments when some roads on the perimeter of the area may be temporarily closed.**

5. **On site development: No specified roads are proposed for construction in the vicinity of the area lacking classified roads. One temporary spur road of 0.15 mile is proposed in unit DE. Recreational travel patterns would not change.**

Approximately 47 acres of the treatments would be shelterwood treatments, which would be visible when viewed from a distance. The remaining 63 acres of treatment would be made up of commercial thinning or sanitation treatments which would be visually subordinate to the landscape, when viewed from a distance. No specified road construction is proposed within these areas.

Within the areas of concern, stumps and logging slash would be evident across the 110 acres of treatment in two areas lacking classified roads. Due to the proximity of some of the units to each other, the size of area that will remain totally unaffected by management within these two areas will be reduced.25 The visual effect of the slash would last possibly ten years or more, however much of the fuel hazard would be reduced after a few years of winter snowpack. The visual effect of the stumps, when viewed on-site would last longer, possibly 40 years or more on large stumps, until they deteriorated to a point where they were visually subordinate to the surrounding landscape. Approximately 0.15 mile of temporary road in Unit DE, some cable corridors in Unit DE, and some skid trails in units DL and GC would also be visible from an on-site perspective (skid trails would lead to an existing road). These trails, corridors, and roads may take 30-40 years to become totally blended with the landscape, although they will be waterbarred and seeded with grass upon completion of harvest activities.

Alternative E

Under Alternative E:

1. **32 acres of vegetation manipulation in the form of commercial thinning is proposed in the area**

2. **16 acres of vegetation manipulation in the form of commercial thinning is**

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25 See Table 4.42: *EFFECTS ON AREAS GREATER THAN 1,000 ACRES LACKING CLASSIFIED ROADS*

proposed in the area in the vicinity of Katy Creek

3. **94 acres of vegetation manipulation in the form of commercial thinning and sanitation/shelterwood treatment is proposed in the area in the vicinity of Alligator Ridge (all treatment on the heavily managed south side of Alligator Ridge)**

Effect upon ROS designations:

1. **Access: Public access would change very little. One temporary road of 0.15 mile is proposed to aid in cable harvesting. This road would be obliterated upon closure of activities. Most of the treatments proposed are either helicopter harvesting, or tractor skidding to an existing road, neither of which would change the access to these areas.**

2. **Remoteness: These areas would remain in the same situation as before treatments, in terms of being generally within one mile of existing roads or motorized trails. Areas where visitors presently would experience sights or sounds that originate outside of areas lacking classified roads would be unaffected by implementation of Alternative E.**

3. **Social Encounters: There would be no change in the likelihood of encountering other forest users, except briefly during harvest treatments when workers involved in helicopter harvesting of timber would be working in the area. Probable encounters in a single day would still be rated low to moderate, which is 6 to 15 per day. The number of people occupying the area at a single time would still range from a low of 1 person per 125 acres to a high of 1 person per 12 acres, which would probably be rarely reached. The amount of visitation is highest during hunting season in the fall.**

4. **Visitor Management: Trails and roads are identified with signposts corresponding with available trail maps. There would be no change to visitor management, except during brief periods during harvest-related treatments when some roads on the perimeter of the area may be temporarily closed.**

5. **On site development: No specified roads are proposed for construction in the vicinity of the area lacking classified roads. One temporary spur road of 0.15 mile is proposed in unit DE. Recreational travel patterns would not change.**

Table 60. Effects on areas greater than 1,0000 acres lacking classified roads*26*

DESCRIPTION OF AREA LACKING CLASSIFIED ROADS27	APPROXIMATE ACREAGE OF AREA LACKING CLASSIFIED ROADS	APPROXIMATE ACRES OF TOTAL WITHIN THE DEADMAN PROJECT AREA	APPROXIMATE ACRES OF PROPOSED HARVEST WITHIN AREA LACKING CLASSIFIED ROADS	APPROXIMATE ACRES AFFECTED BY HARVEST WITHIN AREA LACKING CLASSIFIED ROADS28

26 No proposed specified or temporary road construction in these areas
27 See Table 3.10 for legal descriptions of these areas.
28 This number represents the approximate acres that may be affected by the harvest treatment,

Area directly east of the Hoodoo Roadless Area	**2375**	**900**	**Alt B = 59 Alt E = 32**	**Alt B = 62 Alt E = 34**
Area in the vicinity of Katy Creek	**4175**	**2775**	**Alt B = 16 Alt D = 16 Alt E = 16**	**Alt B = 16 Alt D = 16 Alt E = 16**
Area in the vicinity of Tie Camp Creek	**1775**	**675**	**No proposed activities**	**No proposed activities**
Area in the vicinity of and north of Alligator Ridge, and west of Thompson Ridge	**6800**	**475**	**Alt B = 94 Alt D = 94 Alt E = 94**	**Alt B = 113 Alt D =113 Alt E = 113**
Area directly west of the Hoodoo Roadless Area	**2400**	**625**	**Alt B - 186**	**Alt B - 723**
Totals by Alternative			**Alt B = 355 Alt C = 0 Alt D = 110 Alt E = 142**	**Alt B = 914 Alt C = 0 Alt D = 129 Alt E = 163**

Approximately 47 acres of the treatments would be shelterwood treatments, which would be visible when viewed from a distance. The remaining 95 acres of treatment would be made up of commercial thinning or sanitation treatments, which would be visually subordinate to the landscape, when viewed from a distance. No specified road construction is proposed within these areas.

Within the areas of concern, stumps and logging slash would be evident across the 442 acres of treatment in three areas lacking classified roads. Due to the proximity of some

of the units to each other, the size of area that will remain totally unaffected by management within these three areas will be reduced.29 The visual effect of the slash would last possibly ten years or more, however much of the fuel hazard would be reduced after a few years of winter snowpack. The visual effect of the stumps, when viewed on-site would last longer, possibly 40 years or more on large stumps, until they deteriorated to a point where they were visually subordinate to the surrounding landscape. Approximately 0.15 mile of temporary road in Unit DE, some cable corridors in Unit DE, and some skid trails in units DL and GC would also be visible from an on-site perspective (skid trails would lead to an existing road). These trails, corridors, and roads may take 30-40 years to become totally blended with the landscape, although they will be waterbarred and seeded with grass upon completion of harvest activities.

4.12.4 Cumulative Effects

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realizing that there are additional effects, beyond the unit boundaries, from the standpoint of visuals and due to sound travel, and also caused by multiple units in the same proximity

29 See Table 4.42: *EFFECTS ON AREAS GREATER THAN 1,000 ACRES LACKING CLASSIFIED ROADS*

Alternative A

There are no cumulative effects to inventoried roadless areas or to other areas with similar concerns greater than 1,000 acres under Alternative A, as no treatments are proposed.

Action Alternatives B, C, D, and E

Implementation of any of the Action Alternatives (B, C, D, or E) would cause a reduction in parts of the Twin Sisters Roadless Area within the Deadman Creek Watershed that are presently without management of any form (approximately 12 percent of the total area within Inventoried Roadless Areas in the Deadman Creek Watershed). Both Hoodoo and Twin Sisters Inventoried Roadless Areas would retain greater than 5,000 acres each of area without noticeable management.

Five other areas greater than 1,000 acres in size that lack classified roads would have the area unaffected by management reduced. 30 The majority of the reduction would come from the area west of Hoodoo Inventoried Roadless Area, the unmanaged portion of which would be reduced by approximately 30 percent.

The cumulative effects of these proposed actions are:

1. **Access: Public access would change very little. Most of the treatments proposed are either helicopter harvesting, or tractor skidding to an existing road, neither of which would change the access to these areas.**

2. **Remoteness: These areas would remain in the same situation as before treatments, in terms of being generally within one mile of existing roads or motorized trails. Areas where visitors presently would experience sights or sounds that originate outside of areas lacking classified roads would be unaffected by implementation of any of the Action Alternatives.**

3. **Social Encounters: There would be no change in the likelihood of encountering other forest users, except briefly during harvest treatments when workers involved in helicopter harvesting of timber would be working in the area. Probable encounters in a single day would still be rated low to moderate, which is 6 to 15 per day. The number of people occupying the area at a single time would still range from a low of 1 person per 125 acres to a high of 1 person per 12 acres, which would probably be rarely reached. The amount of visitation is highest during hunting season in the fall.**

4. **Visitor Management: Trails and roads are identified with signposts corresponding with available trail maps. There would be no change to visitor management, except during brief periods during harvest-related treatments when some roads on the perimeter of the area may be temporarily closed.**

5. **On site development: Very little change, no new specified roads in these areas.**

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30 See Table 4.42 *EFFECTS ON AREAS GREATER THAN 1,000 ACRES LACKING CLASSIFIED ROADS*

4.12.5 Summary

- **Proposed management entries into the Twin Sisters Roadless Area are commensurate with Colville National Forest Land and Resource Plan standards and guidelines.**

- **No road construction is proposed in any inventoried roadless area.**

- **Proposed timber harvest treatments within the Twin Sisters Inventoried Roadless Area would reduce the area unaffected by any form of management by approximately 10 percent in Alternative E and 12 percent in Alternative B.**

- **Proposed timber harvest treatments within areas lacking classified roads that exceed 1,000 acres in size, would reduce the area unaffected by any form of management. Of the five such areas within the Deadman Project Area, four would be affected under Alternative B, two would be affected under Alternative D, three would be affected under Alternative E, and none would be affected under Alternative C.**

4.13 Minerals

There are no effects expected in any alternative. In the Deadman Project Planning Area it is highly likely that Alternatives B and E will encounter mining claim corners or discovery monuments. This is due to a new road and six harvest units in section 10, T. 37 N., R. 35 E., W.M. Alternatives C and D are less likely to encounter these same monuments due to fewer harvest units and no new roads. Elsewhere within the Deadman Project Planning Area, any mining claim corner or discovery monuments found are likely to be from abandoned claims. All corners or monuments are to be undisturbed by any activities conducted on National Forest lands. There is only a slim chance that new corners or monuments will be encountered in the Deadman Project Planning Area.

4.14 Financial Analysis

4.14.1 Description of Analysis

Comments were received citing the need for a complete "economic analysis" as part of the analysis for Deadman Ecosystem Management Projects EIS.

Under FSM 1970.6 - Scope of Analysis it is stated, "The responsible line officer determines the scope, appropriate level, and complexity of economic and social analysis needed. In many planning and management situations, certain laws and regulations or Forest Service policy specify analysis requirements (FSM 1901, 1903). In other situations, the scope and depth of analyses depend on the potential effects of the program or project planned or under review."

Under FSM 1973.03 Policy it is stated: "Initiate social impact analysis if the potential social effects of Forest Service policies or actions are important to the decision. This determination is made by the responsible official early in scoping (FSH 1909.15, ch. 10)".

Under FSH 2409.18, 32.1 - Analytical Methods it is stated, "Complete a financial efficiency analysis for each alternative of the proposed project. An economic

efficiency analysis may also be completed, as needed (sec. 32). Additional analysis depends on the scope and complexity of the project."

The Responsible Official, in this case the Forest Supervisor of the Colville National Forest, has reviewed the scoping comments, the proposed action, and alternatives to the proposed action, and made the determination that a financial efficiency analysis as described in FSH 2409.18, 32.11 is the correct and appropriate level of analysis given the scope and complexity of the Deadman Project. The proposed actions of timber harvest, precommercial thinning, site-preparation and planting, road construction and reconstruction, road decommissioning, and prescribed fire can be adequately expressed in a financial efficiency analysis. There were no key issues that would require a social impact analysis beyond the existing analysis in the Colville National Forest Land and Resource Management Plan EIS.

Although not affecting the land in the watershed directly, the financial analysis reflects whether a particular alternative is viable economically. It is not an absolute measure, as some dollar values may change monthly or even more often, but is more of a comparison between alternatives. Each of the activities has a cost or revenue associated with it. For instance, one alternative may construct less new road than another, but may also employ more expensive yarding methods. One alternative may require more expensive post-sale activities than another. One alternative may harvest more trees than another. The end result is a relative comparison between alternatives. The complete spreadsheet listing activities and cash flow for each alternative is included in the Analysis File. A financial analysis for the proposed Deadman Ecosystem Management Projects shows that all action alternatives will return a positive Present Net Value (PNV) and benefit/cost (B/C) ratio and will result in job support to the local community. The analysis tables and a description of the values used for the analysis is contained in the economic report in the Analysis File. The following table summarizes these values for the action alternatives.

Table 61. Financial analysis values

	B	C	D	E
Benefit/Cost	1.092	1.109	1.247	1.040
Total Cost	$6,341,091	$3,636,348	$3,499,758	$5,414,418
Total Revenue	$6,922,866	$4,033,403	$4,363,063	$5,632,943
PNV	$581,775	$397,054	$863,305	$218,526
PNV/AC	$141	$166	$337	$69

Figure 7. Benefit to cost ratio for action alternatives

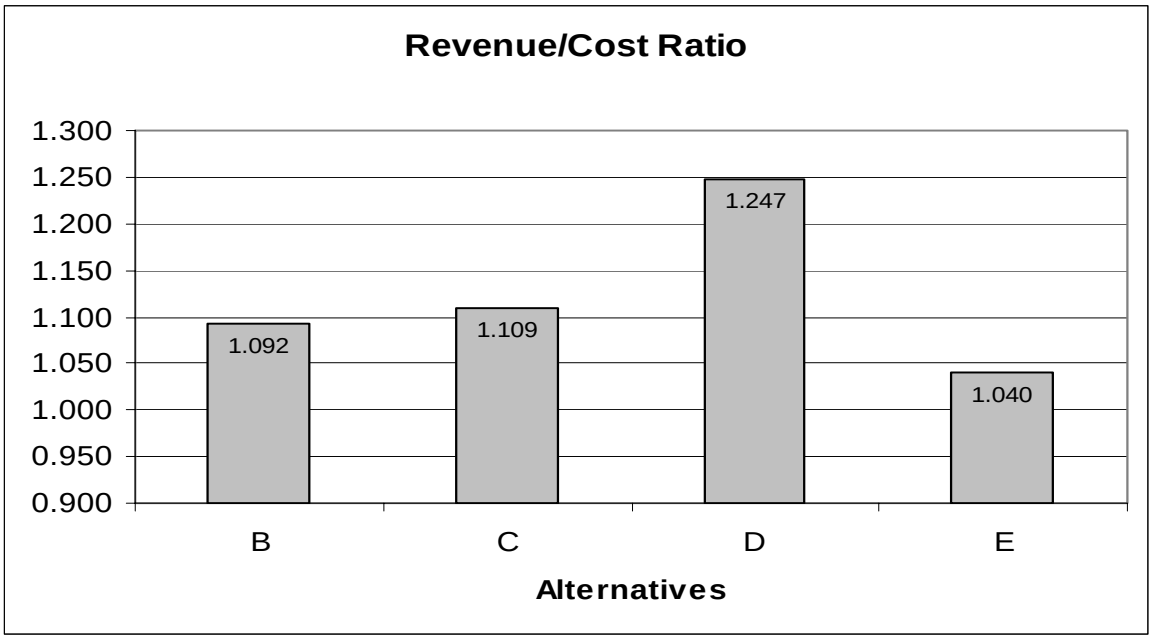
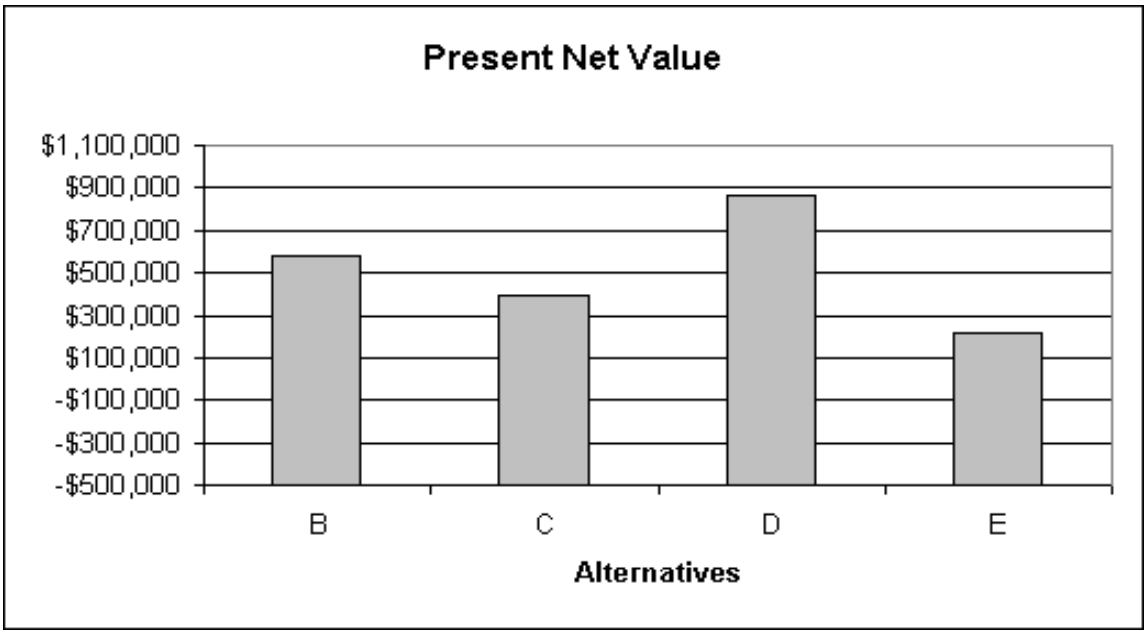


Figure 8. Present net value for action alternatives



4.14.2 Financial Report Summary

The financial analysis for the proposed Deadman Ecosystem Management Projects shows that all action alternatives will return a positive Present Net Value (PNV) and benefit/cost (B/C) ratio, which generally indicates job support to the local community. A nominal future activities scenario, scheduled in 20 years, also indicated a positive PNV and B/C ratio.

Alternative D **was the most cost effective, as was shown by all three indicators (Benefit/Cost Ratio, Present Net Value [PNV], and PNV per acre treated). Under Alternative D, 7.2 miles of new road construction would be undertaken. However, the cost of road construction was offset by more cost efficient yarding methods**

which could be used. Helicopter yarding is the most expensive yarding method, but none was proposed under Alternative D.

***Alternative C* placed second in the rankings. This alternative benefited financially from no road construction, and no entry into inventoried roadless areas, which would have emphasized helicopter yarding. Some helicopter yarding (727 acres) was required, however, in order to reach priority treatment areas where roads were not constructed.**

Under *Alternative B*, the financial analysis showed that the combination of building the most new roads (13.9 and reaching the most priority stands in remote areas, such as the inventoried roadless areas (557 acres helicopter yarding) was more costly than alternatives D and C. The lower cost of tractor yarding (2322 acres) was offset by road construction and helicopter yarding costs.

***Alternative E*, which did not build new roads, but made extensive use of helicopter yarding (1202 acres) showed the worst financial indicators for the action alternatives.**

Table 62. Rank of alternatives from financial analysis

	B	C	D	E
Benefit/Cost	3	2	1	4
PNV	2	3	1	4
PNV/AC	3	2	1	4

4.15 Other Effects

4.15.1 Unavoidable Effects

Unavoidable effects are those adverse environmental impacts that cannot be avoided. Some soil will be compacted during timber harvesting in all action alternatives. Forest plan Guidelines specify that no more than 20 percent of an activity area will be compacted, puddled, or displaced, including roads and landings, unless restoration treatments are considered.

For all action alternatives, other unavoidable effects follow.

- Exposure of soils to erosion during road reconstruction and maintenance,
- Minor nutrient loss as a result of prescribed fire for site preparation and fuel hazard reduction,
- Disturbance of soil due to livestock grazing,
- Some stream sedimentation during road construction, timber harvesting and prescribed burning,
- Reduced wildlife habitat effectiveness due to human activity,
- A temporary increase in fire hazard levels due to logging slash,
- A temporary change in air quality due to prescribed burning,
- A temporary disruption of recreation uses while harvest activities are taking place.

A more complete discussion of the adverse environmental effects that cannot be avoided when timber is harvested is found on pages IV-147 to 148 in the Forest Plan FEIS.

4.15.2 Irreversible and Irretrievable Commitment of Resources

The term "irreversible commitment of resources" refers mainly to actions that disturb a nonrenewable resource or a renewable resource to the point that renewal can occur only over a long period of time and/or at great expense. Road construction was identified as an irreversible commitment of resources since roads can only be restored to a non-road condition after a long period of time or after ripping and revegetating. No other irreversible commitments of resources were identified in any of the alternatives.

"Irretrievable commitment of resources" is the loss of production or use of renewable resources because of an allocation decision. This represents opportunities foregone for the period of time that the resource cannot be used.

In all action alternatives, there will be some timber volume growth and yield loss since the most optimal unit silvicultural prescription was not always selected. Seeding of grasses and forbs could reduce tree seedling growth and survival. The construction of new roads would be an irretrievable commitment of the ground they occupy if those roads are maintained in an open condition for fire access or other resource management activities. No old growth stands will be harvested.

4.15.3 Relationship between Short-term Use and Long-term Productivity

All action alternatives would result in some soil damage from road construction and logging operations that would not be mitigated. Soil protection measures in the action alternatives would be used to minimize impacts. The effects of harvest activities would be short-term and of limited magnitude. Mitigation measures would serve to ensure long-term soil productivity. Standards and Guidelines that apply Forest-wide will be followed to maintain soil productivity and to minimize erosion.

4.15.4 Specifically Required Disclosures

Floodplains and wetlands

The floodplains and wetlands would be protected through mitigation measures that conform to Executive Order 11988. Page: 104
Refer to Hydrology, Fish sections of EIS.

Social groups and environmental justice

Executive Order 12898, issued in 1994, ordered federal agencies to identify and address the issue of environmental justice.31 There are no differences between alternatives on the civil liberties of any American Citizen. In accordance with

31 Environmental Justice issues consider the adverse human health and environmental effects of agency programs that would disproportionately affect minority and low-income populations.

Executive Order 12898, no minority or low income populations would be disproportionately impacted by implementation of any of the alternatives. To date, questions of environmental justice have typically dealt with pollution or waste being discharged or dumped in minority or poor neighborhoods. However, the Executive Order specifically directs agencies to consider patterns of subsistence hunting and fishing when an agency action may affect fish or wildlife.

Hunting, firewood gathering, and huckleberry picking constitute the primary subsistence activities in the area. While a discreet population is difficult to identify, it is assumed that low-income people in the area use National Forest System Lands to augment their income either from the direct sale of forest products, or by offsetting food and fuel bills

Prime rangeland, farmland, and forestland

The alternatives considered are in compliance with the Federal Regulations for prime land. (FSH 1909.15, 65.21 (WO amendment 1909.15-93-1, pages 26, 27)

Energy requirements and conservation potential of alternatives

With relation to national and global petroleum reserves, the energy consumption associated with the individual alternatives, as well as the differences between alternatives, is insignificant.

Heritage resources

All areas of proposed ground disturbing activities have been inventoried for cultural resources. The effects are disclosed in *Heritage Resources* section earlier in this chapter.

4.16 Summary of Alternatives

Table 63. Summary of alternatives

	ALTERNATIVE				
TREATMENTS	**A**	**B**	**C**	**D**	**E**
Commercial Treatment Acreage	0	4,120	2,386	2,561	3,147
Tractor Yarding Acreage	0	2,322	991	1,826	1,202
Cable Yarding Acreage	0	1,241	668	735	747
Helicopter Yarding Acreage	0	557	727	0	1,198
Post and Pole Removal Acreage	0	104	104	104	104
Planting Acreage	0	403	270	305	325
Precommercial Thinning Acreage	0	562	562	562	562
Specified Road Construction (miles)	0	13.9	0	7.2	0
Road Reconstruction (miles)	0	13.9	8.9	13.2	8.6
New Stream Crossings Constructed	0	13	0	5	0
Planned Temporary Roads	No	2.2	1.9	2.1	2.1
Underburning Acreage	0	956	880	956	956
Logging Residues Created (1000 tons)	0	24.4	13.0	14.1	17.7
Forest Fuels Treated/Reduced (1000 tons)	0	19.6	21.1	10.2	15.9

Table 64. Summary of alternatives

	ALTERNATIVE				
EFFECTS	A	B	C	D	E
Transitory Range Acreage Created	0	133	64	74	110
Soil Disturbance Acreage	0	4,432	2,655	2,840	3,456
Harvest Acreage Affecting Big Game Seclusion	0	1,556	522	556	919
Treatment Acreage in Inventoried Roadless Areas	0	570	0	0	324
Acres Altered from Roadless Character	0	1,569	0	0	1,301
Treatment Acreage in Areas Lacking Classified	0	355	0	110	142
Acres Altered in Character in these Areas	0	914	0	129	163
Present Net Value (thousands of dollars)	N/	$582	$397	$863	$219
Benefit/Cost Ratio	N/	1.092	1.109	1.247	1.040