United States
Department of
Agriculture

Forest Service
Northern Region R1

Custer National Forest
Sioux Ranger District
Carter County, Montana

August 2004

EKALAKA HAZARDOUS FUEL PROJECT

Environmental Assessment

Prepared by: USDA-FS Enterprise T.E.A.M.S.
Boise Group
161 E. Mallard Drive, Suite A
Boise, Idaho 83706

Ekalaka Hazardous Fuel Project

Environmental Assessment

August 2004

Location: **Carter County, Montana**

Lead agency: **USDA Forest Service**
Custer National Forest
Sioux Ranger District

Responsible official: **Nancy T. Curriden, Forest Supervisor**
Custer National Forest
1310 Main Street
Billing, MT. 59105

For further information: **Rhonda O'Byrne, District Ranger**
Sioux Ranger District
P.O. Box 37
Camp Crook, South Dakota. 57724
Ph: (605) 797-4432
Fax: (605) 797-4404

Notice: Comments received in response to this document, including names and addresses of those who comment, will be considered part of the public record on this proposed action, and will be available for public inspection. Comments submitted anonymously will be accepted and considered; however, those who submit anonymous comments will not have standing to appeal the subsequent decision under 36 CFR Parts 215 or 217. Additionally, pursuant to 7 CFR 1.27(d), any person may request the agency to withhold a submission from the public record by showing how the Freedom of Information Act (FOIA) permits such confidentiality. Persons requesting such confidentiality should be aware that, under FOIA, confidentiality may be granted in only very limited circumstances, such as to protect trade secrets. The Forest Service will inform the requester of the agency's decision regarding the request for confidentiality, and where the request is denied; the agency will return the submission and notify the requester that the comments may be resubmitted, with or without name and address.

Organization of This Document

The document consists of the following sections:

Chapter 1 - Purpose and Need for Action
Describes the proposed action, the purpose and need for action, relationship to management direction, decisions to be made, and any relevant issues that would provide the basis for alternatives and the decision.

Chapter 2 – Alternatives
Describes the range of alternatives considered in the analysis, and the proposed action in detail. A comparison of alternatives concludes Chapter 2.

Chapter 3 – Environment and Effects
Describes the affected environment and focuses on the existing condition of resources that would be affected by the alternatives. The expected environmental consequences on resources within the project area are disclosed for each of the alternatives. Direct, indirect, and cumulative effects are predicted. Any expected, unavoidable adverse impacts are listed, including any irreversible and irretrievable commitment of resources. Additionally, a list of the individuals who prepared or reviewed the document is presented and a literature citation section is listed.

Appendix A: Maps
Project maps are grouped together for ease of viewing, printing and email/www distribution.

Appendix B: Supplemental Information
Supplemental analysis information that is referenced in the Environmental Assessment.

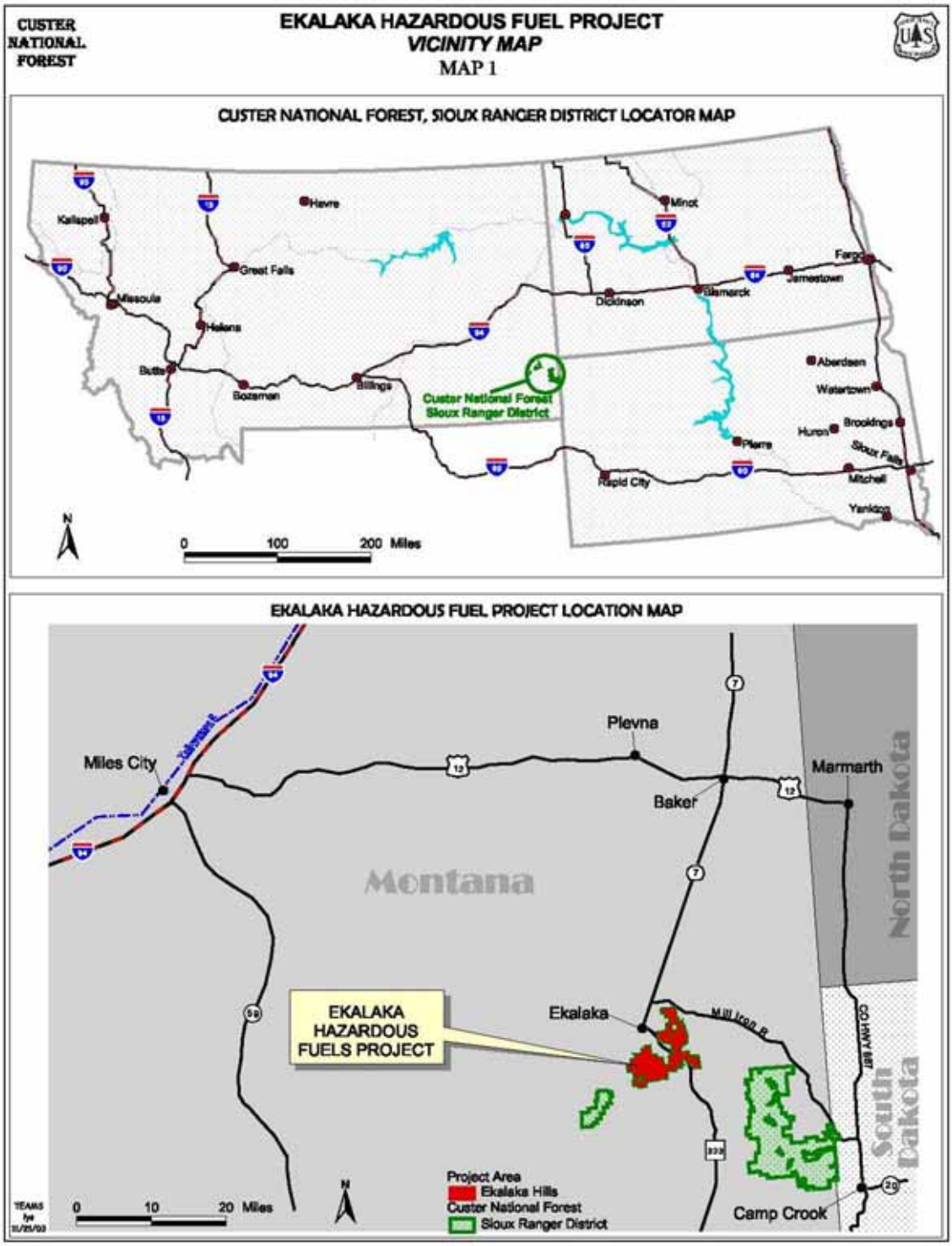
Project Record
Additional documentation, reports, and analysis that are referenced in this document can be found in the project record files. These items have not been included in this document due to technical nature, excessive length, or are reference materials used to develop the analysis in this document. All supporting documents in the planning record are located at: Custer National Forest, Sioux Ranger District, P.O. Box 37, Main and 1st Street, Camp Crook, South Dakota. 57724. Phone 605-797-4432, Fax 605-797-4404

==========

Cover Photo: View from "Rimrock-Carter Road" in the Ekalaka Hills Unit, looking southeast along the southern rim. The forested "Island" landscapes of the Custer NF-Sioux Ranger District are dominant land features in northwestern South Dakota and southeastern Montana (Photo by G.Lind, FS TEAMS).

Table of Contents

Figure iv-1: Custer NF – Sioux Ranger District, Ekalaka Hazardous Fuel Project vicinity map



1 Chapter: Purpose and Need

1.1 Introduction

The USDA Forest Service, Custer National Forest-Sioux Ranger District has prepared this Environmental Assessment (EA) to disclose the potential effects of hazardous fuel reduction and forest thinning activities in the Ekalaka Hazardous Fuel Project area (See Figure iv-1 on facing page). The project area is located in Carter County, Montana, and is within the Sioux Ranger District-Custer National Forest. The Sioux Ranger District office is in Camp Crook, South Dakota. However, the lands managed in this proposed action are located in southeastern Montana.

The majority of forest treatments proposed in this analysis are to reduce the possibility of stand-replacing wildland fires and to restore a more sustainable age structure to the forested stands within the Ekalaka Hills area. This EA discloses the direct, indirect, and cumulative environmental impacts and any irreversible or irretrievable commitment of resources that would result from the proposed action and any alternatives. The Interdisciplinary Team (IDT) used a systematic approach for analyzing the proposed project and associated alternatives, estimating the environmental effects, and preparing this EA. The planning process complies with NEPA[1] and the CEQ[2] regulations. Planning was coordinated with the appropriate federal, state, and local agencies, and local federally recognized tribes.

1.2 Purpose and Need for Action

Within the Ekalaka Hills Unit on the Sioux Ranger District there is a need to reduce the risk from a stand-replacing wildland fire that could affect the general forest stand diversity and adjacent BLM lands, state lands, and private property. Currently, the majority of ponderosa pine stands in the Ekalaka Hills is in Fire Condition Class 3 and also has a Fire Hazard rating of high or very high (see discussion below for more information on Fire Condition Class (FCC) and Fire Hazard (FHR) ratings). Detailed discussions of both concepts are found in the fire and fuels section in Chapter 3. The forested stands are represented by overly dense ponderosa pine stands, and include some areas of broken, snow damaged trees (See Figure 1 and Figure 2). In addition, the stands were ranked by their departure from a desired condition, which are stands that are resistant to disturbance. The majority of stands have a high departure from desired condition. Currently the stand conditions are characterized by overly dense canopy cover (i.e.: greater than 40%), high number of trees per acre, and the tree spacing is very close.

[1] NEPA: National Environmental Policy Act, 1969.

[2] CEQ: Council on Environmental Quality, Executive Office of the President.

1 Purpose and Need

Figure 1: Typical ponderosa pine stands with overly dense conditions.

Figure 2: Snow damaged ponderosa pine stand resulting in broken trees.

Ninety percent of the Ekalaka Hills is surrounded by private property with a planned subdivision located just east of the project area. Two organization camps are located within the Ekalaka Hills: Camp Needmore (T1N, R59E, Section 24) and Trail Ends Ranch (T1N, R59E, Section 13). During the summer months these camps would house in upwards of 200 children (See Figure 3 and Figure 4). National Forest System (NFS) lands in the Ekalaka Hills contain the following improvements that are at risk from fire: Tower Hill Electronic Communication Site (T1N, R59E, 25), Ekalaka Park Campground (T1N, R58E, Section 33), and Mac Nab Pond (T1N, R59E, Section 19). Finally, the town of Ekalaka is located within two miles of NFS lands. See Appendix A-Map #1a for the locations of these sites in relationship to the project area.

Figure 3: A Camp Needmore structure adjacent to pine stands with dense conditions.

Figure 4: A private residence adjacent to NF lands.

1.2.1 Fire Condition Class Situation for Ekalaka Hills

The Fire Condition Class (FCC) concept describes the departure from the normal fire regime that an area or stand currently has. The risk of a wildfire that would occur outside the normal fire regime behavior increases for each higher numbered Fire Condition Class. A Fire Condition Class of 3 means that the current conditions exist for a wildfire that would be outside normal conditions and fire-caused losses to resources or property would be higher than if the area was in Condition Class 1. Condition Class 2 is an intermediate condition between these two.

Currently in the Ekalaka project area there are approximately 2,287 acres (17%) of ponderosa pine stands in Condition Class 1, and 11,172 acres (83%) of ponderosa pine stands in Condition Class 3. There are no stands identified as being in Condition Class 2. What this means is that the risk for a stand-replacing wildfire is high for the majority (83%) of ponderosa pine stands in the project area. Figure 5 shows this in a graphical format noting the percentage of Fire Condition Classes in project area. See the Fire and Fuels section in Chapter 3 for a detailed discussion of Fire Condition Classes. Appendix A-Map #1b shows the distribution of stands in project area by Fire Condition Class.

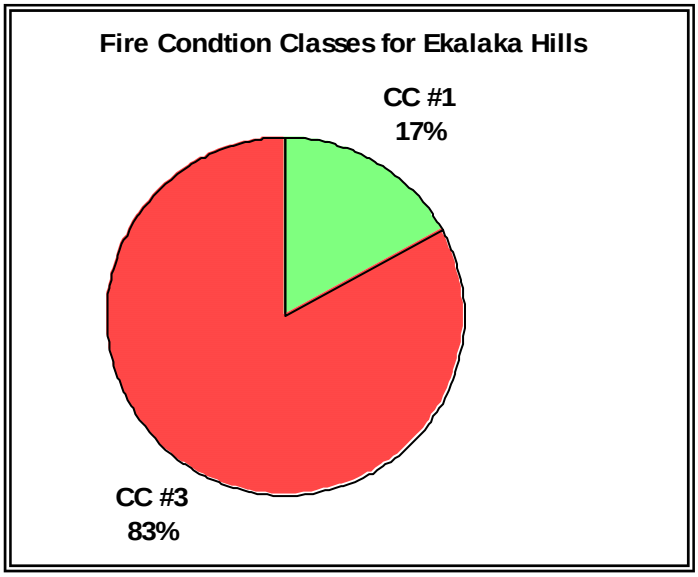


Figure 5: Fire Condition Classes in Ekalaka Hills project area.

1.2.2 Fire Hazard Rating For Ekalaka Hills

Fire Hazard Rating is determined by the use of specific fire behavior indicators used in the Fire and Fuels Extension (FFE) for the Forest Vegetation Simulation (FVS) Model. The Fire and Fuels section in Chapter 3 has a detailed discussion of the FVS Model and the FFE extension.

Currently in the Ekalaka project area there are approximately 125 acres rated as Very High hazard, 7,585 acres rated as High hazard, 1,406 acres rated as Moderate hazard, and 4,343 acres rated as having a Low hazard rating. What this means is that a majority (58%) of the project area has a Fire Hazard rating of Very High to High and the risk for a stand-replacing wildfire is high in those stands. Figure 6 shows this in a graphical format with the percentage of acres of each Fire Hazard rating in the

project area. **Appendix A-Map #1c** shows the distribution of forested stands and the Fire Hazard Ratings for those forested stands in the project area.

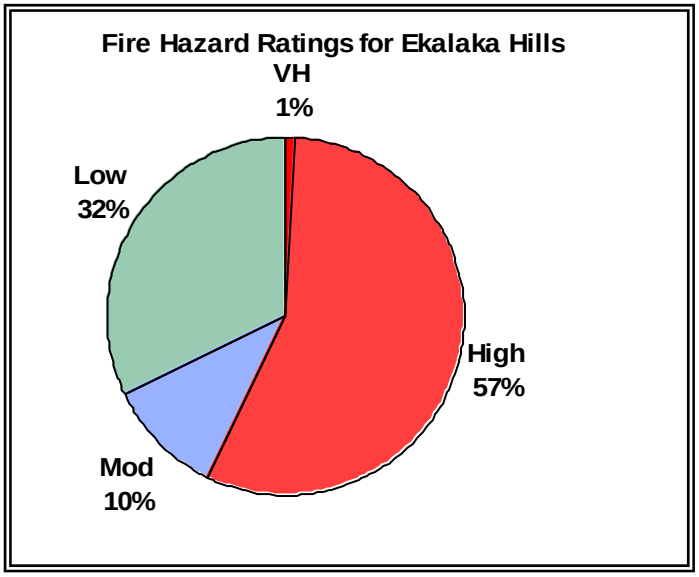


Figure 6: Fire Hazard Ratings in Ekalaka project area.

1.2.3 Forest Stand Condition

Stands within the project area were also assigned a ranking for forest stand condition that indicates the degree at which the current stand conditions depart from the desired stand conditions. Currently the stand conditions are characterized by overly dense canopy cover (ie: greater than 40%), high number of trees per acre, and the tree spacing is very close (See Table 1 below).

Table 1: Current and Desired Stand Conditions

	Canopy Cover		Spacing between Trees In feet
	Range	Trees per Acres	Range
Current	40-98%	110-10,000	2-20
DFC	30-45%	30-80	23-36

High departure from desired condition stands exhibit conditions that have a lower resilience and presently exceed the ability to survive disturbance without long term loss of functional or structural elements. Moderate departure stands would exhibit high departure conditions within 20 years. Approximately 68% of stands are rated high departure from desired condition and 6% of stands are rated moderate departure from desired condition. Approximately 26% of stands are rated low departure from desired conditions and do not need treatment at this time. Of the low departure stands, over 60% of them were treated during the 1990s to break up the continuity of fuels and now have a single storied, open grown structure. Table 2 and Figure 7 display the percentages of each departure

class for the project area. **Appendix A-Map #1d** shows the distribution of each departure class in the project area.

Table 2: Forest Stand Condition		
Departure Rating	Approximate Acres	% of Area
Low Departure from Desired Conditions	3540	26%
Moderate Departure from Desired Conditions	770	6%
High Departure from Desired Conditions	9160	68%

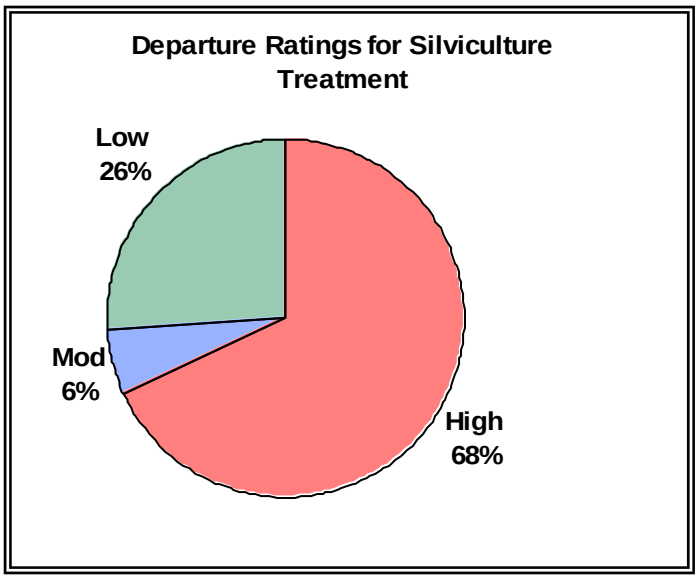


Figure 7: Departure Ratings for Silviculture Treatment in Ekalaka Hills project area.

1.3 Project Goals

The goals of this project proposal would be to:

1. Reduce severity of future wildland fire in the Ekalaka Hills by reducing existing fuel loading and provide a safer fire suppression environment. Reduce the amount of Fire Condition Class 3 or 2, and increase the amount of Fire Condition Class 1.
2. Address concerns over forest health and fire hazard,
3. Begin the process of restoring fire to its natural role,
4. Improve timber stand health, vigor, and resistance to fire, insect, and disease,
5. Maintain a distribution of age classes that is more resistant to high-intensity stand replacing fires,
6. Apply mechanized harvesting systems and equipment appropriate to silviculture prescriptions, and also to match harvesting systems and equipment to the terrain and timber conditions,
7. Protect private property in and around National Forest System lands in the Ekalaka Hills Land Unit, and

8. Ensure that any commercial harvesting proposal with roads results in a viable bid offer from the timber industry.

1.4 Project Area Description

The closest town to the project area is Ekalaka, MT, about 2 miles to the north of the Ekalaka Hills Unit project area. The Sioux Ranger District is located in the southeast corner of Montana and the northwest corner of South Dakota.

The entire Ekalaka Hills Unit is approximately 21,500 acres with about 18,000 acres of National Forest System lands. The land unit functions as an "Island" with forested vegetation within a landscape of short grass prairie ecosystem. The areas managed by the Sioux Ranger District consist of several of these forested islands and they are extremely important for biodiversity of wildlife species and the forested habitats that are present. A forest cover dominated by ponderosa pine covers approximately 70% of the analysis area. Juniper woodlands, woody draws (consisting of aspen, box-elder and green ash), grasslands, and other non-forested vegetation types cover the other 30% of the public lands. A large, high intensity wildland fire could convert the remaining mid-aged and late seral-forested stands in the Ekalaka Hills to a landscape dominated by early seral conditions. Previous forest management activities in early 1990's developed fuelbreak treatment areas along the major roads in the project area. Some of those existing fuelbreaks need follow-up treatments (prescribed burning) to maintain their effectiveness as fuelbreaks. Elevations range from 3,500 at Ekalaka, MT, to approximately 4,100 feet in the Ekalaka Hills Unit.

1.5 Proposed Action In Brief

A proposed action was developed from a thorough analysis of the desired and existing conditions of the project area. The proposed action presented to the public was well defined and gave the public and other agencies specific information on which to focus comments. Using these comments *(See discussion of issues later in this chapter)*, and information from preliminary analysis, the interdisciplinary team developed additional project design measures for the proposed action. These design measures are listed in Chapter 2.

The Custer National Forest-Sioux Ranger District proposes hazardous fuels reduction treatments that include commercial thinning, non-commercial thinning, pre-commercial thinning, prescribed fire, aspen stand rejuvenation, and activity fuels abatement on approximately 8,525 acres of National Forest System Lands in response to the purpose and need for action. Activity fuels abatement includes treatments such as lopping, activity fuels underburning, and whole tree yarding. Commercial thinning would use only tractor yarding methods. No new system roads would be needed, but temporary roads would be used to access the commercial thinning acres. Actions included in this proposal are summarized briefly in Table 3 Chapter 2 has a detailed description of the Proposed Action and project design measures. A detailed map showing the management activities planned for the proposed action is found in Appendix A-Maps #2a-#2b.

Table 3: Alternative 2-Proposed Action Treatments	
Vegetation Treatments	Acres[1]
Commercial thinning (with follow-up non-commercial thinning and activity fuels treatment)	4,870
Non-commercial thinning (with follow-up activity fuels treatment)	2,480
Pre-commercial thinning	575
Aspen rejuvenation	120
Natural fuels underburning	480
Total acres treated	8,525
Road Management Activities	Miles[1]
Maintenance on existing FS system roads	71.0
Reconditioning on existing FS system roads	12.0
Reconstruction on existing FS system roads	7.9
Proposed temporary roads, existing FS system roads[2]	4.7
Temporary road construction[2]	26.3

[1] Treatment acres and road miles are rounded from actual GIS data.
[2] Temporary roads would be closed and decommissioned after use.

1.6 Relationship to Forest Plan and Other Management Direction

The Ekalaka Hazardous Fuel project as proposed at this time, responds to goals and objectives of the National Fire Plan and the National 10-Year Comprehensive Strategy. Additionally, the Ekalaka Hazardous Fuel Project responds to the direction and objectives found in the 1987 Resource Management Plan (Forest Plan) for the Custer National Forest, and the 1998 Forest Service Northern Region Overview.

1.6.1 National Fire Plan

In April of 1999, the General Accounting Office (GAO) released a report on forest health problems in the West[3], and recommended that the Forest Service, Bureau of Land Management, and other Federal agencies develop a strategy to address the large wildland fires occurring in the interior West. In September 2000, in response to a request by President Clinton, the Secretaries of Agriculture and Interior developed an interagency approach to respond to severe wildland fires, reduce their impacts on rural communities, and assure sufficient firefighting capacity in the future. This report[4] outlined a strategy to reduce wildland fire threats and restore forest ecosystem health in the interior West. The strategy builds on the premise that within fire-adapted ecosystems, reducing fuel levels and using fire at appropriate intensities, frequencies, and time of year are key to restoring healthy, resilient conditions; sustaining natural resources; and protecting people. On September 9, 2000, President

[3] *Western National Forests. A Cohesive Strategy is Needed to Address Catastrophic Wildfire Threats*. April 1999 GAO report # GAO/RCED-99-65.. (available at- http://www.gao.gov/\).

[4] *Managing the Impacts of Wildfires on Communities and the Environment*: A Report to the President In Response to the Wildfires of 2000 (available at http://www.na.fs.fed.us/nfp/overview/.

Clinton accepted the recommendations contained in the report and directed the two Secretaries to implement those actions. The Forest Service and the Bureau of Land Management developed and released that strategy and is collectively referred to as the National Fire Plan.

The National Fire Plan[5] addresses five key points: Firefighting; Rehabilitation and Restoration; Hazardous Fuel Reduction; Community Assistance; and Accountability. The fuel management and hazardous fuel reduction focus is critical to the Plan. It addresses overly dense forest vegetation that is the result of decades of fire exclusion from those lands. Fuel management activities would incorporate all types of treatments necessary to change stand condition classes (which reflect the level of damage that would result from a wildland fire on those lands) from higher risk condition classes to lower risk condition classes, and to maintain those areas in which a desirable condition class has been established. In addition, activities would focus on Wildland-Urban Interface[6] areas to reduce risk to people and property.

The Ekalaka Hazardous Fuel Project would respond to goals and objectives of the National Fire Plan including:

- Restore natural ecological system to minimize uncharacteristically intense fires.
- Reduce the threat to life and property from catastrophic wildland fires.
- Reduce the number of small fires that become large.

The Ekalaka Hazardous Fuel project would primarily address the key point of "hazardous fuel reduction" in the National Fire Plan.

1.6.2 Comprehensive Strategy-10-Year Plan

With the development of the National Fire Plan, Congress then directed the Agencies to develop a 10-year comprehensive plan that would require collaboration with the States, Tribes, local officials, and other interested publics to reduce wildland fire risks. In August of 2001, the Forest Service and the Bureau of Land Management released that strategy[7].

The primary goals of this Comprehensive Strategy are to:

1. Improve Prevention and Suppression,
2. Reduce Hazardous Fuels,
3. Restore Fire-Adapted Ecosystems, and
4. Promote Community Assistance.

The Ekalaka Hazardous Fuels project would address all goals of the Comprehensive Strategy.

[5] National Fire Plan website: http://www.fireplan.gov/

[6] Wildland Urban Interface (WUI) is defined as that area where private land and public land mingle and homes, property and lives are at risk from large wildfires. WUI protection zones have been defined in several places as anywhere from ¼ to 1-mile radius from private property.

[7] A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment-10-Year Comprehensive Strategy. Aug. 2001. (Available at: http://www.fireplan.gov/).

1.6.3 Northern Region Overview

In response to the Forest Service Natural Resource Agenda[8] the Northern Region of the Forest Service completed a Northern Region Overview[9] *(October 1998)* that described the situation in the Region with regard to ecosystem health and made recommendations to implement the Natural Resource Agenda. The ponderosa pine forest systems were recognized as systems at high risk due to fire suppression and past logging practices that removed the larger trees and left the smaller less fire resistant trees. The opportunity was noted for vegetation management (including timber harvest) and prescribed fire being used to improve ecosystem health. Management tools identified for restoration of species at risk includes vegetation treatment (such as timber harvest), tree stocking reduction (thinning), prescribed fire, road improvement, and road obliteration.

The actions being proposed for the Ekalaka Hazardous Fuel Project are consistent with the direction in the Northern Region Overview.

1.6.4 Custer National Forest Plan

The Forest Service has two types of decisions: programmatic (e.g., the Forest Plan) and project level that implements the Forest Plan. The Ekalaka Hazardous Fuel EA is a project-level analysis and its scope is confined to addressing the issues and possible environmental consequences of the project. It does not attempt to address decisions made at a programmatic level.

The Forest Plan embodies the provisions of the National Forest Management Act of 1976, its implementing regulations, and other guiding documents. The Forest Plan sets forth in detail the direction for managing the land and resources of the Custer National Forest. Where appropriate, the Ekalaka Hazardous Fuel Project EA also tiers to the Forest Plan Final Environmental Impact Statement (*USDA Forest Service 1987).*

1.6.4.1 Forest wide Management Direction

The Ekalaka Hazardous Fuel project meets the objectives of the relevant Forest Plan goals and objectives, including timber management (FP pp 4-5), fire-fuels management (FP p. 5) and wildlife management (FP pp 3-4). The complete list of forest wide management direction goals and objectives are found in the Forest Plan pg. 3-8.

1.6.4.2 Forest wide Standards and Guidelines

The Ekalaka Hazardous Fuel project meets the relevant Forest Plan standards and guidelines, including timber management (FP pp 24-25) and fire-fuels management (FP pp. 38-39). The complete list of forest wide standards and guidelines are found in the Forest Plan pg. 12-38.

1.6.4.3 Management Area Direction

The Forest Plan uses Management Areas (MA) to guide management of the national forest lands within the Custer National Forest. Each management area provides for a unique combination of activities, practices and uses. The Ekalaka Hazardous Fuel project area includes the following management areas:

---

[8] USDA Forest Service. Natural Resource Agenda for the 21st Century. March 1998. (Available at- http://www.fs.fed.us/news/agenda/)

[9] USDA Forest Service. October 1998. *Northern Region Overview Detailed Report and Summary* – October 1998: Northern Region, Missoula, Montana. 187 pp.

Table 4: Forest Plan Management Areas1 in project area		
Management Area	Emphasis	Acres in Project Area
Management Area B	Livestock grazing	9,740 acres
Management Area C	Key Wildlife Habitats	Unmapped acres [1]
Management Area D	Wildlife diversity	4,200 acres
Management Area F	Recreation	135 acres
Management Area G	Timber management	4,630 acres
Management Area M	Riparian areas	Unmapped acres
Management Area N	Woody draws	Unmapped acres
Management Area P	Administrative Facilities	40 acres

[1] Management Areas C, M, and N occur as unmapped inclusions in Management Areas B, D, and G.

The Ekalaka Hazardous Fuel project is consistent the direction for all management areas. The Custer Forest Plan contains a detailed description of each management area and direction on pp. 41-98. See Appendix A-Map #1e for map showing management areas in the project area.

1.7 Public Involvement

The Council on Environmental Quality (CEQ) defines scoping as "an early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action" (40 CFR 1501.7). Among other things, the scoping process is used to invite public participation, to help identify public issues, and to obtain public comment at various stages of the environmental analysis process. In addition to the following specific public involvement activities, the Ekalaka Hazardous Fuel project has been listed on the Custer National Forest Schedule of Proposed Actions (SOPA) since January 2004. Scoping has included coordinating with Carter County Commissioners, Bureau of Land Management, tribal governments, and adjacent landowners.

1.7.1 Public Mailing

On December 19, 2003, a letter providing detailed information on the proposed action in the Ekalaka Hills Land Unit was mailed to approximately 100 individuals and groups, including federal, state, and local agencies, and affected Indian tribes. A total of twenty-one (21) responses to this mailing were received. A content analysis was conducted on the scoping comments. The content analysis is a compilation of comments from public scoping and shows how comments were used to develop any significant or tracking issues, alternatives to the proposed action, and any additional project design measures. The content analysis with the initial mailing list, public comments received and the IDT responses to those comments are in project files

1.7.2 Local News Media

Announcements and notices about the project and requesting public scoping comments were published in the Ekalaka Eagle (January 09, 2004).

1.7.3 Custer National Forest Website

The Ekalaka Hazardous Fuel project was posted on the Custer NF website at: (http://www.fs.fed.us/r1/custer/, and scoping information and maps were available to the public effective December 19th, 2003. The January-2004 Schedule of Proposed Actions (SOPA) for the Custer NF noted the Ekalaka Project and was posted on the Custer NF website.

1.8 Issues

Scoping is used to identify issues that relate to the effects of the proposed action. An issue is a dispute or debate about the effects on a physical, biological, social, or economic resource as a result of the proposed action. The Interdisciplinary Team reviewed these issues and categorized them into three groups:

1. Significant Issues- Issues significant to the analysis.
2. Tracking Issues- Issues not considered significant, but still important to track.
3. Non-significant Issues eliminated from detailed analysis.

Additionally, an indicator for each significant or tracking issue is used to allow comparison of effects among the alternatives. Each issue/indicator would be listed in the alternative comparison table at the end of Chapter 2, and would also be discussed in detail in the resource section noted after the identification of the issue indicator.

1.8.1 Significant Issues

There were no issues determined to be significant as prescribed in 40 CFR 1502.2. Therefore, no additional alternatives to the proposed action were developed to address significant issues. All other issues or concerns from internal IDT processes and external public scoping were addressed using project design measures for the proposed action. Project design measures are developed to reduce environment effects and comply with laws, regulation and policy. See the tracking issue discussion in the next section for the list of those issues. The issue identification process is documented in the project files.

1.8.2 Tracking Issues (Non-Significant Issues)

Tracking issues are issues that were not considered significant, but were determined to be important to the public for tracking effects or resolution of the issue. Tracking issues are generally of high interest or concern to the public or are necessary to understand the full extent of the alternatives. Tracking issues provide additional information for the analysis but do not drive the formulation of alternatives. Project design measures for each alternative would address concerns raised by the tracking issues. The following are tracking issues relevant to this analysis, and indicators to measure the effects of the alternatives are presented. The section of this environmental analysis document where the tracking issue and indicator(s) are discussed in detail is noted.

1.8.2.1 Tracking Issue #1: Northern Goshawk

There is a concern that the proposed action may have an effect on goshawk habitat, nest sites and territories within the project area. During the development of the proposed action, numerous project design measures were adopted to protect suitable goshawk habitat, nest sites, and both post-fledging

and foraging territories. See Chapter 2 for the detailed list of these measures. The indicator below would be used to measure impacts (both positive and negative). *(See Wildlife Section in Chapter 3)*

- **Indicator**: Maintenance of Suitable habitat for goshawk.
- **Indicator**: Number of Goshawk nest sites.
- **Indicator**: Maintenance of Post-fledgling (PFA) habitat.

1.8.2.2 Tracking Issue #2: Late Successional Forest Habitat

There is a concern that the proposed action may have an effect on late successional habitat within the project area. Forest Plan direction is to provide for a variety of habitats for indicator species, this includes late successional habitat (mature and old forest). To be consistent with the purpose of the project and the Forest Plan, the Forest Service must determine if, and to what extent, the treatment of hazardous fuels in the project area would affect late successional habitat. During the development of the proposed action, project design measures were adopted to protect areas of late successional habitat. The indicator below would be used to measure impacts (both positive and negative). *(See Forest Vegetation Section in Chapter 3)*

- **Indicator**: % of the project in late successional habitat (mature and old forest) in year 2024.

1.8.2.3 Tracking Issue #3: Long-Term Soil Productivity - Coarse Woody Debris (CWD)

There is a concern that the proposed action and alternatives to the proposed action may have an effect on long-term soil productivity by an inadequate amount of coarse woody debris left on site after treatments. A project design measure was incorporated into the proposed action that would require a range of 3-7 tons/acres of CWD left in treated stands. The indicator below would be used to measure impacts both positive and negative. *(See Watershed/Soils Section in Chapter 3).*

Indicator: Coarse Woody Debris (tons/acre), on average, left in treated sites.

1.8.2.4 Tracking Issue #4: Noxious Weeds

There is a concern that the proposed action may have an effect on the spread of noxious weeds within the project area. The invasion of treatment areas by noxious weeds is a concern because they compete with native grass, shrubs, and tree species for occupation of a site, make regeneration difficult and costly, and can be harmful to domestic stock and wildlife. Project design measures for control of noxious weeds were adopted for the proposed action. The indicator below would be used to measure impacts (both positive and negative). *(See Range/Noxious Weeds Section in Chapter 3)*

- **Indicator**: Potential increase of noxious weeds (acres).

1.8.3 Issues Eliminated from Detailed Analysis

The following issues or resource areas were considered in the determination of significant or tracking issues. However, they were determined to be requests for information or other process issues, were already resolved through existing law, regulation, or policy, or are beyond the scope of this analysis. Some are already addressed through other processes such as the Forest Plan. The complete analysis of issue identification and resolution is located in the project record.

1.8.3.1 Issue Not Studied In Detail #1: Inventoried Roadless Areas (IRAs) or Unroaded Areas.

There was a concern that the proposed action may have an effect on roadless or unroaded areas.

Resolution: There are no IRAs in or adjacent to the project area. There are no roadless areas located on the Sioux Ranger District including the Ekalaka Hills Land Unit and project area (See Forest Plan FEIS Appendix C – Roadless Area Evaluation, p. 133; and Forest Service Roadless Area Conservation Final Environmental Impact Statement, Volume 2 – Maps of Inventoried Roadless Areas, pgs. 103 and 106. There are no unroaded areas of 1000 acres or more in the area. This issue would not be studied in detail or discussed in the Chapter 3 of this EA.

1.8.3.2 Issue Not Studied In Detail #2: Effect on Fish Species or Habitat

There was a concern that the proposed action may have an effect on fish species or habitats in the project area.

Resolution: There are no perennial streams in the project area, and therefore, there are no fish species of concern for the project area. This issue/resource area would not be studied in detail or discussed in Chapter 3 of this EA.

1.9 Decision Framework

Based on the environmental analysis in this environmental assessment, the Custer National Forest responsible official would decide whether and how to reduce fuel loading, reduce wildfire risk to private property and to reduce the overall risk of stand-replacing wildland fire in the Ekalaka Hazardous Fuel Project area in accordance with Forest Plan goals, objectives and desired future conditions. The responsible official would decide whether or not to implement the proposed action, a modified action alternative, or the no action alternative. If the decision is to implement a new action the responsible official would also decide on any mitigation or monitoring actions that would occur. A decision is currently scheduled for summer of 2004 and project implementation would be scheduled to start in 2005.

Additional documentation, including more detailed analyses of project-area resources, may be found in the project planning record located at the Custer National Forest-Sioux Ranger District, P.O. Box 37, Camp Crook, South Dakota 57724. For information contact John Clark at phone # 605-797-4432. Additionally the NEPA environmental document (EA) is available on the Custer NF web site at: http://www.fs.fed.us/r1/custer/.

This page contains a graphic only

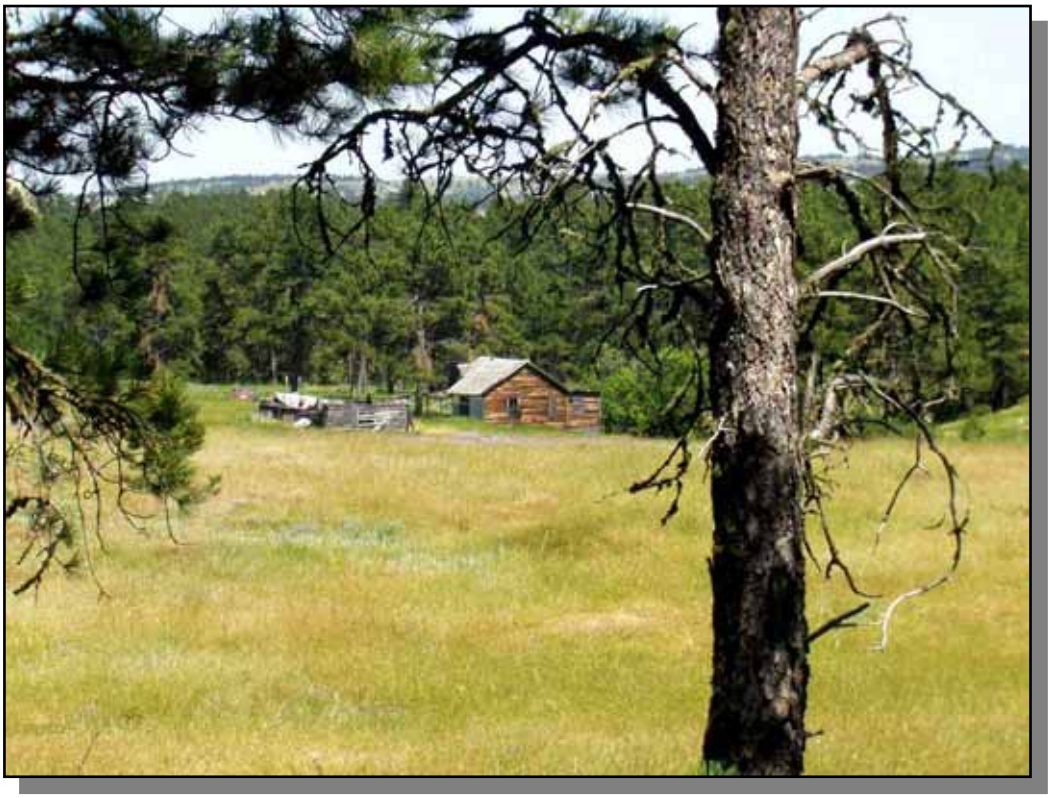


Figure 8: Photograph of historical home-site and cabin, northeast portion of Ekalaka Hills.

2 Chapter: Alternatives, Including the Proposed Action

2.1 Introduction

This chapter describes and compares the alternatives considered by the Forest Service for the project area. It includes a discussion of how alternatives were developed, a description and map of each alternative considered in detail, a list of integrated project design measures, alternatives considered but not studied in detail, and a comparison of these alternatives focusing on the issues and resource indicators. Chapter 2 is intended to present the alternatives in comparative form, sharply defining the issues and providing a clear basis for choice among options by the responsible official and the public (40 CFR 1502.14).

Some of the information used to compare alternatives at the end of Chapter 2 is summarized from Chapter 3-Environment and Effects. Chapter 3 contains the detailed scientific basis for establishing baselines and measuring the potential environmental consequences of each of the alternatives. For a full understanding of the effects of the alternatives, readers would need to consult Chapter 3.

2.2 Alternative Development Process

The Forest Service interdisciplinary team (IDT) used information from scoping, including the issues identified for the project in conjunction with the field-related resource information to formulate and modify the proposed action. In addition, alternatives considered but eliminated from detailed study are presented in this chapter. The alternatives analyzed in detail, and those alternatives considered but eliminated from detailed study, constitute the range of alternatives for this analysis.

2.3 Alternatives Considered But Eliminated From Detailed Study

Federal agencies are required by NEPA to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). Public comments received in response to the proposed action provided suggestions for alternative methods of achieving the purpose and need. Some of these alternatives may have been outside the scope of the project intent, duplicative of the alternatives considered in detail, or determined to be components that would cause unnecessary environmental harm. Therefore, a number of alternatives were considered, but dismissed from detailed consideration for reasons summarized below.

2.3.1 Use of Prescribed Fire Only

An alternative was proposed that would use only prescribed fire as a management activity. This alternative was considered; however, many of the forest stands in the project area that need thinning

are overly dense and a prescribed fire without pre-treatment by mechanical thinning and fuels reduction would result in tree mortality among the mid-aged size class of trees or the risk of a prescribed fire escaping control. Prescribed fire is used to treat some stands in the proposed action alternative; however, those are stands that are currently less dense and would not result in tree mortality. For these reasons, this alternative was eliminated from detailed study.

2.3.2 Non-Commercial Thinning Only and No New Temporary Roads

An alternative was proposed that would use only non-commercial thinning to accomplish management objectives. No temporary roads would be needed for this alternative. This alternative was considered and non-commercial thinning is an activity in the proposed action alternative. However, some forest stands need thinning of the mid-aged canopy trees to space trees apart to reduce the fire hazard of a canopy wildfire. Non-commercial thinning only would result in some stands with very high levels of post-activity fuels on the ground that would create an increased short-term fire hazard. In addition, this alternative would not recover any of the economic value of the thinned trees in the commercial size class (> 9" diameter) and would be much more expensive to implement due to costs for thinning crews and fuels reduction treatments. For these reasons, this alternative was eliminated from detailed study.

2.3.3 Treat All Forest Stands In Project Area with High or Moderate Fuel Hazard

An alternative was proposed that would maximize treatments on all forest stands in the Ekalaka Hills that are noted as having very high, high or moderate fuel hazard. Although the primary purpose and need for action is to reduce fuel hazard ratings in the Ekalaka Hills, other resource areas such as wildlife habitat and watershed/soils need to be considered. The forested stands selected for treatment in the proposed action alternative placed a priority on those stands closest to the wildland urban interface or private lands, and an emphasis on breaking up continuous forest stands with very high, high or moderate fuel risk across the entire landscape of the Ekalaka Hills. Small amounts of very high, high or moderate fuel hazard stands that are bordered by treated stands with a low fuel hazard would reduce the overall fire risk for a large wildfire. In addition, this alternative would not meet Custer Forest Plan standards and guidelines for maintaining goshawk habitat on the project area. Goshawks need dense, multi-storied forest stands for nesting habitat and many of these stands are rated as high fire hazard due to the dense tree conditions. For these reasons, this alternative was eliminated from detailed study.

2.3.4 Treat Only WUI Stands Using Direction in the Healthy Forests Restoration Act (HFRA, 2003)

An alternative was proposed that would only treat in the stands identified within the Wildland-Urban Interface (WUI) as noted in the Healthy Forests Restoration Act (HFRA) of 2003. This alternative was considered, however many of the forest stands in the project area that need thinning to reduce fuel hazards are outside the WUI area (defined in HFRA as 1 ½ mile radius from an occupied area). Other criteria noted by HFRA were not present to justify needed fuel reduction treatments, including presence of Threatened and Endangered Species habitat, a municipal water supply system, or a current epidemic outbreak of insects or disease. Several of the project objectives would not be met for the overall forest stand health and fuels reduction needs in forested stands in the entire Ekalaka Hills land

unit by restricting fuels reduction treatments to the WUI area only. For these reasons, this alternative was eliminated from detailed study.

2.4 Alternatives Considered In Detail

There are two (2) alternatives considered in detail for this analysis:

Table 5: List of Alternatives

1.	Alternative #1-No Action, is the baseline for comparing the other alternatives. The proposed management actions would not occur in the project area at this time, and the project area would remain subject to natural events and ongoing management activities.
2.	Alternative #2-Proposed Action, is the agency proposal for vegetation treatments, fuel treatments, and roads management activities. This alternative was developed to meet the purpose and need for action and accomplish the project objectives.

2.4.1 Alternative #1-No Action

The Council on Environmental Quality (CEQ) regulations (40 CFR 1502.14d) requires that a "no action" alternative be analyzed. This alternative represents the existing and projected future condition against which the other alternatives are compared. The management activities that are proposed would not occur; however, it does not preclude ongoing activities in this or other areas or management proposals for the area at some time in the future. Alternative 1, the No Action, is represented by the current distribution of fire condition classes, fire hazard ratings and departure from desired condition and needing silviculture treatment (See Appendix A-Maps #1a-c).

2.4.2 Alternative #2-Proposed Action

The proposed action was designed by the agency to respond to the purpose and need for management and the project objectives to reduce fuels and the risk of stand replacing wildfire to the forested stands in the project area as described in Chapter 1. Additionally, this alternative responds to the National Fire Plan by treating the Wildland Urban Interface area, and responds to 10-Year Comprehensive Strategy by reducing hazardous fuels and restoring fire-adapted ecosystems.

Detailed maps showing the management activities planned for the proposed action are found in Appendix A-Maps #2a-#2b. All project design measures for Alternative #2 are described in this chapter.

This alternative would move the project area towards the desired condition with non-commercial thinning, commercial thinning, prescribed fire, and activity fuels treatment on approximately 8,525 acres. See Table 6 below for a summary list of project activities.

Table 6: Alternative 2-Proposed Action Treatments

Silviculture Treatments	Acres[1]
Commercial thinning (with follow-up non-commercial thinning and activity fuels treatment)	4,870
Non-commercial thinning only (with follow-up activity fuels treatment)	2,480

Table 6: Alternative 2-Proposed Action Treatments	
Pre-commercial thinning	575
Aspen stand restoration	120
Natural fuels under burning	480
Total acres treated	8,525
Road Management Activities	Miles[1]
Maintenance on existing FS system roads	71.0
Reconditioning on existing FS system roads	12.0
Reconstruction on existing FS system roads	7.9
Proposed temporary roads, existing FS system roads[2]	4.7
Temporary road construction[2]	26.3

[1] Treatment acres and road miles are rounded (up/down) from actual GIS data.
[2] Temporary roads would be closed and decommissioned after use.

2.4.2.1 Vegetation Treatments

Commercial thinning would reduce stand density to tree crowns spaced to reduce the fuel hazard rating to at least moderate and low if possible. The commercial thinning would be accomplished by tractor yarding on slopes of approximately 35% or less. These same stands would also have some post-harvest felling of non-commercial size trees (ladder fuels) and subsequent fuel treatments to reduce the activity fuels created by the commercial and non-commercial thinning treatments. Activity fuels would be reduced by using a variety of methods in combination, including whole tree yarding during harvest, and mechanical/ or / hand piling/burning, or prescribed burning after harvest. Mechanical fuels treatments would occur on slopes less than or equal to 35% in most cases. See Table 7 and Table 8 below for details of the treatment prescriptions.

Non-commercial thinning would remove small understory trees (ladder fuels) and reduce density. Overstory trees and commercial size trees would be left. Thinning would be completed using mechanical methods on slopes less than or equal to 35% if feasible. On slopes greater than 35% thinning would be primarily by hand cutting. Thinning activity fuels would be reduced by mechanical or hand piling/burning, and prescribed burning. Mechanical fuels treatments would occur on slopes less than or equal to 35% in most cases.

Aspen Stand Restoration would remove the ponderosa pine overstory where it overtops stands of aspen. Mechanical thinning and fuels treatments would be used on slopes less than 35%, and hand cutting and piling on slopes over 35%. Ponderosa pine trees would be removed from the stand using commercial harvest or non-commercial thinning.

Natural fuels/prescribed fire would reduce natural fuel loading and reintroduce natural fire to stands. These treatments could occur at times of the year to meet management objectives.

Table 7: Treatment Prescriptions	
Fuels Reduction for Wildland-Urban Interface (WUI)[1]	Acres

Table 7: Treatment Prescriptions	
CT – WUI (Commercial Thinning in Wildland-Urban Interface) • Thin from below to a canopy cover range of 30-45% (goal of 40%) leaving all healthy trees greater than 16 inches diameter. • Approximate average conditions of residual stand where available: o Trees per acre greater than 9" diameter: 30-80; Trees per acre 5"-9": 0-100 o Spacing between trees: Range of 23 feet to 36 feet, average of 31 feet o Fuel Loading - Fuels reduced to a range of 3-5 tons/acre, of which 0 – 3 inch diameter does not exceed 2 tons/acre, and 3 – 12 inch plus diameter (CWD), with 50% being 12" and larger when available, is a minimum of 3 tons/acre. o Target Fuel Hazard Rating: Low	610 acres
NC – WUI (Non-commercial Thinning in Wildland-Urban Interface) • Thin from below in the 0 to 9 inch diameter size class to a canopy cover range of 30-60% (goal of 40%). • Approximate average conditions of residual stand: o Trees per acre greater than 9" diameter: 25-160; Trees per acre 5"-9": 0-100 o Spacing between trees: Range of 16 feet to 43 feet, average of 25 feet o Fuel Loading – Fuels reduced to loading described for CT- WUI above; however, increases in disposal treatment due to an expected heavier loading in the 3 – 9 inch diameter fuels. o Target Fuel Hazard Rating: Low	280 acres
Fuels Reduction and Forest Health Treatments in non-WUI Forested Stands	Acres
CT – Commercial Thinning • Thin from below to a canopy cover range of 30-45% (goal of 40%) leaving all healthy trees greater than 16 inches diameter. • Approximate average conditions of residual stand where available: o Trees per acre greater than 9" diameter: 30-80; Trees per acre 5"-9": 0-100 o Spacing between trees: Range of 23 feet to 36 feet, average of 31 feet o Fuel Loading - reduced to a range of 3-7 tons/acre, of which 0 – 3 inch diameter does not exceed 3 tons/acre, and 3 – 12 inch plus diameter (CWD), with 50% being 12" and larger when available, is a minimum of 4 tons/acre. o Target Fuel Hazard Rating: Low	1,575 acres
NC – Non-commercial Thinning • Thin from below in the 0 to 9 inch diameter size class to a canopy cover range of 30-60% (goal of 40%). • Approximate average conditions of residual stand: o Trees per acre greater than 9" diameter: 25-160; Trees per acre 5"-9": 0-100 o Spacing between trees: Range of 16 feet to 43 feet, average of 25 feet o Fuel Loading - Fuels reduced to loadings described for CT Treatment noted above; however, loading of 3-9 inch diameter fuels would be somewhat higher than CT treatment above. o Target Fuel Hazard Rating: Low (upper end of low rating).	1,450 acres
PCT – Precommercial Thin • Thin sapling size class (1-5" diameter) to a density of 125 to 260 trees per acre and pole size class (5-8" diameter) to a density of 125-200 trees per acre, leaving the fastest growing, disease free and damage-free trees.	575 acres
Forest Diversity Treatments in non-WUI stands	Acres

Table 7: Treatment Prescriptions	
CT1 – Commercial Thin 1 (Modified CT for wildlife habitat and vegetative diversity) • Thin from below to a canopy cover range of 40%-60% within 10 years of harvest leaving all healthy trees greater than 16" diameter. • Approximate average conditions of residual stand where available: o Trees per acre greater than 9" diameter: 40-150; Trees per acre 5"-9": 0-100 o Spacing between trees: Range of 17 feet to 33 feet, average of 26 feet o Fuel Loading - Fuels reduced to a range of 3-7 tons/acre, of which 0 – 3 inch diameter does not exceed 3 tons/acre, and 3 – 12 inch plus diameter (CWD), with 50% being 12" and larger when available, is a minimum of 4 tons/acre. o Target Fuel Hazard Rating – Low to low end of Moderate	1,900 acres
CT2 – Commercial Thin 2 (Modified CT for wildlife habitat and vegetative diversity) • Thin from below to a canopy cover range of 55%-70% (goal of greater than 60%) within 10 years of harvest leaving all healthy trees greater than 16 inches diameter. • Approximate average conditions of residual stand where available: o Trees per acre greater than 9" diameter: 65-160; Trees per acre 5"-9": 0-100 o Spacing between trees: Range of 16 feet to 26 feet, average of 22 feet o Fuel Loading - fuels reduced to same as described for CT1 treatment. o Target Fuel Hazard Rating - Moderate (low end of Moderate hazard)	85 acres
NC1 – Non-Commercial Thin 1 (Modified NC for wildlife habitat and vegetative diversity) • Thin from below in the 0 to 9 inch diameter size class to a canopy cover range of 55%-70% within 10 years of thinning. • Approximate average conditions of residual stand: o Trees per acre greater than 9" diameter: 25-160; Trees per acre 5"-9": 0-100 o Spacing between trees: Range of 16 feet to 41 feet, average of 22 feet o Fuel Loading – fuels reduced to loading described in NC treatments; however, more loading of 3-9" diameter fuels would occur. o Target Fuel Hazard Rating – Moderate	750 acres
CT/SO – Commercial Thin with Small Openings • CT-1 or CT-2 treatments, with a series of 1-acre openings throughout the stand, to equal approximately 10% of the stand area.	700 acres
Prescribed Fire • Prescribed underburning is proposed for the initial disposal of woody biomass, lessen excessive numbers of seedling and saplings, and rejuvenate aspen where it is present within stands. • Maintenance burns every 10 to 15 years would be needed to provide a long-term low fuel hazard rating. • Burning prescription would be in conditions to meet management objectives and with an approved burn plan. • Burning prescription would result in less than 5% mortality of mature trees greater than 9 inches DBH	480 acres
Aspen Stand Restoration • Release aspen understory by removing overtopping and competing ponderosa pine trees.	120 acres
[1] Defined as ½ mile radius or the entire stands adjacent to the occupied areas	

Table 8: Approximate Post Treatment Stand Conditions

Treatment	Canopy Cover		Trees Per Acre 9" + Diameter	Tree Per Acre 5"- 9" Diameter	Spacing Between Trees (Feet)	
	Goal	Range			Range	Average
CT and CT-WUI	40%	30-45%	30-80	0-100	23-36	31
NC and NC-WUI	40%	30-60%	25-160	0-100	16-43	25
CT1	40-60%	40-60%	40-150	0-100	17-33	26
NC1	50%	40-70%	25-160	0-100	16-41	22
CT2	60%+	55-70%	65-160	0-100	16-26	22

2.4.2.2 Fuels Management Activities

Fuel management techniques within the WUI zone are designed to protect human communities from wildland fires as well as minimize the spread of fires while maintaining the structural characteristics of the forest stand. The management objective in the WUI zone is to enhance fire suppression capabilities by modifying fire behavior inside the zone and provide a safe and effective area for fire suppression activities.

Fuel treatments would be strategically placed across the landscape in a manner designed to interrupt wildland fire spread and reduce fire severity and intensity. Specifically, treatments would be designed to modify wildland fire behavior, thereby reducing spotting and lowering rates of spread and intensity. Treatment of fuels within the WUI zone, where fire hazard and risk are high, would be given priority.

Activity fuels abatement includes treatments such as lopping, underburning, and whole tree yarding, as appropriate. All management tools, including harvest of merchantable material, cutting, piling, and burning of non-merchantable material are part of this Proposed Action.

Commercial treatments would focus on the smallest trees first. Trees larger than 16 inches diameter that are dead or dying are also considered for removal but minimum levels of dead snags would be retained. Fuel loads would be reduced in all size classes and tree densities would be decreased creating a fire hazard rating of low.

The Proposed Action includes a modified CT for wildlife habitat and vegetative diversity. This phase of the project would also thin trees in the lower crown classes, but would retain a greater percentage of canopy cover (ranging from 40 to greater than 60 percent versus 40 percent in the previously described CT treatment). Trees would be retained at higher densities to accommodate wildlife habitat and promote vegetative diversity. The fire hazard rating for such stands would range from low to the low end of moderate.

Non-commercial (NC) thinning treatments, proposed for both the WUI and non-WUI project areas, would also remove trees in the lower crown classes to favor the trees in the upper crown classes. Non-commercial treatments are prescribed in stands with little or no commercial value or are on non-operable ground (e.g., slopes >35 percent). Residual tree densities would be somewhat higher than those within CT treatment areas and greater surface loadings of 3 to 9 inch fuels are anticipated. Non-commercial thinning treatment is also proposed for non-WUI stands to be managed for wildlife and vegetative diversity. Similar to the management actions proposed for CT1 and CT2 wildlife habitat and vegetative diversity stands, these NC stands would retain greater canopy cover (55 to 70 percent) and greater tree densities. Surface fuel loads would be reduced to the same levels as prescribed for the other NC treatment areas, but tree density and canopy cover levels would result in a fire hazard rating of moderate.

Pre-commercial thinning (PCT) would thin sapling size class (1 to 5 inch diameter) and pole size class (5 to 8 inch diameter) trees, selecting the faster growing, disease and damage-free trees as the residual stand components.

2 Alternatives

Prescribed fire underburning and pile burning is proposed as a means of fuels management throughout the project area following thinning activities. Prescribed fire under prescriptive conditions is proposed for, (1.) initial disposal of woody biomass, (2.) to decrease seedling and sapling densities and (3.) restore aspen (when present). Subsequent prescribed burns would be applied to the project area on a 10 to 15 year cycle as a means of maintaining a long-term low to moderate fire hazard rating.

The Proposed Action also includes an aspen restoration component. Aspen stands free of encroaching pine are fairly fire resistant and would reduce the overall fire hazard rating in those stands.

Fuel treatments involve a combination of methods: (1) removal of larger diameter material as a product, (2) disposal of slash from larger diameter material with whole-tree yarding and decking at landings, (3) disposal of landing slash decks by burning or as fuel wood, (4) combination of piling, burning or prescribed underburning of unused woody biomass on-site, and (5) lopping and scattering.

Some reduction of fuels would be accomplished by removal of larger diameter trees as a marketable product (i.e., trees ≥9 inch diameter), either as a timber sale, stewardship contract, or through firewood cutting. The National Fire Plan (2000) emphasizes disposal of woody fuels as a product. Piling, burning, or lopping and scattering and prescribed underburning would then be used to treat fuels remaining on site to meet Coarse Woody Debris guidelines. The end-result objective is to manage surface fuel conditions for the long-term through reducing fuel loading and breaking up the surface fuel arrangement/continuity.

Fuel treatment prescriptions would include the following:

- Whole tree yarding (WTY) for removal (disposal) of larger size fuels as a merchantable product. This treatment method would also remove a majority of the smaller size fuels from the site and be decked at the landing for disposal later by burning, unless other opportunities exist for fuel wood and/or wood fiber.
- Where existing trees are not a merchantable product, fuel treatment would be a combination of cutting, piling and burning, and in some cases, lopping, scattering and prescribed burning.
- Lopping/scattering is intended to reduce the fuel bed depth, leave some woody biomass on site, provide a discontinuous surface fuel arrangement, and accelerate decomposition by having the fuel in contact with the ground surface. Specifications are to cut limbs on three sides of the bole and sever the bole so resulting lengths are not more than 8 to 10 feet. The objective is a fuel bed height not more than 1 foot.
- Mechanical piling would be used to reduce the amount of unmerchantable biomass that would accumulate. Piling by grapple or similar machine would be used to reduce soil disturbance and compaction
- Maintenance prescribed underburns would consist of a surface fire spreading over 70 to 80 percent of the stand's area. Burning prescription would be of low heat intensity with flame lengths not exceeding the desired objective for management. The end-result appearance would be a patchy mosaic of burned and unburned areas. Fire spread would be minimized or would not occur where ground fuels are sparse and discontinuous. If heavier fuel accumulations occur (as a result of unexpected natural events), such concentrations would be burned prior to application of maintenance prescribed underburn.
- The intent of an underburn treatment is threefold: (1.) lessen the amount of 0 to 3 inch diameter surface fuels that have accumulated since the last treatment (fine fuels contribute to fire ignition and spread), (2.) ensure mortality of some regeneration that has already established as dense pockets, and (3.) stimulate the sprouting of hardwoods and aspen.

2.4.2.3 Road Management Activities

Road management activities include the following:

Table 9: Summary of Road Improvements

Road Activity	Miles
Reconstruction	7.9
Reconditioning	12.0
Temporary Road Construction	26.3
Existing System Roads Used as Temporary Roads	4.7
Timber Sale Related Maintenance	71.0

Roads listed in Table 10 need improvement, 7.9 total miles of these roads would be reconstructed. Reconstruction would include additional road width and turnouts, ditch reshaping, drive through dips with rock surfacing or armor, additional ditch-relief culverts and culvert replacements to increase both capacity and length, and gravel surfacing.

Segments of 17 roads would be reconditioned under the Timber Sale Contract to facilitate timber hauling. See Table 10 for miles of reconditioning by road number. Reconditioning would include blading, ditch cleaning, culvert cleaning, cutting vegetation back to widen road. Gravel and rock source would be from outside of the project area near Ekalaka.

Reconstruction is proposed for approximately 7.9 miles and reconditioning is proposed on 12 miles of existing system roads (See Table 10). About 71 miles of existing roads would be used for timber harvest and would be maintained under the timber sale contract to meet BMPs (Best Management Practices). Five miles of existing roads would be improved for timber hauling, then closed and re-vegetated after operations are complete. Twenty six miles of temporary road is needed to access harvest areas. These temporary roads would be closed, decommissioned, and re-vegetated after use (about one year). Appendix B has a complete detailed list of all road segments by road number and length and management need.

Table 10: System Road Improvement

Road Number	Reconstruction Miles	Recondition Miles
3071		0.7
3101B		0.9
3101E		1.2
3101E1		0.8
3102A	0.5	0.7
3104	2.6	0.1
31045		0.2
31049		0.9
3105		0.2
3108		0.7
3109		0.3
31092		0.3
3811	1.8	
38111		1.1
3811J		0.9
3813	1.1	
38133	0.2	
3813B		1.6

Table 10: System Road Improvement		
Road Number	Reconstruction Miles	Recondition Miles
3813B2		0.3
3814	1.7	1.1
Total	7.9	12.0

Road management definitions

Maintenance of Existing Roads – The ongoing upkeep of a road necessary to retain or restore the road to the approved road management objectives. Maintenance activities would involve drain dip construction and surface drain installation, culvert armoring, minor culvert installation and replacement, drop inlet installation, catch basin reshaping, road side brushing, and surface grading. The intention of this activity is to maintain the existing road features and bring the road into compliance with State of Montana Best Management Practice standards. Maintenance would be performed to the standard of each road's assigned Maintenance Level. Maintenance work would be included in the appraisal and would be done before, during, and after timber sale activities. System roads not associated with timber sale activities would be maintained under the annual district road maintenance program. Costs associated with these non-timber sale related roads would be provided for by annual road maintenance funds.

Reconditioning of Existing Roads – This activity is road improvement that is minor in nature. It includes removing log or earth barricades, fill and level water bars, and/or clear trees and brush, removal of down timber and debris from ditches and roadway. Remove bank slough that interferes with ditches and roadways and deposit on fill at designated locations. Construct drain dips as designed and staked on the ground. General road blading and ditch maintenance may be included. Cost allowance is included in the appraisal when performed under a timber sale contract.

Reconstruction of Existing Roads – Activities that result in improvement or realignment of an existing classified road as defined below:

- Road Improvement: activities that result in an increase of an existing road's traffic service level, expansion of its capacity, or change in its original design function.
- Road Realignment: activities that result in a new location of an existing road or portions of an existing road and treatment of the old roadway.

Reconstruction work includes minor earth work on cut and fill slopes, installations of drain dips or surface cross drains, culvert inlet armoring, culvert installation, catch basin reshaping, installation of berms, road side brushing or tree clearing, and spot surfacing. On roadways where brush and trees are established clearing and grubbing would be done. Reconstruction would improve road conditions to meet Best Management Practices standards and to bring the road into conformance with its intended maintenance level and function. Improvement work would be performed to ensure a suitable long-term running surface with reduced maintenance needs.

Existing Temporary: Improve for Timber Hauling and Decommission: These existing closed or roads grown over with vegetation would be reopened or improved for temporary use for timber hauling. Following use the roads would be decommissioned or obliterated and the road prism recontoured.

The intention of these treatments would be to use currently vegetated roads for timber haul and post sale activities and then obliterate the road prisms. These roads have been identified within the Ekalaka Roads Analysis Process (RAP) as "unneeded" for long-term access. Alternative routes or methods would be used to access these areas in the future. Because these roads would not be needed in the future, their prisms would be removed from the landscape.

Prior to haul, road improvements would include minor clearing and grubbing of brush and trees growing upon the road surface and shoulders, windrowing of cleared vegetation along the road edge, road surface grading, minor earthwork (cut and fill reshaping), ditch reshaping, the installation of drain dips and surface cross drains, and seeding and fertilizing. The roads would be maintained during project use to provide safe access, and to meet State of Montana BMPs during timber haul.

Following haul and completion of post-sale activities (e.g. burning, planting, fuel treatments), these roads would be decommissioned or closed. Decommissioning of the road would include full recontouring, replacing overburden (excavated soils) back onto the road prism to return the ground to its natural contour, removal of structures (culverts) and reshaping of draw crossings to natural contours, placing woody debris upon the disturbed area, and seeding and fertilizing the disturbed soil. This road work would be included in the timber sale contract and appraisal.

Temporary Road Construction – Roads that are built for temporary use would be constructed to minimum standards to provide access for harvest equipment and log trucks. These roads would generally be open one season or less and would be decommissioned after harvest activities are complete in the area. Construction cost would be included in the timber sale appraisal.

2.4.3 Project Design Measures for Alternative #2: Proposed Action

The analysis documented in this EA discloses the possible impacts that may occur from implementing the actions proposed under each alternative. Project design measures have been incorporated into the proposed action alternative design to reduce impacts on resources. Project design measures are an integral part of the alternative activities. These criteria were guided by direction from the Custer National Forest Plan, Montana Streamside Management Zone BMP's, Montana Forestry BMP's, USFS Region 1 Soil and Water Conservation Practices BMP's, USFS Region 1 Noxious Weed BMP's, and applicable Forest Service Manuals and Handbooks. Table 11 includes a complete list of the project design measures.

Table 11: Project Design Measures

Project Design Measure Item	Description of Project Design Measure
Fire and Fuels	

Table 11: Project Design Measures

Project Design Measure Item	Description of Project Design Measure
1.	Tree thinning slash would be piled and cured for at least 1 year prior to ignition of piles. • Purpose: to reduce smoke impacts on air quality when burning piles.
2.	Prescribed fire (pile burning and underburning) would be strategically scheduled to accomplish the burn safely and monitor smoke conditions. • Purpose: to reduce smoke impacts on air quality when burning slash piles
3.	Chipping and natural abatement of thinning slash would be encouraged where accessibility is possible. • Purpose: to reduce smoke impacts on air quality by reducing the amount of activities fuels that need to be burned.
4.	Mechanical treatments of downed material and green tree thinning should encourage biomass utilization wherever economically feasible. • Purpose: to reduce smoke impacts on air quality by reducing the amount of activities fuels that need to be burned.
Soil Productivity and Watershed Protection	
5.	Where fuel reduction by piling and burning is necessary, use low-ground pressure equipment such as a grapple/excavator. • Purpose: to protect residual trees and reduce impacts to soils. Mechanical piling by this means would lessen damage to residual trees and can leave partially decomposed woody material on the site for long-term site productivity.
6.	Implement applicable Forest Plan standards and guidelines, Montana Streamside Management Zone BMP's, Montana Forestry BMP's, and the Soil and Water Conservation Practices BMP's. • Purpose: to protect water quality and ensure future soil productivity
7.	Leave a range of 3 to 7 tons/acre of Coarse Woody Debris (CWD) in treatment areas. Where available this would include 50% in the size class greater than or equal to 12 inches diameter and at least 8 feet long. • Purpose: To ensure future soil productivity
8.	Use winter skidding when commercial harvesting in ephemeral draws. Forest Service would determine when frozen ground conditions are adequate for operations. . • Purpose: To reduce impacts to soils and water quality.
9.	Rip landings where burning of activity fuels is done. • Purpose: to mix soils where hot burn piles have sterilized soils.
10.	Duff moisture at 15-20% at time of prescribed under burning. • Purpose: to reduce impacts to soil quality by not consuming all the duff and/or micro-organisms in the soil
Wildlife Habitat and Species	
11.	Management activities within ¼ mile of any known goshawk nest would be restricted from March 1 through August 31 unless surveys confirm that goshawks are not nesting or within the area. • Purpose: To retain goshawk use in the project area. Goshawks are highly sensitive to disturbance from the nesting through the fledging period.
12.	If an active goshawk nest is discovered within a stand prior to or during treatment activities work should be halted and the wildlife biologist would be notified immediately to determine steps to resolve the situation. • Purpose: To retain the stand in suitable condition for goshawk use. Goshawks are highly sensitive to disturbance from the nesting through the fledging period.

Table 11: Project Design Measures

Project Design Measure Item	Description of Project Design Measure
13.	All potential nesting and lek habitat within 200 feet of proposed new temporary road construction shall be surveyed by spring 2005.
14.	If sharp-tailed grouse leks are discovered during temporary road construction , all activities within ¼ mile of the active site (within suitable habitat) would not be allowed to occur from April 1 through July 1 annually (if more than one season s required for activities to be completed). • Purpose: To avoid disturbance to any leks or nesting habitat. To maintain the sharp-tailed grouse population in this area.
15.	New temporary road construction would be located a minimum of 200 feet away from sharp-tailed grouse lek sites. • Purpose: To avoid disturbance to any leks or nesting habitat. To maintain the sharp-tailed grouse population in this area.
16.	Treat existing aspen clones in CT and PCT units to remove all ponderosa pine trees. • Purpose: To retain aspen on the landscape and to create habitat diversity that improves wildlife species diversity in the area.
17.	Leave existing snags greater than or equal to 12" diameter, which are greater than 75 feet from roads and/or private property, and are not a safety hazard during project implementation. • Purpose: Snags are limited within the project area. Snags are essential for both primary and secondary cavity users.
18.	Leave existing large tree (16" diameter or larger, 3+ trees) clumps for wildlife habitat and natural range of variability for PIPO stands. • Purpose: These clumps are limited in this project area. They provide valuable old growth structure for wildlife.
19.	Construct temporary roads at least 100-feet away from wet areas including seeps, springs, wet meadows, and riparian corridors (except at crossings when necessary). • Purpose: To help maintain habitat security for wildlife and preserve the integrity of these limited areas.
20.	Restrict mechanized equipment within 50-feet of wet areas: seeps, springs, wet meadows, and riparian corridors. • Purpose: To help maintain habitat security for wildlife and maintain habitat in these areas.
21.	Decommission all temporary roads within 6 months of unit completion. Where readily available, spread logging slash across decommissioned temporary roads in areas easily accessed by motorized vehicles to deter vehicle use. • Purpose: To help maintain habitat security for wildlife and deter motorized use. The longer the roads are open the less secure these areas are for wildlife. Once the roads are closed they can begin growing vegetation.
22.	When constructing temporary roads across dry grasslands, position the roads away from trees larger than 12 inches diameter, or prohibit their cutting or removal. • Purpose: This would reduce the potential for adverse impacts to western kingbirds and other species.
23.	If an active raptor nest is found during unit layout, it would be protected and buffered from planned activities. • Purpose: To protect and maintain raptor use in the project area.

Table 11: Project Design Measures

Project Design Measure Item	Description of Project Design Measure
24.	If an active raptor nest is discovered within a treatment unit, the Contract Administrator would seek cooperation from the contractor to delay work activities in this area until the young have fledged. • Purpose: To protect and maintain raptor use in the project area.
25.	If fawns and/or calves are found in active treatment units from the third week of May through the first week of July), individuals implementing the activity (Forest Service/contractor) would coordinate options with the project leader to work in other areas within the vicinity until the young are removed from the area. • Purpose: To protect fawns and calves and reduce impacts to deer and elk populations.
26.	Viable hiding cover within 75 feet of open roads or large openings would be retained where feasible. In cases where retaining cover would affect defensibility of the unit during wildfire, the cover would be removed. • Purpose: To help maintain wildlife security.
Noxious Weeds	
27.	Noxious weed surveys would be accomplished 1 year post-project on all open and closed system and temporary roads affected by the project activities as funding is available. • Purpose: To control, reduce, and minimize the spread of noxious weeds
28.	All off-road equipment used in conjunction with any fuel treatment, vegetation treatment and/or road building activities would be cleaned (washed) prior to coming onto the project area. The same equipment would be cleaned (washed) prior to moving from an infected unit to an un-infected unit within the project area. • Purpose: To control the spread of noxious weeds and protect against new noxious weed species. .
29.	Seed, straw, and other materials used for road decommissioning and erosion control would be certified as noxious weed free. • Purpose: To control the spread of noxious weeds and protect against new noxious weed species.
30.	As needed, temporary roads, landings, skid trails and similarly disturbed sites would be seeded with an approved seed mix after activities occur. • Purpose: To control the spread of noxious weeds and protect against new noxious weed species.
Heritage Resources	
31.	Heritage field inventories would be completed for temporary roads and landing locations outside of already surveyed and cleared units, planned landings and roads.. • Purpose: To protect known and unknown heritage sites from project activities that would cause adverse impacts.
32.	All sites within ground disturbing units would be reviewed by the Forest Archaeologist and individual treatment prescriptions assigned prior to ground disturbing activities. • Purpose: To protect known heritage sites from project activities that would cause adverse impacts.
33.	Forest Archaeologist would monitor all approved treatments affecting known sites. Forest Archaeologists would be notified prior to conducting the approved treatments on known heritage sites. • Purpose: To protect known heritage sites from project activities that would cause adverse impacts.
34.	All activity fuels would be piled outside the perimeter of all heritage sites. No mechanized equipment would be allowed to operate within the heritage site boundaries unless specifically allowed by the prescribed site treatment. • Purpose: To protect known heritage sites from project activities that would cause adverse impacts.

2.4.4 Monitoring Tasks for Alternative #2: Proposed Action

The following table lists recommended monitoring tasks to validate project design measures for implementation and effectiveness of those measures. The specific monitoring tasks accomplished would depend on future funding.

Table 12: Monitoring Tasks

Monitoring Item	Description of Monitoring
Fuels	
	Monitoring specific to fuels management actions associated with the proposed action would be conducted through the establishment of monitoring sites prior to project implementation. Pre- and post-treatment parameters to be assessed include surface and fuel ladder loading, and changes in vegetative species, size class, and canopy cover. Ash and nutrient transport and height to crown scorch would be assessed post-burn. Monitoring activities of established plots would occur pre-treatment, within 1 year after treatment, and again, 5 years after treatment. Fuels management strategies would be re-evaluated and modified, if necessary, following each site visit. • Responsibility: Forest or District Fuels Specialist
Heritage Resources	
	The Forest archaeologist would monitor the sites receiving protective treatments during project implementation and upon completion of the project to assure the preservation and protection of the heritage resources and determine the success of the proposed treatments. • Purpose: To determine the effectiveness of measures used for protection of heritage resources. • Responsibility: Forest or District Archaeologist

2.4.5 Timeline for Treatment Activities: Alternative #2

Treatments would begin in the summer of 2005. Commercial thinning would be accomplished as the initial treatment, followed by non-commercial treatments, and finally the fuels abatement treatments, including prescribed fire. The project area would be divided into three (3) commercial timber sales to conduct the commercial thinning. The first timber sale (Russell T.S. 2005) implemented would be the area on each side of Highway #323 where the priority WUI impact areas are primarily located. The other two timber sales (Opeeche T.S. and Ridge T.S.) would be awarded prior to 2010.

2.4.6 Sale Area Improvement Opportunities and Hazard Reduction Activities By Order Of Priority

The following is a list of proposed activities by priority that would have potential to be funded with Knutson Vandenberg (KV) funds from any commercial salvage sale receipts. Funding could be a combination of KV, BD and appropriated funds to meet the multiple objectives.

2.4.6.1 Essential Regeneration

- Site preparation activities for natural regeneration on suitable timberlands.
- Monitoring for natural regeneration on suitable timberlands.

2.4.6.2 Non-Essential Regeneration

- Site preparation activities for natural regeneration on non-suitable timberlands.

- Monitoring for new noxious weed infestations on sale area treatments.
- Rehabilitation of landings.
- Monitoring for natural regeneration on non-suitable timberlands lands.
- Timber stand improvement activities and associated fuel treatments within commercial harvested units.
- Timber stand improvement activities and associated fuel treatments outside commercial harvest units.
- Treatment of existing noxious weed infestations.
- Wildlife habitat improvement in Aspen stands.

2.5 Comparison of Alternatives

This section provides a tabular comparative summary of the alternatives, including the project objectives, activities, outputs, and effects of the alternatives on the issues and other resource areas.

Table 13: Comparison of the Alternatives: Project Objectives, Activities, and Outputs/Costs

Purpose and Need Indicators Project Objectives	Alternative #1 No Action	Alternative #2 Proposed Action
Total acres of forest stands treated for fire hazard	0.0 acres	8,525 acres
Acres of WUI priority stands treated for fuel hazard	0.0 acres	890 acres
Fire Condition Class (% / acres)	FC Class I: 17% (2,287 ac.) FC Class II: 0% FC Class III: 83% (11,172 ac.)	FC Class I: 76% (10,173 ac.) FC Class II: 0% FC Class III: 24% (3,286 ac.)
Fire Hazard Ratings (% / acres)	Low Hazard: 32% (4,343 ac.) Mod Hazard: 10% (1,406 ac.) High Hazard: 57% (7,585 ac.) V-High Hazard: 1% (125 ac.)	Low Hazard: 52% (7,104 ac.) Mod Hazard: 21% (2,843 ac.) High Hazard: 24% (3,297 ac.) V-High Hazard: 1% (173 ac.) Extreme Hazard <1% (42 ac.)
Departure Classes for Silviculture Treatment (% acres)	Low Departure: 26% Mod Departure: 6% High Departure: 68%	Low Departure: 67% Mod Departure: 19% High Departure: 14%
Project Activities and Outputs		
Commercial thinning and activity fuels treatments	0.0 acres	4,870 acres
Non-commercial thinning and activity /fuels treatments	0.0 acres	2,480 acres
Pre-Commercial Thinning	0.0 acres	575 acres
Natural Fuels Rx burning	0.0 acres	480 acres
Aspen Rejuvenation	0.0 acres	120 acres
Road Maintenance	0.0 miles	71.0 miles
Road Reconditioning	0.0 miles	12.0 miles
Road Reconstruction	0.0 miles	8.0 miles
Existing System Roads used as Temporary Roads	0.0 miles	4.7 miles
Temporary Roads (Decommissioned after use)	0.0 miles	26.3 miles
Project Outputs/Costs		

Table 13: Comparison of the Alternatives: Project Objectives, Activities, and Outputs/Costs

Purpose and Need Indicators Project Objectives	Alternative #1 No Action	Alternative #2 Proposed Action
Planning Costs	$260,000	$260,000
Administrative Costs (Sale prep and Harvest Admin)	$0	$486,710
Job Years Created	0	319
Present Value - Total Costs	$0	$1,672,000
Present Value - Total Revenue	$0	$2,856,000
Present Net Value	$0	$1,184,250
MMBF Timber Harvested by commercial thinning	0	16.9 MMBF

Table 14: Comparison of the Alternatives: Tracking Issues and Indicators

Tracking Issue Indicators	Alternative #1 No Action	Alternative #2 Proposed Action
Tracking Issue # 1: Northern Goshawk		
Suitable Habitat	Suitable habitat maintained in the short-term, but potential loss of suitable habitat in a large wildfire	Improvement and maintenance of suitable habitat in long-term
Goshawk Nest sites	Existing nest sites maintained in short-term, but potential loss of nest sites in a large wildfire	Short-term and Long-term maintenance for: • active nest sites • alternative nest sites • 6 replacement nest sites
PFA habitat	Suitable PFA habitat maintained in the short-term, but potential loss of 4,245 acres of suitable habitat in a large wildfire	2 PFAs totaling 4,245 acres maintained in the long-term
Tracking Issue # 2: Late Successional Forest % of area in Mature (MF) and Old Forest (OF) vegetation stage in year 2024	Year 2024 39% MF 0% OF	Year 2024 46% MF 17% OF
Tracking Issue # 3: Long-term Soil Productivity CWD tons/acre (3-7 tons/acre is DFC)	Current is 3-5 tons/acres	Maintained at 3-7 tons/acre
Tracking Issue #4: Noxious Weeds Acres of new infestations	0 acres short-term; however, ongoing activities likely cause an increase in noxious weeds and a large wildfire and the effects of suppression activities could result in large increases of noxious weeds.	Estimated 270 acres

Table 15: Comparison of the Alternatives: Other Resource Areas and Indicators

Other Resource Indicators	Alternative #1 No Action	Alternative #2 Proposed Action
Forest Vegetation Forest Stand Diversity	No Change in short-term. In the long-term forest stand diversity could be affected by a large wildfire by the loss of young and mid-aged stands and an increase in early seral grass-forb/shrub stage.	• Mid-aged Stands are reduced • Mature Forest Stands are increased • Old Forest Stands are increased
Watershed/Soils Detrimentally Disturbed Soils (%)	Estimated at 2%	Estimated at 4% for 1-10 years
Coarse Woody Debris (tons/acre)	Current tons/acre of CWD is estimated at 3-5 tons/acre. A large wildfire would result in a near term increase of CWD amounts followed by a long-term deficit.	3-7 tons/acres of CWD maintained on landscape
Sediment delivery from roads (tons/acre/yr)	4.4 tons/year	16.6 tons/yr during activity period.
Wildlife-Fisheries[1]	No effect in short-term. In the long-term impacts on some wildlife species from a large wildfire	No significant effects on any wildlife species or habitat
Rare Plants[2]	No effect	No significant impacts on sensitive plant species
Range and Grazing Livestock	No effect	Increase in transitory range for grazing livestock
Cultural Resources	No effect in short-term. In the long-term there could be impacts from a large wildfire.	No effects on any historical property or Native American sites or Traditional Use Areas.
Transportation System	No changes	• System Roads are improved. • Unneeded roads are closed.

[1] See Table 16 for full list of wildlife TES and MIS species and the effects determinations

[2] See Table 17 for a full list of Sensitive plant species and the effects determinations

Table 16: Summary of Effects on Wildlife Species[2]		
Listed Species	Alternative 1	Alternative 2
Bald Eagle	No Effect	No Effect [7]
Black-footed Ferret	No Effect	No Effect [10]
Grizzly Bear	No Effect	No Effect [10]
Gray Wolf	No Effect	No Effect [10]
Lynx	No Effect	No Effect [10]
Sensitive Species	Alternative 1	Alternative 2
Peregrine Falcon	No Impact	No Impact [10]
Northern Goshawk	No Impact[3]	MIIH[1, 7]
Mountain Plover	No Impact	No Impact [10]
Burrowing Owl	No Impact	MIIH [7]
Flammulated Owl	No Impact[3]	No Impact [10]
Sage Grouse	No Impact	No Impact [10]
Greater Prairie Chicken	No Impact	No Impact [10]
Harlequin Duck	No Impact	No Impact [10]
Baird's Sparrow	No Impact[3]	MIIH [7]
Sprague's Pipit	No Impact[3]	MIIH [7]
Loggerhead Shrike	No Impact[3]	MIIH [7]
Black-backed Woodpecker	No Impact[5]	No Impact [10]
Townsend's Big-eared Bat	No Impact	MIIH [7]
Pallid Bat	No Impact	No Impact [10]
Spotted Bat	No Impact	No Impact [10]
White-tailed Prairie Dog	No Impact	No Impact [10]
Black-tailed Prairie Dog	No Impact	No Impact [10]
Northern Bog Lemming	No Impact	No Impact [10]
Bighorn Sheep	No Impact	No Impact [10]
Fisher	No Impact	No Impact [10]
Wolverine	No Impact	No Impact [10]
Tawny Crescent Butterfly	No Impact	No Impact [10]
Regal Fritillary Butterfly	No Impact	No Impact [10]
Dakota Skipper Butterfly	No Impact	No Impact [10]
Belfragi's Chlorochroan Bug	No Impact	No Impact [10]
Boreal Toad	No Impact	No Impact [10]
Northern Leopard Frog	No Impact[3]	No Impact [10]
Sturgeon Chub	No Impact	No Impact [10]
Yellowstone Cutthroat Trout	No Impact	No Impact [10]
MIS Species	Alternative 1	Alternative 2
Northern Goshawk	No Impact[3]	MIIH [7]
Ruffed Grouse	No Impact	No Impact [7]
Sharp-tailed Grouse	No Impact[3]	Limited Impact [7]
Western Kingbird	No Impact	Limited Impact [7]
Lark Sparrow	No Impact	Limited Impact [7]
Northern Oriole	No Impact[3]	Limited Impact [7]
Yellow Warbler	No Impact[3]	Limited Impact [7]
Ovenbird	No Impact[3]	Limited Impact [7]
Rufous-sided (Spotted) Towhee	No Impact[3]	Limited Impact [7]
Brewer's Sparrow	No Impact	No Impact [10]

Table 16: Summary of Effects on Wildlife Species[2]		
White-tailed Deer	No Impact[4]	Limited Impact [10]
Cutthroat Trout (Native Species)	No Impact	No Impact [10]
Largemouth Bass	No Impact	No Impact [10]
Key Wildlife Species	Alternative 1	Alternative 2
Golden Eagle	No Impact[5]	Limited Impact [7]
Merlin	No Impact	Limited Impact [7]
Sharp-tailed Grouse	No Impact[3]	Limited Impact [7]
Elk	No Impact[4]	Limited Impact [7]
Mule Deer	No Impact[4]	Limited Impact [7]
White-tailed Deer	No Impact[4]	Limited Impact [7]
Big Horn Sheep	No Impact	No Impact [10]
Pronghorn Antelope	No Impact[4]	No Impact [10]
Yellowstone Cutthroat Trout	No Impact	No Impact [10]
Turkey (In MA D only)	No Impact[3]	Limited Impact [8]
Other Species	Alternative 1	Alternative 2
Neotropical Birds	No Impact[6]	Limited Impact [9]

[1] MIIH = May Impact Individuals or Habitat, but would not move to Federal Listing or loss of population viability.
[2] Project design measures for specific species are listed in Table 11. See also the Wildlife Specialist Report in the Project files.
[3] No Impact in short-term, however a stand replacement wildfire would reduce available habitat.
[4] No Impact in short-term, however a stand replacement wildfire would have increase forage habitat and decrease thermal and hiding cover.
[5] No Impact in short-term, however a stand replacement wildfire would increase available habitat.
[6] No Impact in short-term, however a stand replacement wildfire would have variable impacts on habitat, depending on the species.
[7] Potential Impacts in the short-term; however, treatments would be neutral or improve habitat conditions in the long-term
[8] No Impacts in short-term; however treatments would improve habitat conditions in the long-term
[9] Limited positive impacts for some species while limited negative impacts for others
[10] No habitat

Table 17: Summary of Effects on Sensitive Plant Species

Species Name	Alternative #1 No Action	Alternative #2 Proposed Action
Asclepias ovalifolia Ovalleaf milkweed	NI (short-term) UK long-term	MIIH[1]
Astragalus barrii Barr's milkvetch	NI (short-term) UK long-term	MIIH
Carex gravida v. gravida Pregnant sedge	NI (short-term) UK long-term	MIIH

[1] MIIH = May Impact Individuals or Habitat, but would not move to Federal Listing or loss of population viability

3 Chapter: Environment and Effects

This chapter provides information concerning the existing environment of the Ekalaka Hazardous Fuel project area and potential consequences to that environment. It also presents the scientific and analytical basis for the comparison of alternatives presented in Chapter 2. Each resource potentially affected by the proposed action or alternatives is described by its current condition and uses. The arrangement of the resource area discussions in this chapter are first by those resources that are proponents of the proposed action treatments (Fire/Fuels and Forest Vegetation) and followed by those resource areas most likely to be affected (either positively or negatively) by the proposed action treatment activities.

Following each resource description of its current condition is a discussion of the potential effects (environmental consequences) to the resource associated with the implementation of each alternative. All direct, indirect, and cumulative effects are disclosed. Effects are quantified where possible, and qualitative discussions are also included. (See also Chapter 2 and Appendix A: Maps).

Direct environmental effects are those occurring at the same time and place as the initial cause or action. Indirect effects are those that occur later in time or are spatially removed from the activity. Cumulative effects result from incremental effects of actions, when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.

The discussions of resources and potential effects take advantage of existing information included in the Custer Forest Plan's FEIS, other project EA's or EIS's, project-specific resource reports or related information, and other sources as indicated. Where applicable, such information is briefly summarized and referenced to minimize duplication. The planning record for the Ekalaka Hazardous Fuel Project includes all project-specific information, including resource reports, analyses, and other results of field investigations. The record also contains information resulting from public involvement efforts. The planning record is located at the Sioux Ranger District Office in Camp Crook, South Dakota, and is available for review during regular business hours. Information from the record is available upon request. See the end of Chapter 1 for an address and contact phone number for the project record.

3.1 Fire and Fuels

The section below is a summary of the affected environment and the effects of the alternatives on this resource. A detailed specialist report is in the project files.

3.1.1 Affected Environment

The primary vegetative habitat type within the Ekalaka Hazardous Fuel Project area is ponderosa pine. This vegetation type is responsible for fuel characteristics (type and size) and directly influences fire behavior within the project area. Past forest practices of aggressive fire suppression has resulted in disproportionate surface fuel loading, both vertical and horizontal continuity and increases in the density of live tree stems as ladder fuel. Most current stands are densely populated mid-aged ponderosa pine with a developed multi-layer vegetative structure. The ground surface fuel bed consists of a fairly continuous loading of fine fuels (0 to 3 inch diameter) which provide a receptive environment for fire ignitions and accelerated fire spread. The multi-stored vegetative structure creates a fuel ladder effect allowing surface fire to easily spread into the canopy crown layer resulting in torching, crowning and spotting fire behavior. Most ignitions on the Ranger District have not exceeded an acre in size; however, there have been recent larger size fires. No recent large wildfires have yet occurred in the Ekalaka Hills Unit, however small ignitions of a few acres or less have been suppressed each year. Recently the largest fires for the district were the Brewer Fire in 1988 and Kraft Springs in 2002, both of which occurred in the Long Pines Unit, east of Ekalaka. Two other wildfires that have occurred in the Long Pines Unit within the past 20 years burned 2,860 and 1,100 acres, respectively. These statistics illustrate the current stand replacing fire regime common to the Ekalaka area.

Two measurable indicators will be used in this analysis to evaluate current and post treatment conditions for fire hazard and fuels.

- Fire Condition Class (FCC) and
- Fire Hazard Rating (FHR)

3.1.1.1 Fire Condition Class

Fire Condition Class is a classification of the amount of departure from the natural fire regime (i.e., the number of missed fire intervals within an identified fire regime) (Hann and Bunnell 2001). Condition classes (CC) are based on low (CC 1), moderate (CC 2), and high (CC 3) departure from the central tendency of the natural (historical) regime (Hann and Bunnell 2001; Hardy et al. 2001; Schmidt et al. 2002).

Central tendency refers to a composition estimate of vegetation characteristics (species composition, structural stages, stand stages, stand age, canopy closure, and mosaic pattern), fuel composition, fire frequency, severity and pattern, and other associated natural disturbances. Low departure is considered to be within the natural (historical) range of variability, while moderate and high departures are outside. Table 18 summarizes the attributes of each of the three condition classes.

Table 18. Fire Condition Class Attributes.

Fire Condition Class[1]	Fire Regime	Example Management Options
Condition Class 1	Fire regimes are within an historical range and the risk of losing key ecosystem components is low. Vegetation attributes (species composition and structure) are intact and functioning within an historical range.	Where appropriate, these areas can be maintained within the historical fire regime by treatments such as prescribed fire use.
Condition Class 2	Fire regimes have been moderately altered from their historical range. The risk of losing key ecosystem components is moderate. Fire frequencies have departed from historical frequencies by one or more return intervals (either increased or decreased). This results in moderate changes to one or more of the following: fire size, intensity and severity, and landscape patterns. Vegetation attributes have been moderately altered from their historical range.	Where appropriate, these areas may need moderate levels of restoration treatments, such as fire use and hand or mechanical treatments, to be restored to the historical fire regime.
Condition Class 3	Fire regimes have been significantly altered from their historical range. The risk of losing key ecosystem components is high. Fire frequencies have departed from historical frequencies by multiple return intervals. This results in dramatic changes to one or more of the following: fire size, intensity, severity, and landscape patterns. Vegetation attributes have been significantly altered from their historical range.	Where appropriate, these areas may need high levels of restoration treatments, such as hand or mechanical treatments, before fire can be used to restore the historical fire regime.

Note: [1] Fire Condition class is a function of the degree of departure from historical fire regimes resulting in alterations of key ecosystem components such as species composition, structural stage, stand age, and canopy closure. One or more of the following activities may have caused this departure: fire suppression, timber harvesting, grazing, introduction and establishment of exotic plant species, insects or disease (introduced or native), or other past management activities (Source: Hann and Bunnel 2001)

Ponderosa pine stands within the project area where management activities or wildfire has occurred within the last 35 years are included in Fire Condition Class (FCC) 1. Approximately 2,287 acres, or 17 percent of the project area, are categorized as FCC 1 (low). In the remainder of the project area (approximately 11,172 acres or 83 percent of the project area), fire frequencies have departed from historic frequencies by multiple return intervals resulting in altered vegetation attributes and an FCC3 (high) classification. See Figure 9 below for a graphical representation of this situation. Appendix A-Map 1b shows the distribution of FCC by forest stand for the project area.

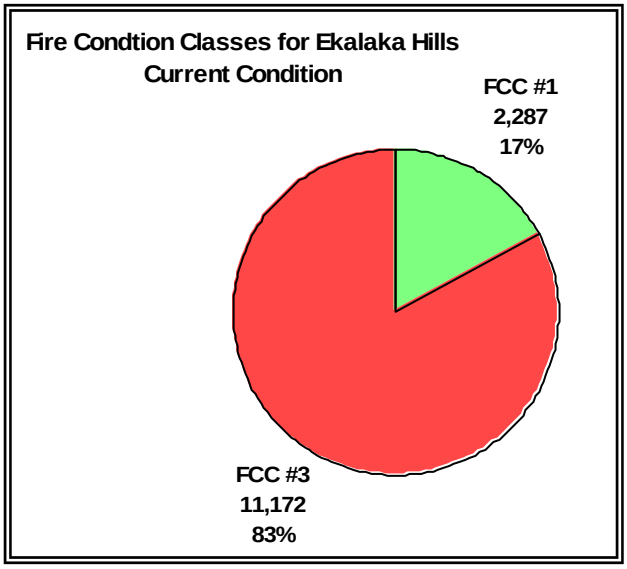


Figure 9. Current (2004) Fire Condition Class (FCC) Situation in the Ekalaka Hills

3.1.1.2 Fire Hazard Rating (FHR)

Fire hazard ratings are based on fuels. Measurable components of FHR include rate of spread (ROS) and resistance to control when considering specific fuel types. Rapid fire spread and/or difficulty to control are characteristics of a high FHR. Conversely, slow ROS and/or easily controlled fire is indicative of

a low FHR. Use of the Fire and Fuel Effects Model allowed grouping each forest stand into FHR ratings of: 1.) Extreme, 2.) Very High, 3.) High, 4.) Moderate, and 5.) Low

Fire hazard is related to fire behavior outputs as well as the operational aspect of containing a fire. Current Fire Hazard Rating (FHR) for the Ekalaka project area (based on a ponderosa pine habitat type) was determined by analysis of fire behavior outputs (i.e., torching index and crowning indices) produced by FVS FFE. Difficulty or resistance to control was also evaluated in determining the fuel loading by size class remaining on the area. Over half of the area (7,585 acres) is currently rated as high fire hazard (See Figure 10 and Table 19 below). Detailed summary tables, including FHR for existing conditions and stands proposed for the various treatments of the Proposed Action are in Appendix B. Appendix A-Map 1c shows the distribution of Fire Hazard Ratings for the project area.

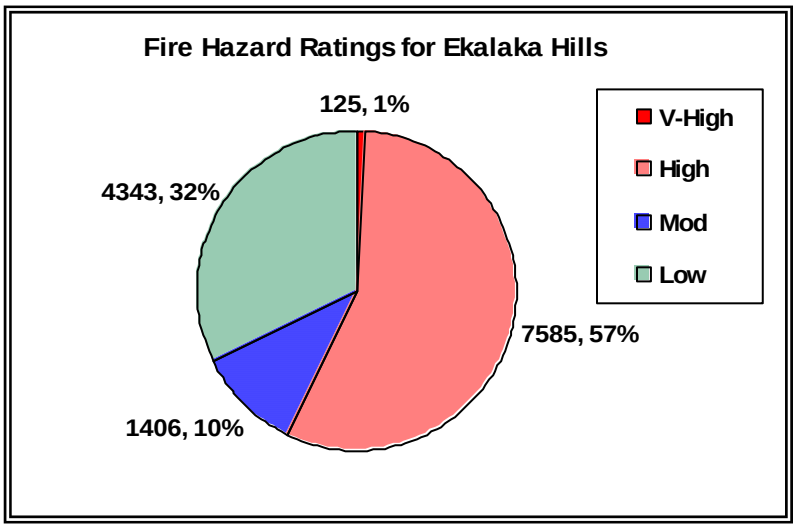


Figure 10. Current Fire Hazard Rating, Ekalaka Hills Fuel Reduction Project

Table 19. Current Fire Hazard Ratings for Ekalaka Hills.

Fire Hazard Rating	Acres	Percent of Area
Very High	125	1%
High	7,585	57%
Moderate	1,406	10%
Low	4,343	32%

3.1.2 Environmental Effects

3.1.2.1 No Action Alternative #1

The No Action Alternative essentially represents existing conditions and would result in no change from current conditions in the short-term. Selection of the No Action Alternative would not meet the intent of the current management directives of the Custer NF LRMP. Existing ladder and surface fuel loads and overcrowded forest conditions are expected to increase in the long-term, resulting in elevated risk to the public, firefighters, identified WUI areas, and increased tree mortality, increased surface and ladder fuel loads, high intensity/severity wildland fire potential, and a decline in overall forest health. Without treatment, extreme fire behavior that has already been observed on the Sioux

Ranger District in recent years with the 1988 Brewer Fire (58,000 acres) and the 2002 Kraft Springs Fire (65,000 acres) would be more likely. The No Action Alternative would increase the probability of uncharacteristic wildfire losses, disease and pest invasions of stands weakened by competition, slowed tree growth resulting from competition, and hazards and aesthetic impacts because of increased dead and downed trees.

Fire Condition Class (FCC): No Action Alternative #1

The Fire Condition Class for the No Action Alternative would be identical to the current condition in the short-term (less than 1 decade) where 17% of the area is in FCC #1, but 83% of the area would be still in FCC #3. See Figure 9. The results of Alternative #1are that within 1-2 decades more acres in the FCC #1 group would move into either FCC #2 or FCC #3 and the risk for wildfires would continue to increase. Appendix A-Map 1b shows the current distribution of FCC.

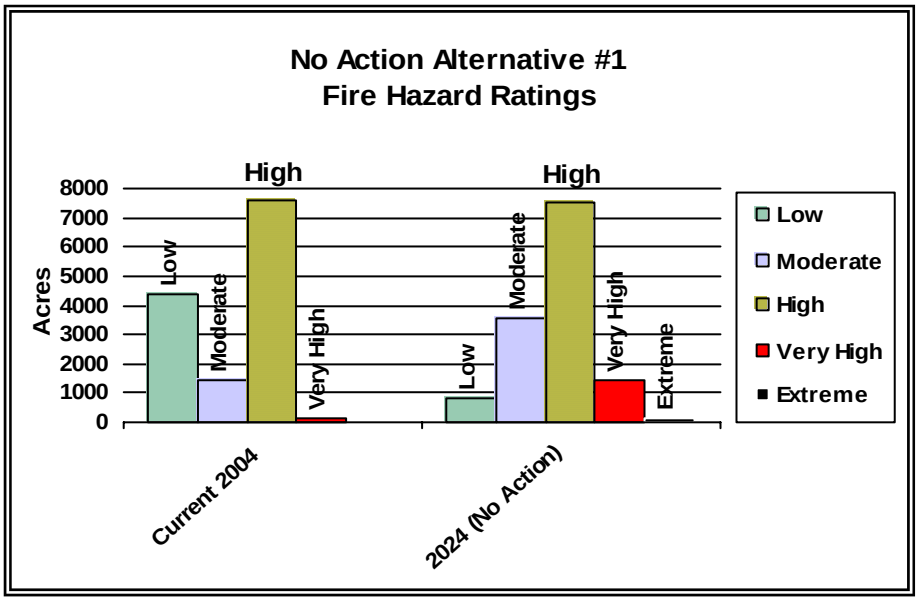
Fire Hazard Rating (FHR): No Action Alternative #1

The Fire Hazard Ratings for the project area would remain the same in the short-term for the No-Action Alternative. However, in the long-term (20 years or 2 decades) the Fire Hazard Ratings would continue to develop with more acres moving into the Very High and High Fire Hazard Ratings. More stand acres currently in a Low FHR would move into either a Moderate or a Very High FHR. Some acres would begin to move into an Extreme FHR. See Table 20 below for a summary of the acres in each FHR for Alternative #1. See Figure 11 below for a graphical representation of the effects of the No-Action Alternative on Fire Hazard Ratings. Appendix A-Map 1c shows the current distribution of FHR stands in the project area for Alternative #1.

Table 20. Fire Hazard Ratings: No Action Alternative #1 2004 and 2024.

Fire Hazard Rating	2004 Acres	2024 Acres
Extreme	0	161
Very High	125	1,427
High	7,585	7,517
Moderate	1,406	3,528
Low	4,343	826

Figure 11. No Action Alternative: Fire Hazard Ratings 2004 and 2024.



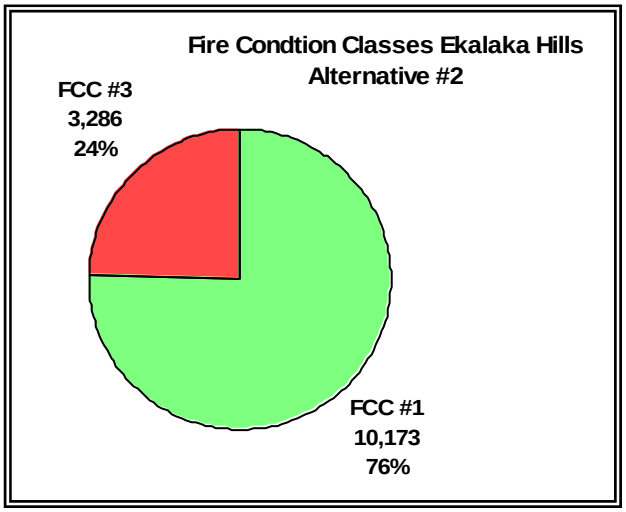
3.1.2.2 Proposed Action, Alternative #2

Completion of the Proposed Action, including thinning, overstory and understory biomass removal, lopping, pile burning, and prescribed understory burning would lead to a reduction in surface fuel loading and fuel ladder conditions throughout the Ekalaka project area. The primary direct effect of vegetation and fuels management activities, as described in the Proposed Action, would be a modification of understory vegetation, subsequently directly affecting potential fire behavior. Removal of ladder fuels and thinning of suppressed class trees would alter torching and crowning indices, the degree of burn severity and intensity, and tree mortality. In turn, modification of fire behavior would enhance fire suppression efforts in the WUI threat zone. Fuel modification would also allow for the application of prescribed fire as a silviculture and fuels management tool.

Fire Condition Class (FCC): Proposed Action Alternative #2

The Fire Condition Class for Proposed Action Alternative #2 would result in a reduction of FCC #3 (from 83% to 24% of area or 3,286 acres) and an increase of FCC #1 (from 17% to 76% of area or 10,173 acres) post treatments and for the next 2 decades. See Figure 12 below. Appendix A-Map 3a shows the distribution of FCC by forest stand in year 2024 for Alternative #2.

Figure 12. Alternative #2: Fire Condition Class (FCC) Situation in the Ekalaka Hills



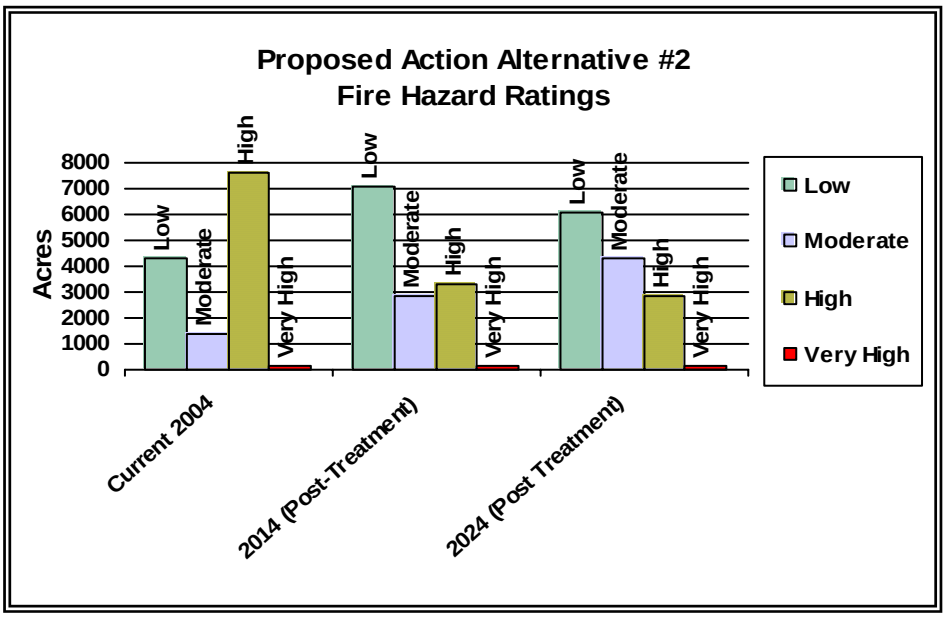
Fire Hazard Rating (FHR): Proposed Action Alternative #2

The Fire Hazard Ratings for the project area would be reduced in the short-term and for the next 1-2 decades by implementation of the Proposed Action Alternative. Stand acres currently in a high FHR would move into low FHR. See Table 21 below for a summary of the acres in each FHR group for Alternative #2. See Figure 13 below for a graphical representation of the effects of Alternative #2 on Fire Hazard Ratings. Appendix A-Maps 3b-3c shows the distribution of FHR by stand in the project area for year 2014 and 2024 for Alternative #2.

Table 21. Fire Hazard Ratings: Proposed Action Alternative #2: At Years 2004, 2014 and 2024.

Fire Hazard Rating	2004 Acres	2014 Acres	2024 Acres
Extreme	0	42	44
Very High	125	173	162
High	7,585	3,297	2857
Moderate	1,406	2,843	4,294
Low	4,343	7,104	6,102

Figure 13. Proposed Action Alternative: Fire Hazard Ratings in Year 2004, 2014, and 2024.



3.1.3 Cumulative Effects

The cumulative effects area involves the Ekalaka Hills Land Unit, one of several ponderosa pine "islands" within a larger prairie-grassland ecosystem. The time span selected for this cumulative effects analysis is from 1992 to the intended completion of activities from this proposed project (approximately 5 years hence). This time span approximates the fire regime interval for this area in which an event such as fire could have occurred. Past, ongoing, and foreseeable future activities considered for the fire/fuels cumulative effects analysis are found in Appendix B.

Alternative 1, No Action

No cumulative effects would occur with the selection of Alternative #1. The selection of Alternative #1 would not reduce overall fire hazard in the project area in combination with these other past, ongoing or future projects.

Alternative 2, Proposed Action

The selection of Alternative #2 would treat an additional 8,525 acres of ponderosa pine stands in the Ekalaka Hills unit and would help to reduce overall fire hazard in the project area in combination with these past, ongoing or future projects

Past actions

Fuel treatments that occurred with past timber harvest and thinning activities resulted in very open stands (approximately 1952 acres). Some whole tree yarding (WTY), lopping and scattering, pile and burn and a limited amount of underburning treatments were implemented. Some woody fuels still remain, but grass is the dominate surface fuel at this time.

Present Actions

Currently two projects are occurring within the Ekalaka Hills Unit. One parcel is on State of Montana land, in which removal of larger size trees is occurring on approximately 357 acres. Whole tree yarding (WTY) is the primary fuel treatment. Disposal of these decks of unused woody biomass would be by burning. Some additional pile and burning may follow within the harvested units.

The Forest Service Laka Breaks Timber Sale would reduce future fire behavior within the Ekalaka Hills Unit on approximately 732 acres. Current overly dense stands of Ponderosa pine would be thinned. WTY would remove a majority of the biomass to a decked area. Material that is merchantable would be removed as logs; material that is not merchantable would be decked and burned. Additional piling and burning, with some underburning is planned throughout the harvested units.

These projects would lessen the fuel ladder effect in the multi-storied stands, reduce existing dead and down surface fuels and lessen stand densities. Rejuvenation of grass species is expected over a majority of the acres involved as the forested stands become more open. Cumulative effects would result in additional acres in which the FHR is reduced to low – low/moderate, and the stand(s) are identified as Fire Condition Class 1.

Reasonably Foreseeable Future Actions

Some harvesting and thinning activities are possible on BLM land parcel adjacent to the Ekalaka Hills Unit. These activities would lessen the density of these stands, reduce the current fuel-ladder development and result in a more discontinuous surface fuel bed arrangement. If prescribed fire is used, it would further reduces both existing and newly created smaller size fuels. The end result would be a positive effect for the Ekalaka Hills Unit in terms of more area identified as low-moderate FHR, and FCC 1. Any activity on intermingled or adjacent land parcels is unknown at this time. Grazing is expected to continue which would reduce some of the fine size fuels as the surface layer.

3.2 Forest Vegetation

3.2.1 Introduction

This section discusses the existing condition of the forest vegetation on National Forest System lands in the project area, including forest vegetation, old growth, and properly functioning condition. The complete forest vegetation-silviculture specialist report is in the project files.

3.2.2 Affected Environment

The diversity of forest stand structures in the Ekalaka Hills project area is decreasing at the landscape level due to the current successional pathway and disturbance patterns. This has led to a gradual elimination of the more open, fire maintained stands of larger diameter trees, composed mostly of ponderosa pine (*Fischer and Clayton 1983*). The current stand conditions are due to the following:

- Past Selective logging of larger, more fire tolerant ponderosa pine.
- The reduction in natural, high frequency low-intensity fire disturbance regimes.

This can be directly related to aggressive fire exclusion tendencies in fire-adapted ecosystems that have been implemented on Forest Service Lands over the last 90 years. Lack of low-intensity fire disturbance has resulted in a forest structure exhibiting increased tree density in the overstory, abundant tree regeneration in the understory (ladder fuels), and a buildup of ground fuels (both larger diameter and litter layers). This successional pathway has resulted in mid aged/sized contiguous tree stands that are more prone to stand replacing fire because of increased surface fuels and ladder fuels.

Non-forested Plant Communities

Approximately 5,220 acres or 28% of the project area is considered non-forested. Large areas of fire maintained grassland and shrubland types of vegetation are found on drier slopes and benches. These areas are naturally non-forested due to temperature, dryness, and poor soil structure.

Fire exclusion and past grazing practices have resulted in vegetation changes within the non-forested plant communities. Although historical fire frequency and seasonal occurrence is not well documented periodic fire was important in maintaining a mosaic of vegetative conditions. Shrubs are probably more dominant than in the past and the species composition of native grasses has probably been altered.

3.2.2.1 Forest Stand Structure and Diversity

The project area contains land of varied topography and elevations (3300 to 4100 feet) with a variety of forested and non-forested plant communities. The non-forested communities dominate south facing slopes and benches throughout the project area as well as the lower elevations along the perimeter. Forested stands are more common on northern and eastern aspects in the northern part of the project area, while in the southern part of the project area forested stands are present on all aspects. The dominant tree species for these forested stands is ponderosa pine. No fir tree species are found in the Ekalaka Hills land unit.

There are approximately 13,460 acres (71% of the project area) of ponderosa pine forested communities within the project area (FS ownership). Five ponderosa pine habitat types occur within the forested stands of the project area (*Pfister and others, 1977*). The warm, dry ponderosa pine

habitat types (Fire Group 2) *Pinus ponderosa*/*Andropogon* spp. (ponderosa pine/bluestem), *Pinus ponderosa/Agropyron spicatum* (ponderosa pine/bluebunch wheatgrass), and *Pinus ponderosa/Symphoricarpus albus- Symphoricarpus albus* phase (ponderosa pine/snowberry-snowberry phase). The warm moist ponderosa pine habitat types (Fire Group 3) *Pinus ponderosa/Symphoricarpus albus-Berberis repens* phase (ponderosa pine/snowberry-oregon grape phase), *Pinus ponderosa/Prunus virginiana-Prunus virginiana* phase (ponderosa pine/chokecherry-chokecherry phase).

The majority of the forested communities are classified as Fire Group 2 - "Warm, Dry Ponderosa Pine Habitat Types" and Fire Group 3 - "Warm, Moist Ponderosa Pine Habitat Types" (*Fischer and Clayton, 1983*). See Table 22. These fire groups are characterized by a climax ponderosa pine component that historically experienced periodic low-intensity, non-lethal understory burns.

Fire group two occurs on the less productive, warm, dry ponderosa pine sites often adjacent to grasslands. Group two is characterized as having a light downed and dead fuel loading and can consist of open ponderosa pine stands with predominant grass undergrowth or as stands with dense, multi-storied with scattered, closed overstory. The stands with dense understory often have unusually heavy litter layers around the base of the large trees.

Fire group three occurs on the more productive (north slopes, ravines and coulees) warm, moist ponderosa pine sites. They tend have more variable fuel complexes with fuel loadings of downed, dead and heavy litter layers similar to Fire group two. Group three sites often exist as stagnant, overgrown thickets of ponderosa pine saplings, but can vary from all-aged with scattered regeneration and shrub layers, to stands with only two or three distinct size classes. Group three fuel complexes of dense dog-hair thickets of regeneration, multi-layered stands, shrub layers and increased biomass tend to promote erratic crown fire behavior.

Table 22. Fire Groups

Fire Group	% Of Forested Area
Fire Group Two - Warm, Dry Ponderosa Pine	27%
Fire Group Three - Warm Moist Ponderosa Pine	73%

Within each fire group are several vegetation development stages, based on vegetation structure (size/age classes and canopy levels) and density of tree species (*USFS R1 cover type and strata code definitions are in project record files*). See Table 23 and Table 24 below. The various vegetation development stages, along with the fire regimes under which they developed, are useful in characterizing the existing vegetative conditions. Other characteristics, such as stocking density and structure are also useful in describing vegetation development stages.

Table 23. Vegetation Development Stages

Vegetation Development Stage	Diameter (in.) at Breast Height (DBH)	Age Class (Years)
Grass/Forb/Shrub/Seedling	0-1 in.	0-15
Seedling/Sapling	1-5 in.	15-40
Young Forest	5-8 in.	40-80
Mid Aged Forest	8-12 in.	80-120

Table 23. Vegetation Development Stages		
Vegetation Development Stage	Diameter (in.) at Breast Height (DBH)	Age Class (Years)
Mature Forest	12-16 in.	120-150
Old Forest	≥ 16 in.	> 150

Table 24. Comparison of Forested Structure, Crown Closure and Fire Regime			
Forested Structure	Crown Closure (Percent)	Current % / Forested Acres	Historical Fire Regime
Maturing—Scattered understory, fire maintained, open, park like overstory	10-39	18% 2,420 acres	Low intensity understory fires, usually non-lethal
Maturing—Two or multi-story with scattered overstory	10-39	9% 1,190 acres	Low intensity understory fires, can be lethal in even age thickets
Maturing--Two or multi-story with closed overstory	40-100	71% 9,560 acres	Mixed-severity fires, often lethal or stand replacing

Old Growth Forest Stands

Custer National Forest Plan Direction

The Custer Forest Plan does not provide direction for old growth. The Plan defines overmature timber as "individual trees or stands of trees that in general are past their maximum rate in terms of physiological processes expressed as height, diameter and volume growth".

R1 Old Growth Direction

Old-Growth Forest Types of the Northern Region, (*Green and others 1992*), defines the minimum characteristics for Old Growth for ponderosa pine cover type on warm, very dry to moist environments (East-Side Montana Zone) as:

- Four trees per acre 17 inches diameter at breast height (DBH) or more
- Large trees 180 years old or more
- Basal area 40 ft^2 per acre or more.

While there are no Forest Plan standards related to this definition, it is appropriate to assess potential impacts on old growth based on this definition. It is ecologically based, and is an accurate indicator for describing vegetative diversity for this analysis and would be used for discussing effects in regards to the vegetation development stages. There are currently small isolated patches of individual old growth trees. However, these patches do not meet the USFS Region 1 definition for old growth due to limited size and structural characteristics.

Properly Functioning Condition (PFC)

Properly Functioning Condition (PFC) assessment is a process, using criteria indicators, to identify areas that are currently in a properly functioning ecological condition and areas that are not. Indicators of a properly functioning condition include: a diverse distribution of seral stages, with composition,

structure, and pattern consistent with those resulting from historical fire regimes, and insect and disease agents within historic levels (*Northern Region Overview 1998*). The PFC represents an ecosystem that is dynamic and resilient to disturbances to structure, composition, and processes of their biological or physical components.

A PFC assessment was conducted for the Ekalaka Hills area of the Sioux Ranger District ((*Sandbak 1998*)) to determine the vegetative diversity status, as well as the processes of disturbance influences to past and present vegetation structures, functions, and compositions. Thresholds were identified to establish acceptable ranges of stand conditions to provide for ecosystem sustainability and resiliency. Table 25 displays the indicators of the PFC for this analysis.

Table 25. Desired Stand Conditions Description

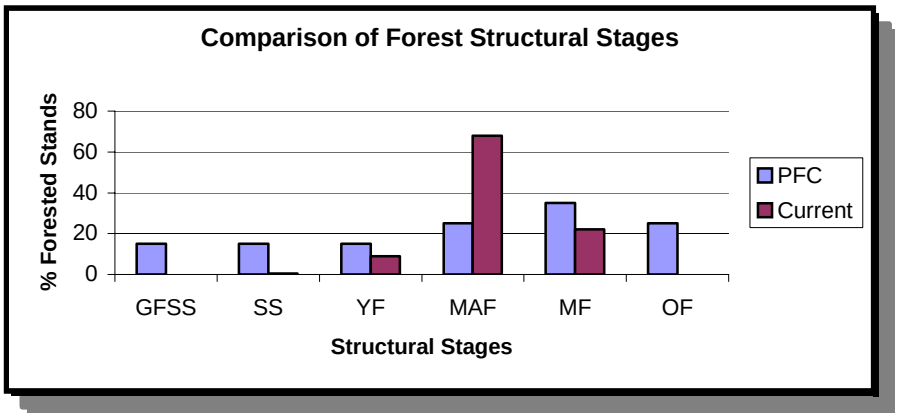
Vegetation Development Stage	Approximate Balanced Range	Indicators of PFC in Forested Communities
Grass/Forb/ Shrub/Seedling	5-15%	Initiation of an even aged, single story, healthy, vigorous growing stand of 200-400 seedlings per acre, with minimum for certification at 200 seedlings/acre at age 5. Grasses, forbs, and shrubs should begin to occupy the site as valuable forage for livestock and wildlife, but not deter pine reestablishment. Fuel loading should be 5-8 tons/acre of 3 inches and larger woody debris and 1-2 tons/acre if less than 3 inches, spread evenly across the stand to ensure nutrient recycling for long term site productivity and serve as micro site protection of the seedlings. With implementation of proper soil protection measures, soil disturbance and erosion would be minimal and vegetation recovery would be rapid. The stand serves as a fuel break to slowdown and control wildfire.
Seedling/Sapling	5-15%	A healthy, vigorous growing, stand of saplings 10 to 30 feet tall. Desired stocking is 125 to 260 stems per acre. Precommercial thin, if needed. Promote best growth potential by selection of crop trees that are fast growing and free of damage and defect to improve stand health and vigor. To increase lumber values at rotation age. Slash would approximate 8-20 tons/acre and would be lopped and scattered to within 18 inches of the grand line, under burning activity fuels to reduce total fuels to 4 to 7 tons/acre. The stand would contain desirable brush, forbs, and grasses that provide forage and habitat for white-tailed deer, turkeys, grouse, and cattle.
Young Forest	5-15%	A healthy, vigorous (relatively free of insect and disease) growing stand of 30-45 feet tall pine pole sized stems. At age 40 to 80 the stand should carry 125 to 200 stems per acre, with 50 to 180 square feet of basal area/acre. Volume would approximate between 1 and 9 MBF per acre. The stand would contain a grass, forb, and pine component for diversity to maintain the structure, function, and composition of the pine ecosystem. This would provide foraging for wildlife and cattle, and hiding/thermal cover for wildlife. With periodic under burning, fuels would be kept at 4 to 7 tons/acre, with small patches of seedlings, and saplings scattered across the stand. Stand structure and condition would favor low intensity ground fires.

Table 25. Desired Stand Conditions Description		
Vegetation Development Stage	Approximate Balanced Range	Indicators of PFC in Forested Communities
Mid Aged Forest	15-25%	A healthy, vigorous growing, mature pole to saw timber sized stand. If needed, precommercial/commercial thin to approximately 45 to 70 trees per acre at age 80. Selection would favor best growing trees and those free of defect and damage to improve stand health and vigor. At age 80 to 120 the stand should carry about 70 to 120 square feet of basal area and 7 to 10 MBF per acre. The average height would be 40 to 55 feet averaging 14 to 19 inches. Soil protection measures should be a major objective during and after the harvest operation. Periodic under burning at intervals of 20 years, and after activities, should keep 3 inches and larger fuels at 5-7 tons/acre, 1-2 tons/acre at less than 3 inches. The stand would provide for wildlife and domestic cattle needs by having a diverse vegetation component and patches of ¼ to 2 acres of seedling and sapling patches.
Mature Forest	25-35%	The target stand would exhibit an even-aged, single story stand showing limited insect and disease activity and mortality. The stand would have approximately 40 to 65 trees per acre with the average height of 50 to 60 feet and average diameter of 19 to 22 inches. Volume per acre would be 5.5 to 11.5 MBF per acre and have approximately 90 to 140 square feet of basal area/acre. Stand structure would favor non-replacing stand fires. The stand would provide a variety of values and habitats, including snags, down woody material, thermal, hiding, and intercept cover and forage where canopy openings occur.
Old Forest	15-25%	The target stand would exhibit a over mature, single story, open grown, park-like stand of ponderosa pine, having insect and disease activity at endemic levels. Small-scattered patches of seedlings to pole timber would occur but not dominate the understory. Canopy coverage would be such that a grass, forb, shrub and pine component is present. Stand structure would favor non-replacing stand fires, and due to periodic underburning, fuel loadings would be 6 to 11 tons/acre with limited ladder fuels. The stand would have 35 to 60 trees/acre carrying 110 to 160 basal area/acre. Volume would approximate 8 to 19 MBF per acre.

Table 26 describes the current condition for the project area by the previously defined vegetation development stages, and compares the current percentage they occupy on the landscape with the approximated balanced range needed for long-term sustainability. Figure 14 displays this graphically.

Table 26. Vegetation Development Stages for Ekalaka Hills Project Area			
Vegetation Development Stages	Current % Forested Area	Approximate Balanced Range	Above, Below, or Within Balanced Range
Grass/Forb/Shrub/Seedling (GFSS	0%	5-15%	Below
Seedling/Sapling (SS)	<1%	5-15%	Below
Young Forest (YF)	9%	5-15%	Within
Mid Aged Forest (MAF)	68%	15-25%	Above
Mature Forest (MF)	22%	25-35%	Below
Old Forest (OF)	0%	15-25%	Below

Figure 14. Current Vegetation Development Stages Compared to Balanced Range (PFC)



The project area has several vegetation development stages that are under represented, including the grass/forb/shrub/seedling, seedling/sapling, mature and old forest stages. At the same time the mid aged forest is over represented often in the form of contiguous dense, multi-storied stands resulting from fire exclusion, and historic management activities.

3.2.2.2 Forest Health-Departure from Desired Conditions

Forest health reflects a composite of stand conditions that may be vulnerable to major change (disturbance) agents, including insects, diseases and fire. When ecosystems lack the resistance and resilience to recover from such change agents, it is an indication of declining forest health.

Departure Rating

Comparing the existing conditions with the desired stand conditions for the ponderosa pine communities in the Ekalaka Hills project area gives an indication of the relative importance of silvicultural treatment. Each stand within the project area has been assigned a departure rating that indicates the degree at which the current stand conditions deviate from the desired stand conditions. High departure stands exhibit conditions that have a lower resilience and presently exceed the ability to survive disturbance without long term loss of functional or structural elements. Moderate departure stands would exhibit high departure conditions within 20 years. Approximately 68% of stands are rated high departure, and 6% of stands are rated moderate departure. Approximately 26% of stands are rated low departure due to their open canopy, single-layered structure. Of the low departure stands, over 60% of them were treated during the 1990s to break up the continuity of fuels and now have a single storied, open grown structure. Table 27 displays the percentages of each departure class for the project area. Appendix A-Map 1d shows the current distribution by departure class in the project area.

Table 27. Departure Rating for Forested Stands within the Project Area

Departure Rating	Approximate Acres	% of Area
Low	3540	26%
Moderate	770	6%
High	9150	68%

3.2.3 Environmental Effects – Forest Stand Structure/Diversity

The following diversity matrix table (See Table 28 and Figure 15) describes the condition of the forested vegetation for each alternative approximately 20 years after implementation. Implementation also includes post-harvest activities including prescribed fire, non- commercial thinning and other stand improvement activities. Assumptions made for successional pathways (*Fischer and Clayton 1983*) in 20 years for each alternative can be found in the project record.

Table 28. Forest Stand Diversity Matrix

Forest Vegetation Development Stages	Balanced Range for Sustainability (PFC) (% of forested acres)	Current*	Alternative 1*	Alternative 2*
		0 Years	20 Years	20 Years
Grass/Forb/Shrub/Seedling (GFSS)	Approximately 5-15%	0% (Below)	0% (Below)	0% (Below)
Seedling/ Sapling (SS)	Approximately 5-15%	<1% (Below)	0% (Below)	<1% (Below)
Young Forest (YF)	Approximately 5-15%	9% (Within)	7% (Within)	6% (Within)
Mid Aged Forest (MAF)	Approximately 15-25%	68% (Above)	53% (Above)	31% (Above)
Mature Forest (MF)	Approximately 25-35%	22% (Below)	39% (Above)	46% (Above)
Old Forest (OF)	Approximately 15-25%	0% (Below)	0% (Below)	17% (Within)

* Percent of Forested Acres within the Project Area In Vegetation Growth Stage (Above, Below or Within PFC)

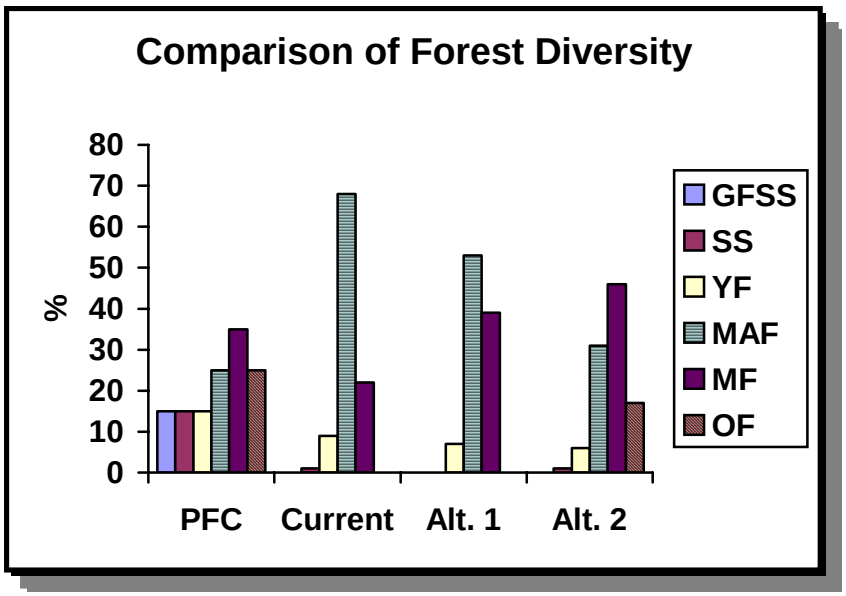


Figure 15. Forest Stand Diversity: Comparisons of PFC, Current Conditions and Alternatives

The diversity matrix allows managers to compare changes in forested vegetation in the project area over time under the two alternatives. Although all vegetation in the project area would not be within PFC, several vegetation development stages would be moving toward PFC. Adequate representation of vegetation development stages associated with the ponderosa pine habitat types within the project area would represent a more diverse condition. Table 28 and Figure 15 illustrates that implementation of the Proposed Action (Alternative 2) would result in a more diverse condition than the No Action Alternative (Alternative 1). Maintenance of the range of development stages is a dynamic process and requires active recruitment over time. Thinning of stands would allow more management options for the future with an objective of moving more forested areas into the grass/forb/shrub development stage and increase forest stage diversity for the long-term. Promoting and maintaining diversity results in ecosystems that are more resistant and more resilient to catastrophic disturbance (i.e. more sustainable).

3.2.3.1 Alternative 1: No Action, Direct and Indirect Effects

Under Alternative 1, no activities would occur and no silvicultural treatments would be implemented. The following narrative describes an approximation of the vegetation condition within each development stage in 20 year. The description assumes no stand-replacing disturbance would occur within the twenty-year period. Figure 16 displays the effects of Alternative 1 on vegetative diversity.

The grass/forb/shrub/seedling and seedling/sapling stages would continue to be under-represented in the project area. Recruitment into these stages can only occur in cases of larger scale stand replacing disturbances such as high intensity fire, bark beetle epidemic or removal of the overstory through silvicultural treatments. A large stand replacing wildfire would result in a loss of the mid-aged stands and a large increase in the grass/forb/shrub development stage.

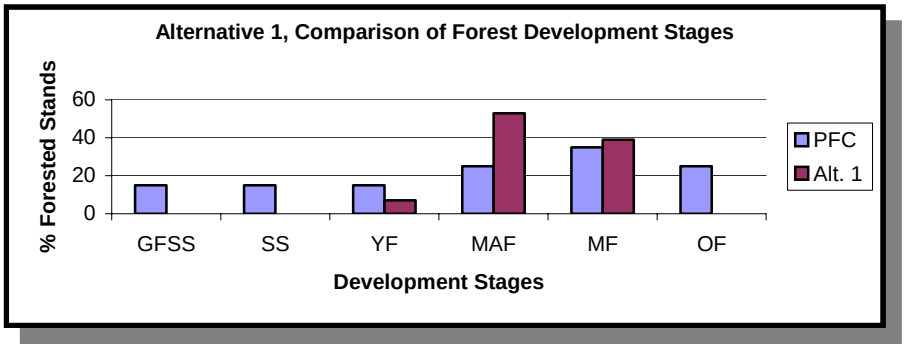


Figure 16. Alternative 1, Compared to Balanced Range (PFC)

As succession continues, many of the stands currently in the upper end of the young forest stage would move into the mid aged forest stage within the next 20 years, decreasing the amount of the project area in the young forest stage but remaining within desired levels. Those areas that remain in this stage would continue to stagnate and diameter growth would occur only in the most ideal conditions. Where they exist, shrub species would become decadent with increasing amounts of dead limbs still attached. These shrubs can become extremely flammable during drier summer conditions.

The mid-aged stage would continue to be the most dominant development stage in the project area, covering approximately 53%. The majority of these stands would occur in continuous, homogenous blocks. Many stands would remain in an overstocked, multi layered condition, experience reduced growth and vigor and become predisposed to insect attack and stands replacing fire. The continuity of vegetation and the lack of diversity in these large blocks would provide less resistance / resilience to future disturbance events and would increase the likelihood of a large, high intensity wildfire. A large wildfire would eliminate much of the mid-aged development stage and move into a grass/forb/shrub development stage.

Some of the current mid aged stands would advance into the mature forest stage. This would be a net increase in this stage to 39% of the forested vegetation that is slightly above the range for properly functioning condition. These stands would exhibit similar overstocked conditions as those in the mid aged stage.

The old forest stage would continue to remain unpopulated at an identifiable scale. Any development into this stage would have been slowed due to poor growing conditions and lack of low intensity fire disturbance in the mid aged and mature forest stages.

3.2.3.2 Alternative 2: Proposed Action, Direct and Indirect Effects

Figure 17 displays the effects of Alternative 2 on vegetative diversity. The grass/forb/shrub/seedling and seedling/sapling stages would continue on the same trajectory as in Alternative 1 with the seedling/sapling stage experiencing some ingrowth due to the small openings created in this alternative.

The amount of young forest stage would decrease after 20 years and exist within the balanced range. This is due to the thinning prescriptions that would favor growth of dominant trees, allowing them to develop into the mid aged stage within 20 years. In the event of wildfire, the likelihood of a large stand replacing event would be reduced and most of the young and mid-aged forest stands would be maintained to develop into the mature development stage.

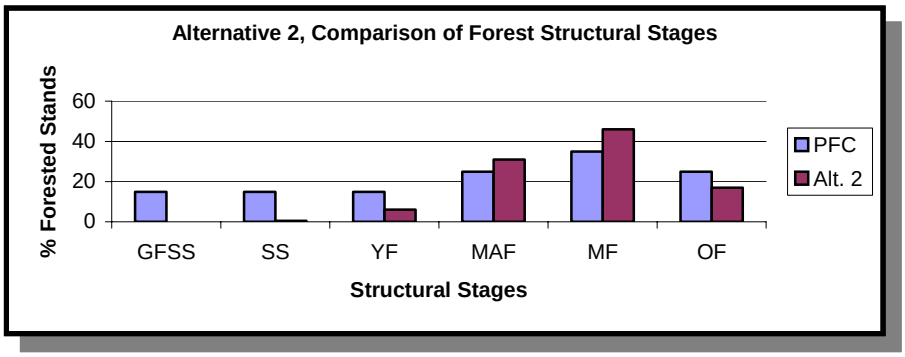


Figure 17. Alternative 2, Compared to Balanced Range (PFC)

The mid aged tree stage would decrease, over a 20-year period, to approximately 31% of the forested stands. Although this is still above the balanced range, many of the stands currently in this stage would move into the mature forest stage while a majority of the young forest stage would grow into this stage.

The amount of vegetation in the mature forest stage would increase from 22% to 46%. This represents a level above the balanced range within 20 years. The contiguity and density of high departure stands within the project area would be reduced. Silviculture treatments combined with prescribed fire would provide conditions allowing the open canopy, mature stage to develop. In 20 years, the open canopy, mature forest stands would be located in areas on the landscape that previously contained large contiguous blocks of homogenous, dense, often multi storied areas of vegetation.

Silviculture treatments would initiate the long-term goals of moving forested vegetation into the old forest stage. Achieving conditions for open grown, old forest stage would begin to occur within the 20-year period. Structurally, adequate numbers of large trees would be present within 20 years, but these trees may be slightly younger than the old forest stands that historically developed.

Alternative 2 would restore the project area to a more resistant, resilient condition that is characteristic of the historic disturbance regimes for the project area. The project area is currently lacking in the open grown, fire maintained old forest and Region 1 old growth stand structures. Management in the mid aged forest and mature forest development stages would lead to an increase in open grown old forest and Region 1 old growth conditions and more balance in the mid-aged, mature and old forest development stages over the long term.

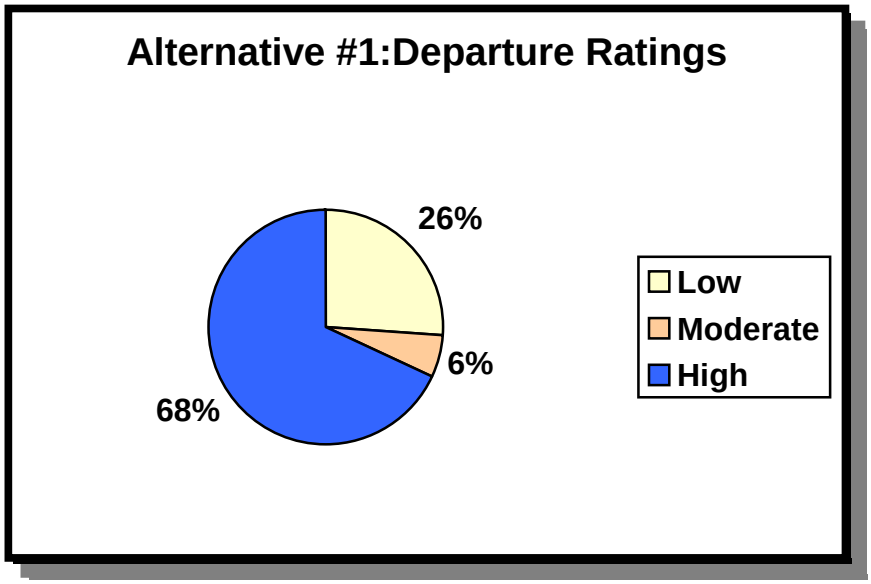
3.2.4 Environmental Effects.-.Forest Health and Departure Classes

3.2.4.1 Alternative 1: No Action

Direct and Indirect Effects

In the short term (less than 10 years), there would be little or no change in the stand treatment departure ratings. Approximately 74% of the forested stands would be classified as moderate or high departure, and remain at high risk to insects, disease, and stand replacing wildfire (See Figure 18).

Figure 18. Alternative 1, Departure Ratings for Forested Stands



A majority of the moderate and high departure acres are currently classified as maturing—multi story with closed overstory canopy or would develop into that structure within the next 20 years. The long-term consequences (at 20 years and longer) would result in moderate rated stands changing to the high departure rating due to increasing density. This would thereby increase the number of contiguous overstocked stand acres in high departure.

Some stands currently classified as low departure would move into a moderate departure rating, resulting in the vast majority of forest stands (over 80%) exceeding threshold conditions, with further decrease of resistance and resilience to an epidemic insect attack and stand replacing wildfire (*Monnig and Byler 1992; Auclair and Bedford 1994).*

The two primary disturbance agents associated with dense forested conditions (bark beetles and stand replacing wildfire) would increase in risk and there would be an increase in the number of acres at risk.

Stand structure and density would continue to move away from historical conditions. Overstocked stands would continue to decline in growth and vigor due to increasing competition and reduced crown development. Risk to insects and disease would continue to intensify. Bark beetle epidemics would be anticipated with the next drought cycle. Stand structure of most stands would consist of dense, multi-storied canopies, resulting in large areas of contiguous ladder fuels, conditions that would lead to stand replacement wildfire.

Dead fuel on the forest floor would continue to accumulate, adding to the past 90 plus years of accumulated material, resulting in higher burn intensity and greater heat output when a wildfire occurs. Potential fire size and intensity would continue to increase and deviate from historical fire regime of ponderosa pine forests in the project area.

3.2.4.2 Alternative 2: Proposed Action

Direct and Indirect Effects

Table 29 notes the type of silviculture prescription, and the acres treated of departure rated stands.

Table 29. Alternative 2, Silviculture Prescriptions and Acres Treated of Departure Rated Stands

Silvicultural Prescription	Departure Rating	Acres Treated	% of Acres Treated
Commercial Thin	High	4,845	53%
Noncommercial Thin	High	2,170	24%
Precommercial Thin	High	250	3%
	Total High Treated	7,265	80%
Commercial Thin	Moderate	30	4%
Noncommercial Thin	Moderate	320	41%
Precommercial Thin	Moderate	275	36%
	Total Moderate Treated	625	81%
Natural Fuels Rx Fire	Low	480	14%
Precommercial Thin	Low	50	1%
	Total Low Treated	530	15%

Table 30 lists the resulting stand departure ratings post treatment for Alternative 2:

Table 30. Alternative 2, Post Treatment Stand Departure Ratings

Departure Rating	Approximate Forested Acres Post Treatment	% of Forested Acres Post Treatment
High	1,885	14%
Moderate	2,565	19%
Low	9,010	67%

Figure 19 graphically displays the stand departure ratings post treatment for Alternative 2.

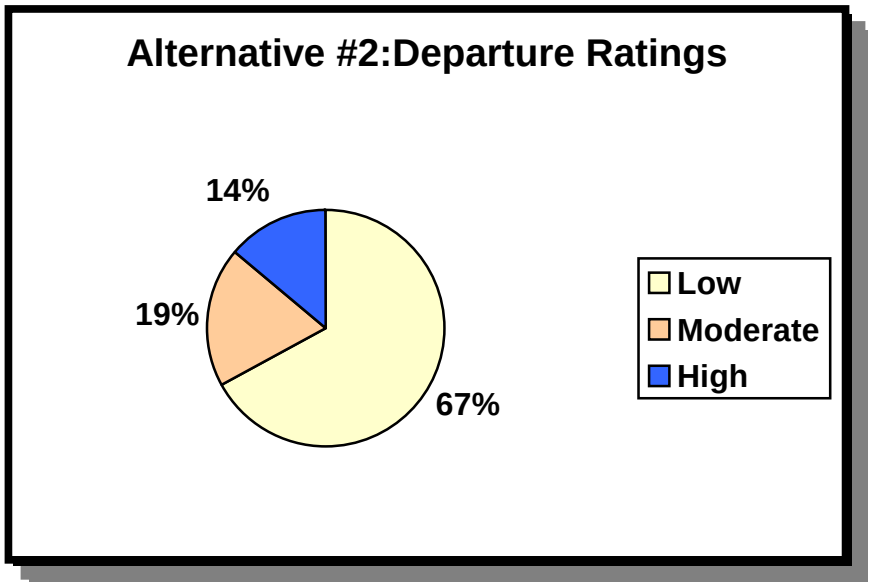


Figure 19. Alternative 2, Post Treatment Departure Ratings for Forested Stands

The percentage of stands in the high departure rating is reduced from 68% to 14%, while the stands in the low departure rating are increased from 26% to 67% (needing no further treatment for 20 years or more).

Many of the stands currently have a maturing-multi story with closed overstory canopy structure would be treated. Twenty seven percent (2560 acres) of the forested acreage with this structure would not be treated and would retain a multi-tiered structure. The stands in this category with a post treatment rating of moderate would no longer be multi story, but would continue to have a closed overstory canopy.

The high risk to insects, disease, and stand replacing wildfire would be reduced on the entire project area. Stand conditions would improve in resilience and resistance as stand density would be reduced and residual tree vigor would be improved. A reduction in stand densities would reduce the number of contiguous acres of stands in high departure. Specific agents or conditions negatively affecting forest health would be substantially lessoned as stand density is reduced to below threshold conditions.

Thinning would concentrate on the removal of weaker, smaller trees. The removal of these smaller, weaker trees mimics mortality caused by inter-tree competition or surface fires and concentrates site growth on dominant trees (*Graham and others 1999*). Intermediate commercial and noncommercial treatments would mimic historic low-severity fire regimes common to the warm, dry and warm, moist ponderosa pine habitat types. Successional pathways would be similar to those experienced after frequent low intensity underburns, which would allow fire resistant stands to develop. Stands would also be better able to withstand the effects of wildfire, in terms of a reduction of tree stem mortality and reduced risk of stand replacement crown fire. Stand growth, yield, and condition would be improved by thinning. Thinning would increase growing space, availability of water, nutrients, and sunlight to residual trees. Thinning would allow individual trees to develop a fuller crown of foliage, which in turn would increase individual tree diameter growth, and allow trees to become more wind and snow firm, and better able to resist insect (bark beetles) attack. Thinning would sustain long-term

timber yields as well as allow more silvicultural management options for the future. Thinning coupled with prescribed fire would encourage and hasten the development of fire maintained large tree size conditions.

Natural fuels prescribed fire would be applied to some of the low risk stands that were treated in the 1990's. These stands are a mosaic of clumpy and scattered stocking under an open canopy overstory. These burns would be a low intensity surface fire designed as a maintenance treatment to reintroduce fire into these stands, reduce natural fuel loading (litter, down fall, etc.) that has accumulated since the last fire cycle to within desired levels and thin individual and clumps of small diameter (less than 8" diameter) ponderosa pine regeneration.

3.2.5 Cumulative Effects

This section would present cumulative effects analysis of the forest vegetation resource for the Ekalaka project area. For purposes of the stand density and the stand structure and diversity cumulative effects impacts assessment, the analysis area is comprised of entire Ekalaka Hills Land Unit that encompasses the project area boundary. Activities considered for cumulative impacts are those that have influenced the current stand density or stand structure and diversity condition within the project area. The list of cumulative effects activities considered for this project is presented in Appendix B.

Alternative 1, No Action

No negative cumulative effects would occur with the selection of Alternative #1; however, more importantly, there would be no beneficial cumulative effects from selection of Alternative #1. Several other previous timber projects have occurred in the Ekalaka Hills and have created conditions on approximately 3,000 acres that have reduced risks to forest stand health and have improved the resilience of the existing forest structural diversity in those stands. In addition the Bureau of Land Management is proposing to treat forested parcels adjacent to the Ekalaka Hills unit at some point in the future. The selection of Alternative #1 would not improve forest health conditions or forest structural diversity in the project area in combination with other past, ongoing or future projects.

Alternative 2, Proposed Action

No negative cumulative effects would occur with the selection of Alternative #2; however, there would be beneficial cumulative effects from selection of Alternative #2. Several other previous timber projects have occurred in the Ekalaka Hills and have created conditions on approximately 3,000 acres that have reduced risks to forest stand health and have improved the resilience of the existing forest structural diversity in those stands. In addition the Bureau of Land Management is proposing to treat forested parcels adjacent to the Ekalaka Hills unit at some point in the future. The selection of Alternative #2 would treat an additional 8,525 acres of ponderosa pine stands in the Ekalaka Hills unit and would help to further reduce risks to overall forest health and improve forest structural diversity in the project area in combination with other past, ongoing and any future projects.

3.3 Watershed – Soils

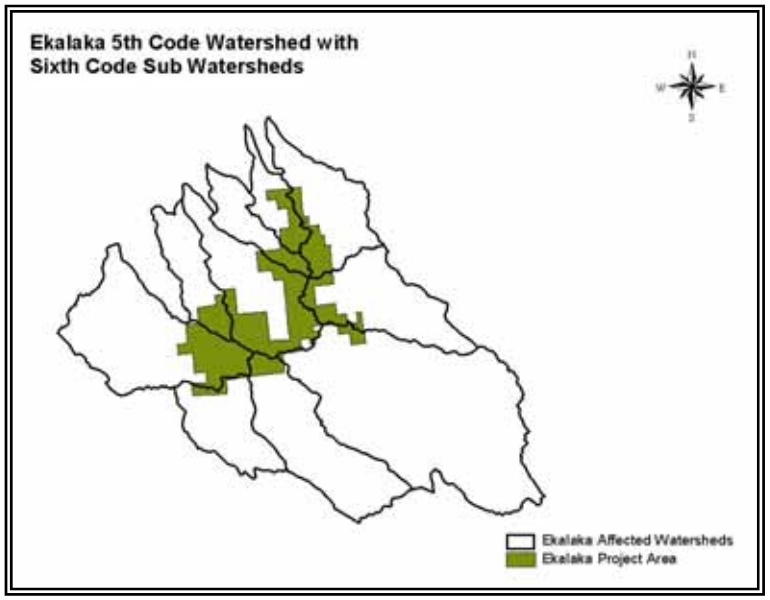
The section below is a summary of the affected environment and the effects of the alternatives on this resource. A detailed specialist report is in the project files.

3.3.1 Affected Environment

The Ekalaka Project area is located on portions of nine Sixth Field Hydrologic Units (HUCs) that feed Box Elder Creek and the Little Missouri River, ultimately feeding the Missouri River. Land ownerships include mainly National Forest system and private lands (See Figure 20).

The analysis area for the affected environment was limited to the actual Forest Service ownership within the Forest Service Ekalaka Hills land unit. Using actual watershed boundaries for the watershed resource on this project is not practical or reasonable in this instance because the project is located on a large rolling butte land feature that is the apex of several watersheds. This means that the project is, in several instances, only a small portion of several watersheds and is located at the upper elevations of drainage areas. Therefore, analysis using watershed boundaries would dilute the analysis results with large non-activity areas.

Figure 20. Project Area (dark shaded), and 6th Code HUC boundaries (black lines) showing the relationship between the project boundary, and watersheds.



3.3.1.1 Soils

Soil erosion hazard in the project area is defined as the potential for soil detachment and transport given a landscape's slope, soil erodability, soil water-holding capacity, and precipitation pattern. It assumes no vegetation is present on the disturbance site. A "high" hazard occurs where disturbance is likely to create soil erosion, and high-cost project design measures may be needed to reduce it. "Moderate" hazard occurs where disturbance is likely to create soil erosion, but special project design measures may be sufficient to prevent or reduce it. "Low" hazard occurs where soil erosion is

unlikely even after disturbance. Soil erosion hazard is low to moderate in most of the survey area (See Figure 21).

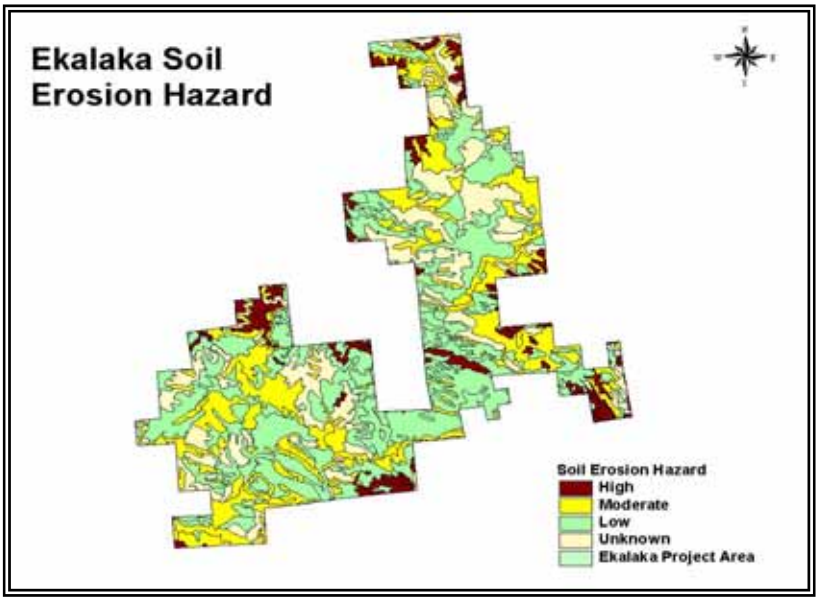


Figure 21. Relative Soil Erosion Hazard for the Ekalaka Project Area.

However, there are relatively small areas (less than 3% of the total project area) near buttes and in sensitive soil areas of the project that have a "High" erosion hazard. These areas are defined as having an erodability factor (Kf) equal to or exceeding 0.43 and representative slope gradients greater than 30%. According to field surveys, regional soil quality guidelines are being met and it is estimated that Detrimental Soil Disturbance occurs over less than 2% of the project area.

Coarse Woody Debris

Coarse Woody Debris is important in terms of its ability to act as a reservoir or sponge for water storage at the soil surface, its effect on stream channel stability, and also for its usefulness as habitat for some wildlife species. Coarse Woody Debris (CWD) (dead organic material 3 inches in diameter and larger) and Large Woody Material (LWM) (a subset of CWD which includes snags and downed organic material 12 inches in diameter and larger) may be lacking in the near future. Data on specific amounts of CWD and LWM for the Ekalaka Hills land unit was unavailable, but Graham (1994) has collected data in other healthy dry pine types and found that they tend to have approximately 5 - 10 tons/acre of CWD. The Ekalaka Hills unit is considered to be a very dry pine type. Local fuel surveys and Forest Vegetation Simulation (FVS) modeling indicate that the long-term CWD levels should be closer to 3 – 7 tons/acre.

3.3.1.2 Stream Channels

Streams within the Ekalaka Hill land unit tend to have very short surface flow durations, likely after substantial rainfall events or snowmelt. Most streams can be characterized as intermittent or ephemeral. During field surveys, only one of the streams surveyed could be classified as having stream flow. Most stream bottom areas are composed of a floodplain but no developed channel system. Developed stream channels are rare ad generally found where the watershed area is large enough to support the hydraulic energy required to create and maintain channel systems. As stream

systems leave areas of relief and enter very broad valleys and prairies, surface flows become increasingly rare as evidenced by the lack of defined channels and riparian vegetation. Stream flow is lost either to evapotranspiration or recharge of groundwater systems (USDA Forest Service, 2002).

Most of the project area is covered by active range allotments and livestock are currently utilizing much of the area. Surface trampling impacts (soil displacement and compaction) from grazing activities tended to be located at water improvements. Springs and seeps exist in other draws, likely correlating with geologic structural features associated with bedrock.

3.3.1.3 Water Quality

There are no 303d listed waterbodies within the project area and there are no listed segments downstream within any reasonable distance that could be impacted by this project. Any impacts to water quality that are occuring are associated with the very localized grazing impacts at water improvements near springs and also from native surface roads.

Table 31. Miles of roads adjacent to stream channels

Miles of roads within 50 feet of Intermittent or Ephemeral Channels	Miles of roads within 100 feet of Intermittent or Ephemeral Channels
7.5	14.5

Roads can cause major impacts to stream systems and water quality (Elliot, 1999). Channel constriction and sediment delivery from roads often result from roads that are located next to stream channels. However, in most instances, the roads are not contributing to any areas of stream flow constriction or major sediment delivery to stream channels. Of the 71 miles of affected roads within the project area, there are approximately 7.5 miles of roads that are immediately adjacent (within 50 feet) to stream channels and approximately 14.5 miles that are within 100 feet. Utilizing the WEPP Erosion Prediction Model, it is estimated that the road segments immediately adjacent (7.5 miles) are delivering about 4.4 tons of sediment annually above the natural erosion rates for the area. According to the model, roads beyond 100 feet of the road were not delivering substantial amounts of sediment and so were not included in the sediment delivery analysis. Most roads in the area tend to be very low standard native surface or two-track construction and, except for those noted above, are located away from stream channels.

3.3.2 Environmental Effects

The forest stand fuel hazard reduction activities would require the construction of temporary roads, reconstruction of some existing roads, and the use of mechanized equipment to remove the thinned materials from the woods. All action alternatives would utilize streamside buffers as described by the Montana Streamside Management Zone law (See Table 32). All streams with a definable bed and bank in the project area would receive at least a 50-foot stream buffer (as required by the Montana SMZ law); however in some instances a wider buffer would be applied where adjacent slope steepness and project activity pose a risk for sediment delivery.

Table 32: Recommended stream buffer widths by slope.

Slope of Mechanical Activity	Buffer Distance (feet)

Unit Adjacent to Stream Channel	
Less than 15%	50
Between 15% and 30%	50, 100 on sensitive soil areas
Greater than 30%	100

In order to meet the CWD recommendations, it would be necessary to leave 3 – 7 tons/acre of CWD on all non-Wildland Urban Interface (WUI) forest stands. All WUI stands would be treated. It is unknown what portion of CWD (all surface fuels 3 inches in diameter and greater) was historically attributable to LWM (the subset of CWD that is 12 inches in diameter and greater). However, based on field observations, it is believed to have contributed at least 50%-70% of the total amount of the Coarse Woody Debris. Based on this estimate, it would be prudent to maintain approximately 2 – 4 tons of LWM scattered over the landscape for long-term soil productivity. The recommended range of LWM pieces for long term soil productivity is arrived at by utilizing the CWD range or a little bit higher as Brown et al (in press) suggests. See Table 33 below.

Table 33. Large Woody Material to be left on site for both WUI and Non-WUI treatment areas.

Diameter of LWM (inches)	Number of Pieces to promote Long Term Soil Productivity: Non-WUI Areas (approximate number of pieces/acre)	Number of Pieces to promote Long Term Soil Productivity: WUI Areas (approximate number of pieces/acre)
12	10 - 20	8 - 15
14	10 - 15	6 - 10
16+	4 - 10	4 - 8

Note: piece length should be a minimum of 8 feet and standing snags are included as future recruitment for LWM and CWD. Longer pieces of LWM can be tabulated for multiples of 8-foot long pieces.

The remaining CWD (up to 1 - 3 tons) that is less than 12 inches in diameter should be lopped and scattered during or immediately after harvest activities.

3.3.2.1 Alternative #1: No Action

The no action alternative would maintain the current conditions, but the risk of a large wildfire would be increased in the long-term. Impacts to water source areas from livestock activity and limited sediment delivery from rutted road conditions would continue. In the short term (0 – 10 Years), CWD would be maintained at or near its current levels, a near term surplus in 10 – 30 years as trees die from overcrowding and endemic insects and disease. There would be a long period afterwards where Large Woody Material (LWM) levels would be reduced due to the effects of dense overcrowded stands on the reestablishment of large diameter trees for LWM recruitment.

In the event of a wildfire, soil and watershed resources could be negatively impacted. There could be a short-term deficit in surface organic material (0 – 10 Years), a near term surplus in 10 – 30 years, and a long period afterwards (until a new forest is re-established and CWD recruitment is occurring) where coarse woody debris, and large woody material in particular, could be deficit in the ecosystem. Sediment delivery to stream channels could be greatly increased over unburned conditions for a period of 3 – 5 years.

3.3.2.2 Alternative #2: Proposed Action

Soils

Commercial harvest and other mechanical fuels reduction areas that would receive temp roads and tractor yarding disturbance activities all rated as high potential for detrimental soil disturbance. These areas are expected to recover within 3-10 years. USDA-FS Regional Soil Quality Guidelines indicate that no more than 15% of any activity area can result in detrimentally disturbed soils. The areas rated as High risk for detrimental soil disturbance are considered to count towards the 15% guideline, and would result in approximately 4% of the project area having detrimental soil disturbance. However, the application of soil and water conservation Best Management Practices (BMPs) should further minimize the extent of impacts to soils. Table 34 displays the effects of Alternative #2 on risk of soil disturbance.

Table 34. Alternative #2 Relative magnitude of Soil Disturbance1.

Soil Disturbance	Percent of the Activity Areas
Low	86%
Moderate	10%
High	4%

[1]Ratings of Low, Moderate, and High are based on the relative impact of the project alternative activities.

Sediment

Project activities, aside from roading, are not expected to deliver sediment to stream channels. All harvest and roading activities would implement Forest Service BMPs. Stream buffers of at least 50 feet would also be applied to all stands to help insure that sediment delivery is minimized. Where adjacent hillslopes are steeper than 15 percent, it is recommended that the stream buffers be implemented as described (See Table 32 on a previous page).

All temporary roads would be reclaimed and rehabilitated to a near natural condition after project activities are completed. According to sediment modeling utilizing the WEPP erosion prediction model, sediment delivery from roads is relatively minor (See Table 35).

Table 35: Sediment delivery from project road segments adjacent to stream channels

Road Activity	Road miles	Sediment Delivery (tons/year)
Existing Condition		
Project Roads Total	71	
Roads with potential risk of sediment delivery	8.6	4.4
Proposed Action (Road Segments with Sediment Risk)		
Maintenance Only	5.0	8.7
Recondition	1.7	3.5
Reconstruction	0.7	1.5
Temporary Road-Existing Template	0.4	0.9
Temporary Road-New	0.7	2.0
Total		16.6

Most of the road segments located next to stream channels are not delivering a lot of sediment, and the potential for the delivered sediment to substantially affect water quality is remote. The current conditions of the rest of the segments adjacent to channels are fair to good, so these road segments are not expected to gain a lot of sediment reduction benefit from road maintenance activities. Therefore, the volumes of sediment generated from this project should not be sufficient to degrade local or downstream channel and water quality conditions. It is expected that sediment delivery from the project activities would decrease substantially (by 50% or more) after the project has been completed due to the decommissioning of temporary roads, improvement in road drainage features and natural stabilization (USDA Forest Service, 1999).

3.3.3 Cumulative Effects

The Cumulative Effect analysis area for the Ekalaka Project includes all of the affected 6th code Hydrologic Units (See Figure 22 below).

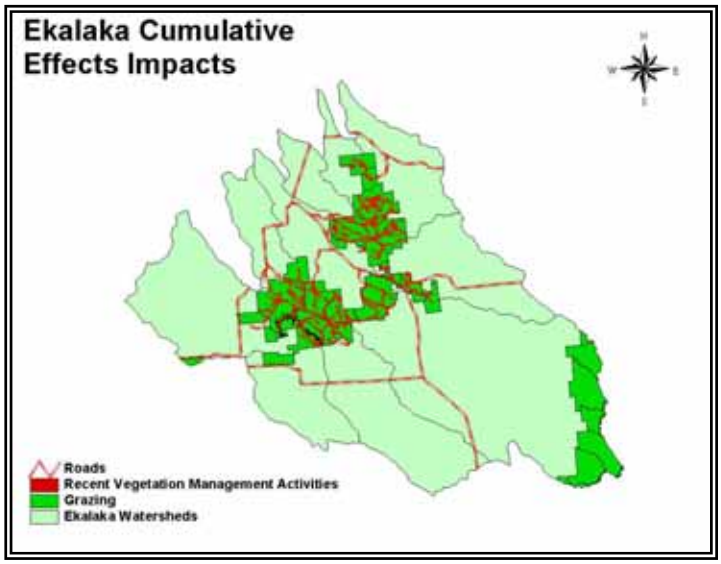


Figure 22. Past, Present, and Future Impacts and Cumulative Effects Analysis Area.

The areas outside of the Ekalaka Project area and within the affected 6th Code Hydrologic Units are mostly privately owned ranches managed for cattle production and are well grazed and moderately roaded with a mixture of low standard native surface roads, graveled roads, and paved roads.

Alternative #1, No Action

The No Action alternative would not create a cumulative effect. There are no activities planned for the No Action alternative that would combine with past, present, and future activities to cause an accretion of effects on soils or sediment delivery.

Alternative #2, Proposed Action

Alternative #2 would treat most of the Fire Hazard and Silviculture Departure stands within the Ekalaka Hill land unit. The Proposed Action includes activities that would require the use of mechanical ground disturbing activities to remove the excess fuel materials.

Mechanical yarding of fuels and temp road building are the primary causes of the additional cumulative effect acres, but as noted in the Effects Analysis section, the effects of those activities should be limited in time to the short-term (1 – 3 years) and near – term (5 – 10 years). The combination of the past, ongoing, and future projects, and Alternative 2 would produce relatively short and near term cumulative effects, but they are not measurably different from the current existing condition (See Table 36).

Table 36. Cumulative Effects of past, ongoing, and future projects within the affected watershed

	Total Watershed Area (acres)	Watershed #162969
Current Condition		
Cumulative Effect Type	Cumulative Effect Disturbance Acres	Percent of Watershed Affected
Roads	306	
Range	2742	
Past Vegetation Management Activities	10	
Total	3058	2%
Post Project		
Cumulative Effect Type	Cumulative Effect Disturbance Acres	Percent of Watershed Affected
Roads	306	
Range	2742	
Past Vegetation Management Activities	10	
Proposed Action and future Projects	767	
Total	3825	2%

3.4 Wildlife

3.4.1 Introduction

The wildlife analysis addresses wildlife habitat and wildlife species needs within the Ekalaka Hazardous Fuel Project area. Habitat characteristics for endangered, threatened, sensitive, and proposed (TESP) species with habitat in the area listed under the Endangered Species Act, Region 1 of the Forest Service, and the State of Montana are addressed. In addition, migratory birds and habitat is discussed.

Other than wintering bald eagles, no Threatened or Endangered wildlife species have been located within the project area. Adequate primary habitat does not exist or have the potential to exist within the project area for any Threatened or Endangered wildlife species. A Biological Assessment would not be prepared for this analysis since no Threatened or Endangered wildlife species would be impacted by either of the alternatives. The Biological Evaluation for Sensitive Wildlife Species has been incorporated into the text of this document, with a separate signature page and summary page in the project file. The complete wildlife specialist report is in the project files.

On the Custer National Forest, all of the species considered in this document occur over a geographical area encompassing several states. Because their distribution is so large, the viability of the species is not tied to actions occurring only on a small portion of their natural range such as the Custer National Forest and in particular the Ekalaka Hills unit. Therefore, one could argue that viability at the forest scale is not an issue. Even so, it is recognized that negative actions occurring within a small portion of the range, if extended out to their entire range, could lead to problems in species viability over time. Therefore, it is important to assess how the actions within a portion of a species range contribute to the viability across the range.

To address this, activities are evaluated in terms of their affect on habitat, at the project level, landscape level, and the planning unit if needed. At the project and forest level, the analysis focuses upon the likelihood of the species or its habitat "persisting" within the analysis area over time. A qualitative rating of persistence is made based upon demographic, habitat, and environmental factors.

- Demographic: Life history, population, distribution, birth and death rates, sex ratios, and dispersal potentials within the landscape.
- Habitat: Amount, quality, and distribution of habitat.
- Environment: Disturbance regimes likely within the landscape, successional pathways, and vulnerability to catastrophic events.

Demographics, habitat, and environmental factors rarely function independently. Loss of habitat or increases in disturbance (natural or manmade) may result in changes in population levels, distribution, and demographics. However, at any given point in time, one of the factors may be dominant in determining the likelihood of species persistence within the analysis area. Table 37 shows the persistence analysis process being used for this analysis.

Table 37. Criteria used to identify whether factors are low, moderate, or highly favorable.

Factor	Feature	Low Persistence	Moderate Persistence	High Persistence
Demographic	Population Distribution *(Province to Domain Scale)*	Species is endemic to a section (unit within the National Hierarchical Framework). Single disturbances could affect major portions of species range	Species is endemic to one or more provinces. Disturbances could affect portions of a species range.	Species is well distributed across one or more domains. Disturbances would not likely affect substantial portions of a species range.
	Isolation *(Landscape to Province)*	Populations are isolated and do not interact with other populations.	Populations are distributed such that interaction between populations is possible.	Populations are well distributed in such a way that dispersal not disrupted.
	Survival *(Landscape to province scale)*	Mortality, particularly human caused, is a big factor in affecting species survival.	Mortality, particularly human caused, has an effect on species persistence, but does not threaten survival	Mortality, particularly human caused, is not a factor affecting species persistence.
	Reproduction *(Landscape to province scale)*	Species has low natural reproductive potential.	Species has a moderate natural reproductive potential.	Species has a high natural reproductive potential.
Habitat	Quality *(Landtype to landscape scale)*	Habitat parameters such as tree size and snag size meet minimum requirements. Small changes in structure at the stand level results in habitat rendered unsuitable.	Habitat parameters exceed minimum levels however, small changes renders habitat minimally suitable.	Habitat parameters easily exceed suitability requirements such that small changes do not render habitat unsuitable or minimally suitable.
	Quantity *(Landtype or landscape scale)*	The amount of habitat barely meets minimum requirements for establishment of territories or to provide for dispersal. Small changes in the amounts of habitat render areas unsuitable.	The amount of habitat exceeds minimum amounts, however, small changes in the amount of habitat renders areas minimally suitable or unsuitable.	The amount of habitat greatly exceeds minimum levels such that small disturbances do not render habitat minimally suitable or unsuitable.
	Distribution *(Landtype or landscape scale)*	Habitat is distributed across the landscape at maximum juvenile dispersal distances. Pockets of isolated habitat exist. Minor disturbances likely result in increased population isolation.	Habitat is distributed across the landscape within maximum juvenile dispersal distances. Pockets of isolated habitat are rare. However, minor disturbances likely result in increased population isolation.	Habitat is distributed across the landscape at optimum levels for juvenile dispersal and few if any isolated patches exist. Minor and even major disturbances are not likely to result in substantial population isolation across the planning area.
Environmental	Disturbance Extensiveness	Fire hazards (fuel loads, tree densities, tree species composition) and other hazards are extensive and contiguous across the planning area.	Fire hazards and other hazards are not extensive or contiguous across the analysis area. Areas of high hazard are broken by vegetation of lesser hazard or by natural features.	Hazards are not extensive and contiguous. Landscapes are diverse, reflecting natural conditions.
	Historical comparison of disturbances	Disturbances are outside historical levels, in terms of their size, severity or intensity, and are likely wide spread across the analysis area.	Disturbances outside historic levels are not likely, however, management strategies and successional trends lead to a high likelihood of disturbances outside historic levels across a large portion of the landscape within the next 10-20 yrs.	Disturbances outside historic levels are possible but not likely because vegetation within the management area have been managed within historic levels as well.

The persistence rating is a qualitative rating and as such, is not a precise determination. Of greater importance is the change in persistence and the rationale for that change. An increase in persistence from a low to a moderate indicates that habitats are less isolated, or that the amount or quality of habitat is improved, or that the risks to existing habitat are reduced.

3.4.2 Affected Environment

The project area contains land of varied topography and elevations (3300 to 4100 feet) with a variety of forested and non-forested plant communities. The woodland draws and drainages provide topographic relief, which provide shade, hiding and thermal cover for animals utilizing the area as well as a variety of forage shrubs species such as green ash, hawthorne, serviceberry, and chokecherry. The non-forested communities dominate south facing slopes and benches throughout the project area

as well as the lower elevations along the perimeter. Forested stands are more common on northern and eastern aspects in the northern portion of the project area, while in the southern part of the project area forested stands are present on all aspects. The dominant tree species for these forested stands is ponderosa pine while small pockets of aspen are found throughout the project area.

Approximately 5,160 acres or 27% of the project area is non-forested. Large areas of grassland and shrubland types of vegetation are found on drier slopes and benches. These areas are naturally non-forested due to temperature, dryness, and poor soil structure. There are approximately 13,660 acres (73% of the project area) of ponderosa pine forested communities within the project area (FS ownership).

The Ekalaka Hills unit is a forested island with a few woody draws surrounded by dry grassland and agricultural lands. The project area is primarily the only conifer forested area in many miles and is important to forest dwelling species. The closest conifer-forested area is the Long Pines Unit, which is about 12 miles southeast of the Ekalaka Hills. The forested Ekalaka Hills rise up above the grasslands with rock cliffs/outcrops along the butte edge. Table 38 and Appendix A-Map #3d shows the distribution and abundance of various habitats across the project area. The open canopy ponderosa pine areas are those with a canopy closure of 10 to 40 percent. These offer little hiding cover for big game and easy access for avian species. Closed canopy ponderosa pine areas are those with a canopy closure of 40 percent or higher. These areas typically offer good hiding cover from the air as well as the ground, and they usually have larger trees associated with them. As displayed in Table 38, approximately 50 percent (6,715 acres) of the forested (ponderosa pine) habitat has a closed canopy.

Table 38. Habitat Abundances within the Project Area

Habitat Description	Approximate Acres
Ponderosa Pine Cover Type Forested – Open Canopy (0-39%)	3607
Ponderosa Pine Cover Type Forested – Mid Canopy (40-69%)	3151
Ponderosa Pine Cover Type Forested – Closed Canopy (70%+)	6715
Aspen	146
Mixed/Other (Interpreted as woodland draws, generally surrounded by grassland)	101
Scoria/Sandstone (Rock)	114
Dry Grassland	4,991

The diversity of forest stand structure in the Ekalaka Hills project area is decreasing due to the current successional pathway and disturbance patterns. This has led to a gradual elimination of the more open, fire maintained stands of larger diameter ponderosa pine trees. The current stand conditions are primarily due to selective logging around the early 1900's of the larger, more fire tolerant ponderosa pine and the reduction in natural low-intensity fire disturbance regimes, due mainly to aggressive fire suppression activity by the Forest Service. Lack of low-intensity fire disturbance has resulted increased tree density in the overstory, abundant tree regeneration in the understory, and a buildup of ground fuels (both larger diameter and litter layers). This has resulted in mid aged/sized contiguous tree stands that are more prone to stand replacing fire because of increased fuel loading. For more

detail on the current vegetation within the analysis area refer to the Fire/Fuels and Forest Vegetation sections.

Livestock grazing has been a dominant use in the Ekalaka Hills since approximately the turn of the century. Water availability is somewhat limited. There are about 61 miles of intermittent streams in the project area. No perennial streams exist within the project area. Livestock permittees have developed stock ponds/troughs and an extensive pipeline system to improve water accessibility across the area. There are also a few ponds and springs dispersed within the area.

Species that have not been documented to exist and have habitat within the project area are speculated to be present within the project area, with no information on estimated numbers of individuals and existing persistence ratings are estimated based primarily on habitat quantity and condition.

Table 39 to Table 42 display the Federally listed and proposed species, Regional Forester's Sensitive Species of known or expected species on the Custer National Forest, Habitat Indicator Species (otherwise known as Management Indicator Species (MIS)), and Key Wildlife Species. These tables also indicate whether or not the species is likely to have habitat within the project area for some portion of its life cycle. If the species does not exist, does not contain habitat within the project area, or could not be impacted by the proposed activities in any way, the existing persistence rating is low within the project area, no impacts or change in persistence rating would occur as a result of any alternative selected and would not be discussed further in this document.

Table 39. Listed Threatened, Endangered & Proposed Wildlife Species

Species*	Suitable Habitat w/in Project Area	Species Documented w/in Cumulative Effects Area	Basic Habitat Description
Bald Eagle	No –winter only	Yes – winter only	Nesting structure near a large water-body (lake or river) to provide sufficient forage
Black-footed Ferret	No	No	Large complexes (6,000 – 7,500 acres) of occupied prairie dog colonies (>100 acres)
Grizzly Bear	No	No	Remote, well connected forested generalist
Gray Wolf	No	No	Remote, well connected forested generalist
Lynx	No	No	Spruce/fir, high alpine, specialist

*Species that have no habitat within the project area (column 2) or have not been documented within the cumulative effects area (column 3) are considered to have a low persistence rating and would not be impacted by this project in any way. They would not be discussed further in this document.

Table 40. Sensitive Wildlife Species

Species*	Suitable Habitat w/in Project Area	Species Documented w/in Cumulative Effects Area	Basic Habitat Description
Peregrine Falcon	No	No	Cliff habitat over 200 feet high with suitable ledges for nest construction
Northern Goshawk	Yes	Yes	Mature forest generalist
Mountain Plover	No	No	Flat, sparse, short-grass prairie

Table 40. Sensitive Wildlife Species			
Species*	Suitable Habitat w/in Project Area	Species Documented w/in Cumulative Effects Area	Basic Habitat Description
Burrowing Owl	Yes	No	Open grasslands, nesting and roosting in burrows dug by mammals or owls –often associated with prairie dogs
Flammulated Owl	No	No	Open ponderosa pine or mixed conifer forests primarily in the Rocky Mountain portions of western states (Not in eastern Montana) – secondary cavity obligate
Sage Grouse	No	No	Large areas of mature sagebrush w/ small openings
Greater Prairie Chicken	No	No	Prairie grasslands and shrublands
Harlequin Duck	No	No	Swift flowing rivers w/ adequate prey
Baird's Sparrow	Yes	No	Prairie grasslands
Sprague's Pipit	Yes	No	Prairie grasslands
Loggerhead Shrike	Yes	No	Grassy pastures that are well grazed – Nests in shrubs or small trees, preferably thorny such as hawthorn
Black-backed Woodpecker	No	No	Primary habitat is recently burned forested areas, secondary habitat is spruce/fir forests
Townsend's Big-eared Bat	Yes	No	Cave and cave-like structures along with forested foraging habitat
Pallid Bat	No	No	Arid deserts and grasslands w/ rock outcrops in western states (Eastern Montana is outside of known range (Chung-MacCoubrey 1999))
Spotted Bat	No	No	Desert to montane coniferous forests – (Eastern Montana is outside of known range (Chung-MacCoubrey 1999))
White-tailed Prairie Dog	No	No	Xeric sites with mixed stands of shrubs and grasses from the Bighorn basin in Montana south to Utah
Black-tailed Prairie Dog	No	No	Relatively flat grasslands throughout the central plains
Northern Bog Lemming	No	No	Sphagnum bogs, wet meadows, moist mixed and coniferous forests
Bighorn Sheep	No	No	Remote, steep, rugged terrain, such as mountains, canyons, and escarpments where precipitation is low and evaporation is high
Fisher	No	No	Mature to over-mature grand fir, mixed fir, spruce/fir, and sub-alpine fir forests
Wolverine	No	No	Remote subalpine and spruce/fir forested areas
Tawny Crescent Butterfly	No	No	Moist meadows and pastures – Not found in this part of Montana (USGS 2002)
Regal Fritillary Butterfly	No	No	Tall-grass prairies – Not found in this part of Montana (USGS 2002)
Dakota Skipper Butterfly	No	No	Not found in Montana (USGS 2002)
Belfragi's Chlorochroan Bug	No	No	Not found in Montana (NatureServe 2004)
Boreal Toad	No	No	Spruce/fir and alpine meadows
Northern Leopard Frog	Yes	Yes	Riparian and wetland areas

Table 40. Sensitive Wildlife Species

Species*	Suitable Habitat w/in Project Area	Species Documented w/in Cumulative Effects Area	Basic Habitat Description
Sturgeon Chub	No	No	Heavily turbid medium to large rivers
Yellowstone Cutthroat Trout	No	No	Upper Yellowstone and upper Snake River drainages.

*Species that have no habitat within the project area (column 2) or have not been documented within the cumulative effects area (column 3) are considered to have a low persistence rating and would not be impacted by this project in any way. They would not be discussed further in this document.

Table 41. Management Indicator Species (MIS) - Wildlife

Species*	Suitable Habitat w/in Project Area	Species Documented w/in Cumulative Effects Area	Basic Habitat Description
Northern Goshawk	Yes	Yes	Mature forest generalist
Ruffed Grouse	Yes	No	Primary habitat includes dense early seral staged forests dominated by aspen – Secondary habitat includes other dense deciduous or conifer woodland areas
Sharp-tailed Grouse	Yes	Yes	Mosaic of dense grass and shrubs with forbs and insects for nesting, woody riparian areas in winter
Western Kingbird	Yes	Yes	Open and partially open country with scattered trees, including agricultural lands
Lark Sparrow	Yes	Yes	Open areas with scattered brush or trees
Northern Oriole	Yes	No	Open deciduous woodland and riparian areas
Yellow Warbler	Yes	Yes	Brushy riparian especially with wouldows
Ovenbird	Yes	Yes	Mid-late successional, closed-canopied deciduous or deciduous/conifer forests with limited understory
Rufous-sided (Spotted) Towhee	Yes	Yes	Shrubby riparian areas, woody draws, and woodland undergrowth
Brewer's Sparrow	No	No	Strongly associated with sagebrush, but also uses other areas with scattered shrubs and short grasses
White-tailed Deer	Yes	Yes	Grassland to montane conifer forest
Cutthroat Trout (Native Species)	No	No	Covered in Sensitive Species Section
Largemouth Bass	No	No	Warm Freshwater areas with beds of aquatic vegetation that have been stocked – (Exotic species to Montana)

*Species that have no habitat within the project area (column 2) or have not been documented within the cumulative effects area (column 3) are considered to have a low persistence rating and would not be impacted by this project in any way. They would not be discussed further in this document.

Table 42. Key Wildlife Species

Species*	Suitable Habitat w/in Project Area	Species Documented w/in Cumulative Effects Area	Basic Habitat Description
Key Wildlife Species			
Golden Eagle	Yes	Yes	Open hilly or mountainous areas
Merlin	Yes	No	Patchy shrub/grassland habitats with large trees to support nesting (Secondary nester)
Sharp-tailed Grouse	Yes	Yes	Covered in MIS Section
Elk	Yes	Yes	Grassland to forested alpine areas
Mule Deer	Yes	Yes	Rugged grassland to forested alpine areas
White-tailed Deer	Yes	Yes	Covered in MIS Section
Big Horn Sheep	No	No	Covered in Sensitive Species Section
Pronghorn Antelope	Yes	Yes	Grassland to montane conifer forest
Yellowstone Cutthroat Trout	No	No	Covered in Sensitive Species Section
Turkey (In MA D only)	Yes	Yes	Woody draws to montane conifer forest

- Species that have no habitat within the project area (column 2) or have not been documented within the cumulative effects area (column 3) are considered to have a low persistence rating and would not be impacted by this project in any way. They would not be discussed further in this document.

3.4.3 Environmental Consequences

Determinations of impact on wildlife species are presented and if any impacts from implementation of the project are expected, that species and the cumulative impact area would be defined and described individually. Impacts are based on implementation of the proposed silviculture treatment prescriptions, road management activities, and project design measures in Chapter 2. Past and present activities (See Appendix B) were considered when describing the existing condition, but may incrementally add to cumulative impacts.

3.4.3.1 Summary of Effects on All Wildlife Species

This section displays a summary table (Table 43) showing the list of all wildlife species considered and the effect determinations for each species by alternative. There was no Biological Assessment (BA) for Listed Species developed because other than bald eagle temporary and limited use during the winter there is no Threatened or Endangered wildlife species or potential habitat within the project area. Those species with no habitat present or those that would not be affected by the project activities would not be discussed in detail. Only those species listed in Chapter 2 as a wildlife issue (northern goshawk) is discussed in detail. The complete wildlife specialist report is in the project files.

Table 43. Summary of Effects on Wildlife Species

Listed Species	Alternative 1	Alternative 2
Bald Eagle	No Effect	No Effect
Black-footed Ferret	No Effect	No Effect
Grizzly Bear	No Effect	No Effect
Gray Wolf	No Effect	No Effect
Lynx	No Effect	No Effect
Sensitive Species	Alternative 1	Alternative 2
Peregrine Falcon	No Impact	No Impact

Table 43. Summary of Effects on Wildlife Species		
Northern Goshawk	No Impact[3]	MIIH[1]
Mountain Plover	No Impact	No Impact
Burrowing Owl	No Impact	MIIH
Flammulated Owl	No Impact[3]	No Impact
Sage Grouse	No Impact	No Impact
Greater Prairie Chicken	No Impact	No Impact
Harlequin Duck	No Impact	No Impact
Baird's Sparrow	No Impact[3]	MIIH
Sprague's Pipit	No Impact[3]	MIIH
Loggerhead Shrike	No Impact[3]	MIIH
Black-backed Woodpecker	No Impact[5]	No Impact
Townsend's Big-eared Bat	No Impact	MIIH
Pallid Bat	No Impact	No Impact
Spotted Bat	No Impact	No Impact
White-tailed Prairie Dog	No Impact	No Impact
Black-tailed Prairie Dog	No Impact	No Impact
Northern Bog Lemming	No Impact	No Impact
Bighorn Sheep	No Impact	No Impact
Fisher	No Impact	No Impact
Wolverine	No Impact	No Impact
Tawny Crescent Butterfly	No Impact	No Impact
Regal Fritillary Butterfly	No Impact	No Impact
Dakota Skipper Butterfly	No Impact	No Impact
Belfragi's Chlorochroan Bug	No Impact	No Impact
Boreal Toad	No Impact	No Impact
Northern Leopard Frog	No Impact[3]	No Impact
Sturgeon Chub	No Impact	No Impact
Yellowstone Cutthroat Trout	No Impact	No Impact
MIS Species	Alternative 1	Alternative 2
Northern Goshawk	No Impact[3]	MIIH
Ruffed Grouse	No Impact	No Impact
Sharp-tailed Grouse	No Impact[3]	Limited Impact *(with design measures[2])*
Western Kingbird	No Impact	Limited Impact *(with design measures)*
Lark Sparrow	No Impact	Limited Impact
Northern Oriole	No Impact[3]	Limited Impact
Yellow Warbler	No Impact[3]	Limited Impact
Ovenbird	No Impact[3]	Limited Impact
Rufous-sided (Spotted) Towhee	No Impact[3]	Limited Impact
Brewer's Sparrow	No Impact	No Impact
White-tailed Deer	No Impact[4]	Limited Impact *(with design measures)*
Cutthroat Trout (Native Species)	No Impact	No Impact
Largemouth Bass	No Impact	No Impact
Key Wildlife Species	Alternative 1	Alternative 2
Golden Eagle	No Impact[5]	Limited Impact
Merlin	No Impact	Limited Impact

Table 43. Summary of Effects on Wildlife Species		
Sharp-tailed Grouse	No Impact[3]	Limited Impact *(with design measures)*
Elk	No Impact[4]	Limited Impact *(with design measures)*
Mule Deer	No Impact[4]	Limited Impact *(with design measures)*
White-tailed Deer	No Impact[4]	Limited Impact *(with design measures)*
Big Horn Sheep	No Impact	No Impact
Pronghorn Antelope	No Impact[4]	No Impact
Yellowstone Cutthroat Trout	No Impact	No Impact
Turkey (In MA D only)	No Impact[3]	Limited Impact *(with design measures)*
Other Species	Alternative 1	Alternative 2
Neotropical Birds	No Impact[6]	Limited Impact

[1] MIIH = May Impact Individuals or Habitat, but would not move to Federal Listing or loss of population viability.
[2] Project design measures are listed in Table 11. See also the Wildlife Specialist Report in the Project files.
[3] No Impact in short-term, however a stand replacement wildfire would reduce available habitat.
[4] No Impact in short-term, however a stand replacement wildfire would have increase forage habitat and decrease thermal and hiding cover.
[5] No Impact in short-term, however a stand replacement wildfire would increase available habitat.
[6] No Impact in short-term, however a stand replacement wildfire would have variable impacts on habitat, depending on the species.

3.4.4 USDA-FS, Region 1-Sensitive Species

3.4.4.1 Northern Goshawk

Northern goshawks prefer nesting in mature, unlogged or lightly managed forest habitats with relatively closed canopies (greater than 60%), typically on the lower 1/3 of north, east, and west aspects with less than 30% slope, greater than 30 acres in size, and within 600 feet of water (Bull and Hohmann 1994). Nest sites in the Ekalaka Hills are ponderosa pine stands with greater than 50 percent canopy closure. Most literature states that open water is required within 1/4 mile of the nest site; however, nests have been found that are up to 2 miles away from known water sources. Goshawks use a variety of habitats for foraging but prefer mid to late succession forest and rarely use openings (USDA 1991), except for foraging along their edges. Home range sizes vary from around 3,000 to 9,000 acres depending upon quality of habitat and available prey, with an average of 6,000 acres.

Squires (USDA Forest Service 2000) confirmed that areas with high canopy closure, big trees, open forest floor, and moderate slopes are the most "typical" nest stands. However, he also indicated that goshawks are not restricted to nesting in these stands and could use stands with lower canopy cover as well. Reynolds (USDA Forest Service 2000) cautioned against using habitat data where known goshawks are nesting to extrapolate a definition of good nesting habitat. Goshawks exhibit high site fidelity and may use lower quality habitat but not produce young. Goshawks would nest in stands of various sizes. Larger tends to be better, but not at the expense of having suitable nesting habitat distributed across the landscape. It is important to provide nesting habitat across the landscape, outside of known territories.

Post-fledging areas (PFAs) generally include dense patches of pole size timber, mature and old forest with >50% crown closure, and small openings. Foraging areas include openings, forest edges, and moderately open canopy stands. Reynolds and others (1992) recommend at least 40 percent canopy closure in mid-age forest forage areas, 40 to 60 percent canopy closure in mature and old forests and openings up to 4 acres in size in ponderosa pine foraging areas.

The project area provides what would be considered to be marginal goshawk habitat. The nesting habitat is medium to low quality and is disconnected from other more suitable areas. The habitat is marginal for several reasons, but is primarily linked to the lack of late forest structure, the preponderance of dense mid-aged forested stands that provide few large trees capable of supporting a goshawk nest, and limited availability of water. Currently the potential for stand replacement wildfire is fairly contiguous across the project area. A large stand replacement wildfire would render the project area unsuitable for goshawk.

This being said, two active northern goshawk nests were discovered within the project area during surveys in 2003. Nesting success was not determined. The Ekalaka Hills provide the only goshawk habitat (forested area) for many miles so it is critical to protect and/or enhance the habitat. It is thought that since the project area contains marginal vegetative habitat, a limited prey base, and is isolated from other suitable habitat, two active nests sites or at the most 3 active nests would currently be the capacity for the Ekalaka Hills. The existing persistence rating for goshwak is low, due to habitat features.

Environmental Consequences Specific to Alternative 1

Over the short term, habitat conditions for the goshawk would not likely change. Although this alternative would not cause any direct or measurable indirect impacts to goshawks or their habitat, this alternative would result in perpetuating marginal to poor conditions for goshawks within the project area for several decades or longer through immeasurable indirect impacts. The existing areas providing low quality nesting habitat would not improve over time, due to the overstocked conditions that currently exist. Trees would remain small and densely arranged. Because much of the low quality nesting-habitat is dense with trees, it is at a higher risk of bug kill and stand replacement wildfire events. The unknown variables are timing, severity, and amount of area impacted by such events. The persistence rating would not change from low in the short or long-term.

Environmental Consequences Specific to Action Alternative 2

Alternative 2 incorporated the needs of goshawks into the project design. The three components of a goshawk's home range were identified. These include the nest areas, post fledgling-family area (PFA) and foraging area. The nest area is the center of all movements and behaviors associated with breeding from courtship through fledging. Since there are no management guidelines for the goshawk specific to the Custer National Forest, Management Recommendations for the Northern Goshawk in the Southwestern United States (Reynolds et al. 1992) were utilized as guidelines for managing goshawk habitat and modified to fit the habitat features of the Ekalaka Hills.

Two goshawk home ranges of approximately 9,000 acres each were delineated within the project area. State Highway 323 divides the two goshawk home ranges (north and south). Two PFAs were also delineated. The north end PFA is 2,106 acres in size and the south end PFA is 2,139 acres. The PFA surrounds the nest area. Because of the PFAs size, it typically includes a variety of forest types and conditions. The general size of PFAs is normally around 420 + acres but due to habitat conditions in the project area, these PFAs needed to be larger. Over one quarter of the project area is well dispersed grasslands. There were also large fuelbreaks established within the PFAs and foraging areas that contain limited numbers of trees. The PFA represents the area of concentrated use by the family from

the time the young leave the nest until they are no longer dependent on the adults for food, (up to 2 months). PFAs have patches of dense trees, developed herbaceous and/or shrubby understory, and habitat attributes (snags, downed logs, small openings) that are critical for much goshawk prey. The foraging area (home range) surrounds the PFA.

The two 2003 active nest sites are protected through the action alternative project design with a no treatment buffer. The north nest site is 39 acres and the south nest site is 34 acres. In addition a project design measure that minimizes and restricts human disturbance within ¼ mile of known or discovered active goshawk nests from March 1 through August 31 would be in place to protect the nest stand from disturbance during nesting and fledging periods.

Most goshawks have two to four alternate nest areas within their home ranges; alternate nest areas may be used in different years, and some may be used for decades. No known historical nest sites are known for this area. Two alternative suitable nest site stands were delineated for each known nest (total of 4 alternate nest sites equaling 70 acres for the south PFA and 56 acres for the north PFA). In addition, a total of 6-replacement goshawk nest stands (3 replacement nest stands for each known nest/PFA) were also identified (125 acres for the north and 93 acres for the south).

Table 44 to Table 46 show the balance of the desired structural stages for goshawk PFAs, the current PFAs habitat description, and the effects of Alternative 2.

Table 44. Goshawk PFAs: Current Conditions

Development Stages for Goshawk[1]	Diameter Range (in.)	Minimum Canopy Closure %	Desired Balance for Goshawk[1] (Percent of Area)	PFA 1 - Current Balance (Percent of PFA)	PFA 2 - Current Balance (Percent of PFA)
Non Forest Openings	NA	NA	10 (7-13)	6	25
Grass/Forb/Seedling	0-1	None		0	0
Seedling/Sapling	1-5	None	10 (7-13)	0	0
Young Forest	5-9	None	20 (15-25)	1	4
Mid-Aged Forest	9-14	50%	13 (8-18)	6	12
		60%	7 (2-12)	23	20
Mature Forest	14-20	50%	20 (15-25)	24	23
Old Forest	>20	50%	20 (15-25)	0	0

[1] Development Stages and Desired Balance is per Reynolds, 1992.

Table 45. Goshawk PFAs: Post Treatment – Alternative 2

Development Stages for Goshawk[1]	Diameter Range (in.)	Minimum Canopy Closure %	Desired Balance for Goshawk[1] (Percent of Area)	PFA 1 – Post Treatment Balance (Percent of PFA)	PFA 2 – Post Treatment Balance (Percent of PFA)
Non Forest Openings	NA	NA	10 (7-13)	6	25
Grass/Forb/Seedling	0-1	None		1	2
Seedling/Sapling	1-5	None	10 (7-13)	0	0

Table 45. Goshawk PFAs: Post Treatment – Alternative 2					
Development Stages for Goshawk[1]	Diameter Range (in.)	Minimum Canopy Closure %	Desired Balance for Goshawk[1] (Percent of Area)	PFA 1 – Post Treatment Balance (Percent of PFA)	PFA 2 – Post Treatment Balance (Percent of PFA)
Young Forest	5-9	None	20 (15-25)	1	4
Mid-Aged Forest	9-14	50%	13 (8-18)	6	11
		60%	7 (2-12)	23	19
Mature Forest	14-20	50%	20 (15-25)	23	23
Old Forest	>20	50%	20 (15-25)	0	0
[1] Development Stages and Desired Balance is per Reynolds, 1992.					

Table 46. Post Treatment + 20 Years – Alternative 2					
Development Stages for Goshawk[1]	Diameter Range (in.)	Minimum Canopy Closure %	Desired Balance for Goshawk[1] (Percent of Area)	PFA 1 – Post Treatment Balance (Percent of PFA)	PFA 2 – Post Treatment Balance (Percent of PFA)
Non Forest Openings	NA	NA	10 (7-13)	6	25
Grass/Forb/Seedling	0-1	None		0	0
Seedling/Sapling	1-5	None	10 (7-13)	1	2
Young Forest	5-9	None	20 (15-25)	0	0
Mid-Aged Forest	9-14	50%	13 (8-18)	3	6
		60%	7 (2-12)	13	14
Mature Forest	14-20	50%	20 (15-25)	26	26
Old Forest	>20	50%	20 (15-25)	11	11
[1] Development Stages and Desired Balance is per Reynolds, 1992.					

Assumptions

Current Condition:

- MA 133 and 233 have an average canopy cover of 50-60%
- MA 134 and 234 have an average canopy cover of > or = to 60%
- MF 133, 134, 233, 234 have an average canopy cover > or = to 50%

Post Treatment:

- Development stage remains the same
- CT1 – Post treatment canopy cover have an average canopy cover of 50-60%
- CT2 - Post treatment canopy cover have an average canopy cover of > or = to 60%
- Patch Clear Cuts become grass/forb/shrub development stage

Post Treatment + 20 Years:

- YF would develop into MA with >60% canopy cover

- 50% of MA would develop into MF and 50% would stay MA
- 50% of MF would develop into OF and 50% would stay MF
- GFS would develop into SS

Alternative 2 would treat approximately 8,525 acres of forested stands currently providing low to marginal goshawk habitat with silvicultural prescriptions and areas of follow-up fuels reduction treatment. This alternative would retain 1,708 acres of densely forested habitat untreated to provide for habitat diversity across the landscape. There would also be another 3,126 acres that would not be treated however these are not densely stocked stands. Alternative 2 moves forested stands in the right direction to provide improved habitat for the goshawk. In twenty years there would be more options available to improve the habitat even more. This alternative works with what is currently available as goshawk habitat and improves that habitat, while at the same time protects the landscape from stand replacement wildfire that could reduce habitat for goshawk.

Alternative 2 would create more diverse habitat for goshawk and would eventually provide a better balance of structural stages, moving the areas closer to the desired balance. Some treatments units within the PFAs contain 1-acre openings throughout the stand, which equal approximately 10% of the stand area (700 acres of regeneration treatment) that would prepare the stands for natural regeneration. Once the regeneration is established, these stands would be classified seedling/sapling and would progress successionally overtime. Prescribed burns and mechanical treatments would open the forest floor and create more diversity in the understory, which would provide important habitat for goshawk prey species. Commercial thinning would generally bring the stands to a basal area of about 80 wherever possible and would maintain a 50% canopy closure. The result would be a more open, mature age class stand. This is desirable for the goshawk PFA and foraging habitat.

Alternative 2 would improve the long-term condition of goshawk habitat within the project area through silvicultural treatments (reducing stand density by thinning from below), which would allow the remaining trees to grow faster and larger. The large tree clumps and overstory trees would primarily remain intact. This would result in improved growth of existing trees and higher quality nesting habitat within the shortest time period. In essence, the silvicultural and follow-up fuels treatments would take the place of several decades of fire suppression efforts. See the Vegetation and Fuels sections for further clarification. The entire project area lacks late successional habitat and multi-tiered stands. Alternative 2 creates the environment to help move the existing stands toward late successional habitat and multi-tiered stands, which is what goshawks prefer and predominately utilize. Alternative 2 would better protect the existing nest stands, suitable nest stands and replacement nest stands from stand replacement wildfire and insect infestations.

There would be short-term impacts related to the treatment activities; primarily noise and other human related activities. Alternative 2 proposes approximately 26 miles of temporary roads be constructed within the project area. This would expose many stands currently away from road traffic to a new form of disturbance. However, all temporary roads are to be closed within 6 months upon completion of activities and would only be used for limited periods. The temporary roads would be closed to non-project related motorized vehicles.

Snags greater than or equal to 12” DBH, which are 75 feet from roads and/or private property, would be retained unless they were a safety hazard in which case they would be felled and left on site. This project design measure would help to retain the limited snag habitat currently available. These snags may be used by both the goshawk and its prey. The snags would eventually become down wood that is also utilized by goshawk and their prey.

Goshawk maneuver easily in dense multi-story stands, however non-commercial and pre-commercial prescriptions in this action alternative should have a positive effect on northern goshawk habitat. Pre-commercial and non-commercial thinning would reduce the density of smaller diameter trees, providing a more open forest understory while still providing a multi-story stand. A more open understory would increase the opportunity for northern goshawks to be more successful in capturing prey. Pre-commercial and non-commercial thinning would also remove ladder fuels, reducing both the risk and potential severity of a wildfire. Commercial, pre-commercial and non-commercial thinning work activities have the potential to disrupt nesting northern goshawks. However a project design measure restricting management activity within the PFAs from March 1 to August 31 should eliminate that.

Pre-commercial and non-commercial thinning prescriptions under the action alternative would have both positive and negative effects on northern goshawk habitat. Pre-commercial thinning would reduce the density of smaller diameter trees, providing a more open forest understory while retaining canopy closure. This results in increased opportunities for northern goshawks to be more successful in capturing prey. However, goshawks prefer a multi-layered stand, which pre-commercial thinning would reduce. Goshawks are adept at moving swiftly through multi-layered stands, which aids in its ability to remain undetected. Pre-commercial thinning would remove ladder fuels, reducing both the risk and potential severity of a wildfire.

Prescribed burning has the potential to remove or change habitat components important to the northern goshawk. Burning would reduce the fuel loading and lower the severity of wildfire. The prescribed burns would be designed to be low intensity and create a mosaic of burned and unburned habitats within a confined area. Prescribed fire under the above conditions would have a long-term positive effect on the northern goshawk and its prey species. Generally speaking, the prescribed fire units would be in more open habitat.

These treated acres would be converted from low quality nesting habitat into foraging habitat for one or more decades. Although sounding substantial in nature, the proposed treatments of leaving the overstory and reducing the density in the understory would result in long-term improvements to the treated stands through increased diameters and branch development.

The proposed treatments included in the action alternative would not likely result in substantial changes to any of the existing foraging habitat, but would improve the access for goshawks. Prey density would not likely change as a result of the activities, because snags are not going to be harvested and down woody material would be maintained following all treatments.

Enhancement of 120 acres of aspen would improve habitat for goshawks by assuring the continuation of diversity on the landscape and enhancing habitat for prey species. In some places goshawks nest in aspen stands, however this has not been documented in the Ekalaka project area.

The persistence rating would remain low for the short-term but could move towards moderate in the long-term due to improvements in habitat conditions over time. The project area would not likely ever exceed a moderate rating due to the size and geographic isolation of the area from other areas providing goshawk habitat. Project design measures for goshawk are incorporated into the larger list noted in Chapter 2.

Cumulative Impacts

Typically goshawk cumulative impacts are addressed on a larger scale, including about 5 miles outside of a project area boundary. However, suitable goshawk nesting habitat doesn't exist outside the project area, due to geographic location of the Ekalaka Hills. With that being the case, cumulative impacts could only occur within the project area itself and the State, BLM and private land within the

perimeter and periphery. Therefore the defined cumulative impact area for goshawk is the essentially the project area.

Historically the project area probably offered large areas of quality goshawk habitat. The Ekalaka Hills landscape probably had large ponderosa pine and aspen groves across much of the area, although year-around water would have been limited. However, between historic logging and fire suppression the project area currently has few trees over 120 years old. This has resulted in substantial changes to the forested areas. The project area has not likely offered high quality goshawk habitat since the early 1900's. The Laka Breaks TS project did little to improve goshawk habitat, and in fact reduced habitat by creating large openings. The prescribed burning has had little impact on the goshawk habitat although it may have improved conditions for some prey species.

Alternative 1 – This alternative would not have any cumulative impacts, because there are no measurable direct, indirect, short- or long-term impacts expected to result from implementation of this alternative. However this alternative leaves the project area vulnerable to insect outbreaks and stand replacement wildfire.

Alternative 2 – This alternative would result in long-term habitat improvements. Recent activities within the cumulative impact area include multiple prescribed burns and some vegetation management including the Laka Break TS. The burns were primarily in open understory or dry grasslands, but also involved the removal of encroaching ponderosa pine into historic meadows. The vegetation management included removal of some overstory and understory. Recent past activities have changed goshawk nesting and foraging habitat. Implementation of the Proposed Action Alternative would likely have short-term negative cumulative impacts, but result in long-term habitat improvements. Alternative 2 would result in an improving trend for goshawk nesting and forage habitat by opening up the understory, growing larger trees and retaining canopy closure.

Determinations

Alternative 1 – Implementation of this alternative would have no impact on goshawks or their habitat.

Alternative 2 – Implementation of Alternative 2 may impact individuals or habitat, but would not likely contribute to a trend towards Federal listing or loss of viability to the population or species.

Rationale for Determinations

- There are no measurable or guaranteed impacts with implementation of Alternative 1.
- Alternative 2 would create human related noise and other disturbances within the project area.
- Alternative 2 incorporated the needs of goshawks into the project design measures that would limit disturbance to the birds.
- Over the long term this alternative improves goshawk habitat within the project area.
- Alternative 2 would make the project area less vulnerable to stand replacement wildfire.

3.4.5 Other Species of Interest

3.4.5.1 Land Birds (Neotropical Migrants)

Neotropical Migratory Birds (NTMB) live in a wide variety of habitats. Several NTMB species occupy the project area. In recent years, concern has grown over widespread declines of numerous NTMB populations. Neotropical migratory birds are defined as those birds that regularly winter south

of the Tropic of Cancer and summer in North America. The Migratory Bird Treaty Act implements various treaties and conventions between the U.S. and Canada, Japan, Mexico, and the former Soviet Union for the protection of migratory birds. Under the Act, taking, killing, or possessing migratory birds, including nests and eggs, is unlawful. A list of NTMB protected by the Migratory Bird Treaty Act is provided in 50 CFR 10.13.

In January 2001, an executive order was signed outlining responsibilities of federal agencies to protect migratory birds under the Migratory Bird Treaty Act. As a complimentary measure to the Executive Order, the Forest Service and the U.S. Fish and Wildlife Service entered into a Memorandum of Understanding (MOU) the purpose of which is to strengthen migratory bird conservation through enhanced collaboration between the agencies, in coordination with state, tribal, and local governments. This MOU would serve as guidance for the two federal agencies until more detailed direction is developed pursuant to the Executive Order.

Neotropical migratory birds occur in a variety of habitat types. The Custer National Forest provides habitat for a variety of NTMB. Some of the species from the Migratory Bird Treaty Act (50 CFR 10.13) that are commonly found in this area are mountain and western bluebirds, dark-eyed juncos, red-tailed hawks, American kestrel, and red-breasted nuthatch, to name a few. Much of the project area provides habitat for those NTMB that prefer closed coniferous, such as the goshawks.

These birds inhabit a wide variety of habitats from grass/shrub communities to dense mature and old growth forests. The habitat needs of NTMBs vary widely based on the species. The existing general habitats available within the project area were listed previously in Table 38 and displayed in Appendix A-Map 3c

Environmental Consequences Specific to Alternative 1

This alternative would have no short-term or direct impacts to any NTMBs or their habitat. There are potential indirect, long-term impacts from potential wildfires and/or insect infestations occurring in the future. However, the magnitude and timing of these potential impacts are unknown; they could modify the existing condition of the forested and shrubland habitats. Wildfire in the Ekalaka Hills would change the diversity and mix of NTMBs populations in the project due to the change in habitat. Some species would decrease, while others could flourish.

Environmental Consequences Specific to Action Alternative 2

Alternative 2 may result in unintentional take of individuals. However, the project complies with the U.S. Fish and Wildlife Service Directors Order #131 related to applicability of the Migratory Bird Treaty Act to federal agencies and requirements for permits. In addition, Alternative 2 is compliant with the Executive Order (Jan. 11, 2001), because the analysis meets our obligation as defined under the Memorandum of Understanding (Jan. 16, 2001), and specifically because it meets sections 2a. and 2b.

Alternative 2 would move treated stands towards providing larger diameter, wider spaced ponderosa pine habitats, which would result in a change of bird species composition and numbers in those areas. Some species would increase in number; while others may decrease as well as new species may move into the project area. Treatments would change the vegetative structure and create more vegetative diversity on the landscape. Approximately 1,708 acres of dense ponderosa pine forested habitat would not be thinned. This would retain adequate habitat for those bird species preferring dense, small diameter ponderosa pine. Sufficient forage, hiding cover and nesting habitat exists within and adjacent to the project area for neotropical birds. Species compositions may change, nesting attempts fail, and/or a few individuals may be displaced to other areas as a result of project activities. However, the

overall number of neotropical birds would not likely change as the potentially displaced individuals would likely find suitable habitat elsewhere within and outside of the project area and new species would move into the project area.

The direct effects of prescribed fire on neotropical migrant birds would occur primarily during breeding season (spring fire). The loss of nests and young could occur in all intensity regimes, nesting substrate can further refine this. In cases of low to moderate fire severity regimes ground and shrub nesters are more at risk than canopy nesters. Many species can overcome these losses by renesting and being double brooded. The indirect effects of low intensity fire are an increase in diversity with no change in total breeding bird populations (Johnsen and Wauer, 94). In other studies very little change in diversity and population has been noted on wildfires (Lyon and Marzluff, 1984; Agee, Huff and Manuwal, 1984). The prescribed burns impacts would be short-term and generally would improve substrate and foraging conditions. Many neotropical migrants are associated with riparian habitats; these would generally be excluded from burning.

Alternative 2 would reduce the risk of stand replacement wildfire. A large-scale stand replacement wildfire would eliminate existing habitat for most bird species dependent upon dense stand of ponderosa pine. Neotropical birds utilizing the project area would experience both negative and positive effects from implementation of the Alternative 2. The short-term negative effects would be offset by longer-term benefits from the reduction of wildfire hazard.

Alternative 2 would restore and enhance approximately 120 acres of aspen within the project area by removing conifers within and adjacent to these stands. This would help to retain these aspen stands on the landscape and retain some diversity of vegetation, which aids in increasing the diversity and numbers of neotropical birds able to use the project area. The temporary roads proposed in Alternative 2 would have no measurable impact on neotropical birds in the project area. There is a possibility that treatment activities and noise associated with it could have an impact on nesting success during the limited project activity and a slight chance individuals could be killed by motor vehicles, falling trees or prescribed burning, however the short-term impacts are perceived as having a long-term positive effect on the habitat. Alternative 2 would decrease the number of competing conifers within the riparian areas, which would enhance browse species. Enhancing browse species within the project area would have a beneficial effect for several species of neotropical birds.

Cumulative Impacts

Alternative 1 – Because this alternative would not have any measurable impacts, there could be no cumulative impacts.

Alternative 2 – Although Alternative 2 could result in the displacement of individuals and/or failed nesting attempts, such impacts would not be expected to result in a trend towards extinction or Federal listing of any neotropical bird species. The project area makes up such a small amount of the species habitat that only immeasurable cumulative impacts would be associated with this alternative.

3.5 Rare Plants

The section below is a summary of the affected environment and the effects of the alternatives on this resource. A detailed specialist report is in the project files.

3.5.1 Affected Environment

Contract botanical surveyors accomplished previous general non-project specific field surveys in the Ekalaka Hills area[10]. Those surveys occurred in 1994 and were accomplished by the Montana Natural Heritage Program botanical staff and contractors. In addition a site visit of the area was conducted by Lucretia Smith and Greg Lind (TEAMS botanists) July 14-17, 2003. There are no known sensitive plant species in the project area. However, three (3) total sensitive species are considered as having the highest probability for occurrence within the project area.

Table 47 displays the list of sensitive plant species for the Montana portion of the Sioux Ranger District-Custer National Forest that have the potential to occur in the project area.

Table 47: Custer National Forest Sensitive Plants List for Sioux Ranger District

Scientific Name	Common Name	Habitat	Closest known population
Asclepias ovalifolia	Ovalleaf milkweed	Sandy, gravelly or clayey soils of prairies and woodlands. Elevation 3,760-3,840 feet.	Known in Long Pines Unit below Icebox Spring.
Astragalus barrii	Barr's milkvetch	Gullied knolls, buttes, and barren hilltops, often on calcareous soft shale and siltstone. Elevation 2,940-4,000 feet.	Adjacent known location west of the Ekalaka Hills.
Carex gravida var. gravida	Pregnant sedge	Open woods, often in ravines with deciduous trees, on the plains. Elevation 3,880-4,000 feet.	No known locations on the Sioux District; however, potential habitat is thought to be in the Ekalaka Hills. Closest site is on Ashland RD - East Fork Otter Creek; Hay Creek.

3.5.2 Environmental Effects

3.5.2.1 Alternative #1, No Action

No negative direct, indirect, or cumulative effects would occur to any sensitive plant species from the No Action alternative. No ground disturbing activities would occur; however, existing and ongoing uses of the project area would still occur, including recreation, grazing, firewood cutting, and many other uses. In the event of a large stand replacing wildfire as a result of the potential for long-term hazard fuel accumulation, negative impacts could affect native plants populations and communities, including rare species, through soil, habitat, and watershed damage that could occur.

[10] Heidel, B.L. and K.H. Dueholm. 1995. Sensitive plant survey in the Sioux District, Custer National Forest, 1994.

3.5.2.2 Alternative #2, Proposed Action

The following plant species have the potential to occur in the project area. A discussion of potential impacts for each species is presented and a determination finding for each species would be noted.

Asclepias ovalifolia (Oval-leaf milkweed)

One documented site is known on the Sioux District and is on the Long Pines Land unit. Unknown potential habitat may exist in the Ekalaka project area and project activities such as temp road construction could impact the habitat for this species. However, any potential impacts would be restricted to minor areas affected by temporary road construction.

- Therefore, a determination of may impact individuals or habitat, but not likely to cause a trend toward Federal listing or a loss of viability is warranted.

Astragalus barrii (Barr's Milkvetch)

There are no known sites on the Sioux District. There is one known adjacent location west of the Ekalaka Hills. Unknown potential habitat may exist in the project area and project activities such as temporary road construction could impact the habitat for this species. However, any potential impacts would be restricted to minor areas affected by temporary road construction.

- Therefore, a determination of may impact individuals or habitat, but not likely to cause a trend toward Federal listing or a loss of viability is warranted.

Carex gravida v. gravida (Pregnant sedge)

There are no documented sites in the Ekalaka Project area; however, there are two documented sites on the Ashland Ranger District. Potential habitat is widespread in the Ekalaka Hills and within the project area. Survey reconnaissance did not find any new populations or sites, but potential habitat would be affected by project activities, including road construction and logging.

Project impacts are limited due to the limited activities proposed for woody draws and other mesic habitats. Woody draws would have buffers protecting from thinning operations and would not be affected. However, the occasional crossing of potential habitat by temporary roads may impact some habitat.

- Therefore, a determination of: may impact individuals or habitat, but not likely to cause a trend toward Federal listing or a loss of viability is warranted.

3.5.3 Cumulative Effects

The area chosen for the cumulative effects analysis is the entire Ekalaka Hills Unit managed by the Custer NF. The reason for this area being selected is that the Sioux Ranger District manages land units that are islands of forested landscape in the larger prairie-grassland ecosystem. These forested islands are separated from each other by many miles, and the effects of management tend to be restricted to each land unit. The temporal scale (time limits for past activities) selected for this project is from the 1992 Sioux Ranger District Fuels Management EA (Laka Breaks T.S. and other T.S. noted in Appendix B, List of Cumulative activities list), were authorized by this EA) to the present. Impacts from the project activities on sensitive plants are limited. Other activities affecting sensitive plants include ongoing livestock grazing on several allotments. Improper range use by livestock has the most likelihood of cumulative impacts on the sensitive plant resource, because range use is concentrated in the potential habitat for sensitive plants (open dry grass sites, seasonal meadows or woody draws).

Ongoing recreational use such as hunting, wood cutting and camping would not have any cumulative effects on sensitive plants.

3.6 Range Resource

The section below is a summary of the affected environment and the effects of the alternatives on this resource. A detailed specialist report is in the project files.

3.6.1 Affected Environment

3.6.1.1 Range Allotments

There are eight (8) grazing allotments permitted for a maximum of 645 animals within the Ekalaka Hills allotments. All allotments are cattle (cow/calf) permits. Table 48 displays the allotments in the Ekalaka Hills Unit.

Table 48. Livestock Allotments in the Ekalaka Hills Unit

Allotment Name	Allotment Acres	Permitted Maximum Livestock
Cleveland	1,561	62
Flastead	1,315	62
Gundlach	963	48
Needmore	2,146	71
North Range	4,872	167
Park	3,775	124
Peabody	1,230	27
Stagville	4,541	84

3.6.1.2 Noxious Weeds

The Ekalaka project area falls within Carter County, Montana. After assessing those species recognized by the counties and the U.S. Forest Service, a list was compiled of species of greatest concern with regards to impacts on ecosystem integrity for the Ekalaka project area (See Table 49).

Table 49. Noxious Weed Species of Concern for the Ekalaka project area.

Scientific Name[11]	Common Name	Acres in Project Area
Carduus nutans	Nodding plumeless thistle	< 1
Centaurea biebersteinii (C. maculosa)	Spotted knapweed	1
Cirsium arvense	Canada thistle	78
Cynoglossum officinale	Hound's-tongue	4
Euphorbia esula	Leafy spurge	13
Verbascum thaspus	Common mullein	2

[11] Nomenclature follows the USDA Plants Database: USDA, NRCS 1999. PLANTS database (http://plants.usda.gov/plants). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

Known locations for noxious weeds have been mapped using GIS (See Appendix A-Map 3f). In the Ekalaka project there is approximately 100 acres of known noxious weed infestations. The most abundant and widely distributed noxious weed species is Canada thistle. Canada thistle species occurs along most of the roads, around range improvements, and in other disturbed sites. Not as abundant, but of great concern, are leafy spurge and hound's tongue. Leafy spurge is not widespread in the project area, but scattered populations have been found. There is a large leafy spurge population on adjacent private land to the north of the project area. Many of the known hound's tongue infestations occur along roads, and in recreational areas such as campgrounds. These areas can be vectors for weed spread.

3.6.1.3 Woody Draws

Woody draws (Management Area N) are scattered in the project area. However woody draws have not been mapped or inventoried in the Ekalaka Hills and total acres of woody draw habitat are not known. The most common habitat type in this ecosystem is the green ash/common chokecherry habitat type. In this habitat type the draw bottom is composed of snowberry, kentucky bluegrass, sedge species, green needlegrass, bluebunch wheatgrass, canada wildrye, common spikesedge and various forbs. The mid-layer consists of chokecherry, serviceberry, wild plum, green ash and quaking aspen seedlings and saplings. The upper layer consists of mature and pole size green ash, quaking aspen, box-elder, cottonwood and ponderosa pine.

3.6.2 Environmental Effects

3.6.2.1 Alternative 1: No Action

Range

Current grazing practices would continue on all livestock allotments in the project area. The No-Action alternative would have no direct impact to the range resource.

Noxious Weeds

Ongoing control of noxious weeds is accomplished by a cooperative approach between the Forest Service and local County weed boards. There is currently an agreement in place between the Custer National Forest and Carter County to use Integrated Pest Management (IPM) practices to control noxious weeds using chemical, mechanical, and biological control measures. Integrated Pest Management practices are implemented to reduce the risk of new noxious weed infestations and control existing noxious weed populations.

Noxious weeds are spread through biological dispersal methods and also by ongoing human activities such as hunting, grazing, firewood cutting, and other uses of the forest. This would continue to spread noxious weeds of all the current species and possibly introduce new species there could be an increase in acres infested by noxious weeds even under the no action alternative. However Alternative #1 should not result in any increases in acres of noxious weeds in the project area for either the short-term. In the long-term the risk of large wildfires would increase, and subsequent suppression activities would increase ground disturbance and bring in an increased amount of outside vehicular traffic and this could increase the noxious weed populations and bring in new species of noxious weeds.

Woody Draws

Under the No-Action alternative there would be no impact to woody draws and areas in the Ekalaka project area in the short-term. In the long-term, the risk of large wildfires would increase and the potential for negative effects of high-intensity wildfire on woodland draws would also increase.

3.6.2.2 Alternative 2: Proposed Action

Range

The project activities of forest stand thinning and prescribed burning would positively affect both the short-term and long-term range conditions by reducing the conifer density in stands, reducing ground fuel loading which restricts livestock movements, and increasing transitory range forage. All these proposed treatments in the Proposed Action would have a positive effect on range conditions and increase available forage for livestock. The fuel reduction activities of this alternative would have a beneficial long-term effect for livestock grazing on approximately 8,525 acres[12]. There would be a temporary loss of forage during the treatment period due to the temporary roads and treatment activities that may cause some displacement for livestock.

Noxious Weeds

Activities proposed in the Proposed Action Alternative would likely result in a short-term increase in noxious weeds acres of all known species and may introduce new noxious weed species to the area. Activities such as logging and burning would introduce increased vehicle and equipment use into areas and create more disturbed soils. Contractors bringing in equipment from other areas have the potential to introduce more infestations of existing noxious weeds and also to introduce new noxious weed species.

Noxious weeds have the potential to increase on the acres proposed for commercial thinning treatment activities, along existing roads used for access, 93 miles of road improvement, and 26 miles of temporary road construction. The actual acres of noxious weed increases that may occur from the Proposed Action is not known, however the potential for an increase in noxious weeds is highly probable, due to the existing populations of noxious weeds that are currently in the project area.

A monitoring study done in the Black Hills NF noted that noxious weeds increased an average of 3% of the ground-disturbing activities such as logging, burning and road construction[13]. If the figure of 3% is used for this project area, that could result in an estimated 270 acres[14] of potential new noxious weed infestation in the short-term; however the expected acre increase should be much lower due to project design measures to control noxious weeds.

Under this alternative all heavy equipment would be cleaned prior to coming on the project area, seed, straw and other materials used for road decommission and erosion control would be certified weed free and all disturbed roads and landing would be seeded with a certified weed free native seed mix after activities occur. Noxious weed surveys/inventories would be done 1 year post-project and for 5 years thereafter on all open and closed system and temporary roads and other areas affected by the project activities. All noxious weed infestations would be treated using an Integrated Pest Management approach. This approach could include biological, mechanical and chemical control

[12] This is based on the acres of commercial, noncommercial, pre-commercial thinning, and prescribed burn treatments.

[13] Source: Black Hills Forest Plan EIS, Dec. 1996, pg III-192.

[14] Based on 8,525 acres of treatments +416 acres of road impacts = 8,941 acres x 3% = approx. 270 acres of potential noxious weed spread.

methods. All treatment would be accomplished under a Participating Agreement with Carter County. Integrated Pest Management procedures and project design measures should manage to control the increase in noxious weeds in the long-term; however, increases in noxious weed infestation may occur in the short-term.

Woody Draws

No management activities are proposed specifically for woody draws in this alternative. However, some temporary roads would cross woody draws, and some winter yarding would be done within woody draws but the impacts would be limited due to the limited acres of wood draws actually being crossed by temporary roads and the over the snow project design measures for yarding.

3.6.2.3 Cumulative Impacts

The area chosen for the cumulative effects analysis is the entire Ekalaka Hills Unit managed by the Custer NF. The reason for this area being selected is that the Sioux Ranger District manages land units that are islands of forested landscape in the larger prairie-grassland ecosystem. The temporal scale (time limits for past activities) selected for this project is from 1992 to the present. The list of cumulative effects activities considered for this project is presented in detail in Appendix B.

Range and Livestock

This project would treat forested stands by thinning and burning, increasing transitory range and acres for livestock on approximately 8,535 acres. Short-term access restriction would affect livestock in treatment areas. The 1992 Fuelbreak T.S. projects (Laka Breaks and others, see Appendix B) have increased the transitory range by over 3,000 acres. In addition, the Bureau of Land Management may treat scattered parcels adjacent to the Ekalaka Hills area and also would increase transitory range acres. The cumulative effects of past and ongoing activities combined with the proposed action would result in a beneficial increase in the transitory range availability and livestock distribution on most of the Ekalaka Hills Unit.

Noxious Weeds

Noxious weeds are expected to increase due to the project activities, and combined with the cumulative effects of past activities and other ongoing activities, the noxious weed resource would likely result in increased acres of noxious weeds, and could introduce new species of noxious weeds to the area. Project design measures to inventory and control noxious weed infestations in 2004-2005 should control any increase in acres or introduction of new species in the long-term.

Woody Draws

The cumulative effects of this project when combined with past and other ongoing projects should result in an overall improvement in the woody draw resource in the Ekalaka Hills Unit. The risk for large wildfires has been lowered by previous fuelbreak T.S. projects in the Ekalaka Hills unit and combined with the treatments in Alternative #1 the conditions for lowered fire risk would be beneficial. Subsequent prescribed fires can improve woody draw conditions if fire intensity is low to moderate. This type of fire regime removes conifer encroachment and rejuvenates the deciduous shrub component. Livestock grazing has the most potential to affect the recovery of woody draws and grazing levels are considered moderate in the project area, with a gradual upward trend in grasslands and woody draw habitats.

3.7 Heritage Resource

The section below is a summary of the affected environment and the effects of the alternatives on this resource. A detailed specialist report is in the project files.

3.7.1 Affected Environment

Fifty-three heritage resource investigations, covering approximately 3900 acres, have been conducted within the Ekalaka Hills Unit from 1977-2004 and 20 sites have been recorded. Four sites within the project area have been identified as potential culturally sensitive sites due to their possible association with "traditional Indian ceremonies, cultural practices and important events in tribal history" (Deaver and Koostra-Manning 1995).

All units identified for ground disturbing activities such as commercial and noncommercial thinning were inventoried at a 100% level. All existing roads that were to be used or modified in some fashion were inventoried. All known cultural sites would be protected from project activities or would be treated under the supervision of an archeologist.

3.7.2 Environmental Effects

3.7.2.1 Alternative 1: No Action

Under this alternative no proposed treatment activities would occur. Normal on-going activities would still occur such as livestock grazing, road maintenance, hunting and wood gathering. In the short-term no impacts would occur on any heritage sites from any proposed treatments in the proposed action. However, in the long-term, without some sort of active management to reduce the fire hazard and restore the functions of the pine parkland vegetation type to a more natural range of variation, the probability of a large wildfire is likely in the area. Dense pine stands and hazardous fuel loads on any existing heritage sites could cause the loss of important archaeological information. Should these sites be burned over during a wildfire the chance that they would be negatively affected is great both from the high fire intensity and accompanying fire suppression efforts. In addition, after a large wildfire vandalism and illegal site collection may increase with the new exposures of sites through erosion and lack of vegetative cover, and improved access and damage by dozer lines constructed during fire suppression efforts.

3.7.2.2 Alternative 2: Proposed Action

For this undertaking, a proactive heritage site management approach would be undertaken in an effort to treat pine stands and reduce fuel loads on the sites with high and moderate fire hazard ratings. This approach calls for the inclusion of the heritage sites in the proposed activity areas rather than avoiding the site by modifying the fuel treatment boundary to exclude the site. All sites would be avoided by ground disturbing harvest and fuel treatment activities, but where feasible, trees that may damage the sites or contribute to increased fuels would be removed. This site treatment would be individually designed for each site located within treatment boundaries and prior to harvest and/or fuel treatment activities. It would only be conducted in conditions where no ground disturbance would occur, and under the direct supervision of a Forest Archaeologist. It also calls for site "pretreatment" prior to prescribed burning where sites that have downed timber and potentially higher fuel loads would be cleared of these fuel loads prior to ignition.

Since the approach is individually prescribed and does not allow any ground disturbance within the site boundaries, no direct effects to known sites is anticipated. No negative impacts are expected on any known heritage site or any site that would be identified during additional field surveys or during implementation. Specific measures take to protect heritage resources are integrated into the proposed action project as project design measures in Chapter 2.

3.7.3 Cumulative Effects

The cumulative effect of the proposed alternative in combination with other previous vegetation management activities identified in Appendix B would be the restoration of portions of the project area to a more desired condition and, eventually, a pre-fire suppression historic landscape. Through the mitigation of indirect effects and the proposed site treatments, this alternative may preserve and protect most of the recorded heritage resources within the Ekalaka Fuels treatment project area and includes the heritage resources as an integral part of the pine parkland landscape.

3.8 Economics

The section below is a summary of the affected environment and the effects of the alternatives on this resource. A detailed specialist report is in the project files.

3.8.1 Affected Environment

The primary affected economic environment is Carter County, the county within which the project occurs and so would receive economic impacts from actions resulting from the proposed action. Other secondarily affected environments would be communities that are somewhat reliant on the Sioux Ranger District as a source of wood fiber for their mills. The communities possibly affected would be Ashland, Montana; Sheridan, Wyoming; Hulett, Wyoming; and Spearfish, South Dakota. Historically, mills in each of these communities have purchased timber sales on the Sioux Ranger District and the surrounding area.

3.8.1.1 Population, Demographics, Employment, and Income

The project area is located in Carter County in southeastern Montana. Carter County has a population of approximately 1,360 people and Ekalaka is the principle community and economic center of the county. The 2000 population estimate for the county has decreased 9.5% since the 1990 census (U.S. Census Bureau 2000); the decline is largely attributed to the lack of good paying jobs and the departure of young citizens from the county for education and work (Stockman and Stewart 2002). The population reduction for both Ekalaka and all of Carter County has meant that more money flows to merchants outside the county.

Like much of southeastern Montana, farming and ranching dominate the economy of Carter County (Table 50) and the standard of living is highly dependent upon commodity prices for cattle and wheat (Stockman and Stewart 2002). In 1998, per capita personal income was $13,369 nearly $8,000 less than the state average. Per capita personal income rose to $17,930 in 2000; the increase was attributed to improved livestock prices (Stockman and Stewart 2002).

Table 50. Selected Demographic and Economic Characteristics1		
Census Information	Carter County	
Year - US Census Data	1990	2000
Population	1,503	1,360
Employment (Jobs)		
Total	827	743
Agriculture, Forestry, Mining	517	421
Construction	14	35
Retail and Service	123	140
Health and Education	75	98
Unemployment Rate	1.20%	0.50%
Median Household Income	$16,458	$26,312

[1]Source: U.S. Census Bureau, Census 1990. (Government Information Sharing Project, website); U.S. Census Bureau, Census 2000. (www.census.gov).

3.8.2 Environmental Effects

The following indicators were used to focus the economic analysis and disclose relevant environmental effects.

- Present Net Value, Job Years and Employee Compensation

3.8.2.1 Effects Common to All Alternatives

Project planning costs are sunk costs incurred initially and are not computed in the PNV calculation. Planning costs for the project is estimated at $260,000. This value is based on the contract cost of $220,000 plus local and Forest cost of about $20,000. This cost is incurred regardless of the alternative selected.

3.8.2.2 Alternative 1: No Action

This alternative proposes no action and produces no economic outputs. There is no return on this investment. No commercial thinning, non-commercial thinning, prescribed fire, road management, or vegetation treatments would occur. No benefits, (direct, indirect or non-quantifiable) can be attributed to this alternative.

3.8.2.3 Alternative 2: Proposed Action

The total direct costs for Alternative 2 are shown in Table 51 and sale preparation and administration, non-commercial thinning, prescribed fire, road management, and vegetation treatments are estimated at $1,672,100.

Revenue generated from the sale of commercial timber is a direct benefit. The TE appraisal (PLATA analysis) for harvesting 33,900 CCF (16.9 MMBF) of timber indicated a high bid stumpage value of $98.57/CCF or a total net sale value of $3,341,000. Present Value (PV) of product sales is $2,856,000. Approximately 319 job years would be associated with Alternative 2 and result in employee compensation of approximately $6,887,000 which includes both full and part-time jobs and income spread over the entire implementation period.

The PNV for all costs plus the revenue generated from the sale of timber for Alternative 2 is $1,184,250 which indicates that the timber sale value exceeds the cost of the non-timber sale related activities (Table 51).

Table 51. Summary of Project Activities Costs and Revenues.

Costs / Revenues	No Action Alternative	Proposed Action Alternative
Activity Revenues		
Commercial Harvest (Revenue)	$0	$3,341,520
Activity Revenues Subtotal	$0	$3,341,520
Administrative Costs		
Sale Prep and Harvest Admin(1)	$0	$486,710
Administrative Costs Subtotal	$0	$486,710
Activity Costs		
Non-commercial Thinning WUI > 35% Slope	$0	$127,020
Non-commercial Thinning WUI < 35% Slope	$0	$26,145
Non-commercial Thinning Not WUI > 35% Slope	$0	$187,355
Non-commercial Thinning Not WUI < 35% Slope	$0	$620,425
Pre-commercial Thinning	$0	$94,875
Natural Fuels Prescribed Fire	$0	$48,000
Aspen Rejuvenation	$0	$44,460
Fuels Reduction Subtotal	$0	$1,148,280
Road Reconstruction	$0	$120,000
Road Reconditioning	$0	$42,360
Temporary Road Construction	$0	$28,351
System Road Use as Temporary	$0	$5,067
Sale Related Road Maintenance	$0	$35,500
Subtotal	$0	$231,278
Total Costs	$0	$1,866,268
Present Value – Total Costs	$0	$1,672,100
Total Revenue	$0	$3,341,520
Present Value-Total Revenue	$0	$2,856,000
Present Net Value	$0	$1,184,250
(1) Sale preparation and harvest administration are cost estimates from Kraft Springs EA.		

3.8.3 Cumulative Effects

Ongoing or foreseeable future actions within or near the project area that could add to the effects of the proposed actions include past, ongoing, and proposed State of Montana projects as well as ongoing and proposed USDA Forest Service projects. The State of Montana recently completed a State Timber Harvest north of the project area and the USDA Forest Service has an ongoing Laka Breaks timber sale. Potential cumulative effects of these projects are unlikely to have any noticeable effect on local services, the availability of housing, or the local or regional economy.

3.9 Transportation System

The section below is a summary of the affected environment and the effects of the alternatives on this resource. A detailed specialist report is in the project files.

3.9.1 Affected Environment

Primary access to the project area is via State Highways 7 and 323. The west part is accessed by the Chalk Buttes Road, the south area by Pershing Cutoff Road, the southeast by the Prairie Dale Road, and the north area by Highway 7 and Mill Iron Road. Current four wheel motor vehicle access to the north end of the project area, sections 23, 24, 25, and 35 T2N, R58E is limited. There is no public access to the three northern sections.

Road use within the Ekalaka Hills Land Unit is light, with highest use during the spring turkey hunting season (April to May) and fall big game hunting season (October to November). Other road use is for agency administration, grazing implementation, and recreation, particularly activities associated with Camp Needmore, McNab Pond Picnic Area, and Ekalaka Campground.

A Roads Analysis Process (RAP) for the Ekalaka Project area was completed in April 2004 and is in the project files. See Appendix B for a complete list of complete list of roads by road number and length. Appendix A-Maps #2a-#2b displays existing roads in the project area.

3.9.2 Environmental Effects

3.9.2.1 Alternative 1: No Action

On this alternative, no road improvement or other treatment activities would be done. Road maintenance would continue under the annual road maintenance plan as funds are available. There are now about 68 miles of system roads in the project are open for public use. This use would not change. Under Alternative 1, No Action, some roads may deteriorate if improvements or BMPs are not applied. Use on roads needing gravel surfacing would continue to be limited to dry conditions. There would be no change in road density.

3.9.2.2 Alternative 2: Proposed Action

Reconstruction is proposed for approximately 8.0 miles and reconditioning is proposed on 12 miles of existing system roads. About 71 miles of existing roads would be used for timber harvest and would be maintained under the Timber Sale Contract to meet BMPs. Five miles of existing roads would be improved for timber hauling, then closed and re-vegetated after operations are complete. Twenty six miles of temporary road is needed to access harvest areas. These temporary roads would be closed, decommissioned, and re-vegetated after use (about one year).

Table 52 summarizes the roads activities and shows costs/mile and total costs associated with those road activities.

Table 52. Summary of Road Improvements and Costs

Road Activity	Miles	Cost/Mile	Cost
Reconstruction	8	15,000	120,000
Reconditioning	12	3,530	42,360
Temporary Road Construction	26.3	1,078	28,350
Existing System Roads Use as Temporary Roads	4.7	1,078	5,067

Table 52. Summary of Road Improvements and Costs			
Road Activity	Miles	Cost/Mile	Cost
Timber Sale Related Maintenance	71	500	35,500

Applied BMPs to reconstructed and reconditioned roads and to the roads maintained for timber hauling would reduce any impacts to soil and water resources. Decommissioning the 5 miles of existing roads that would be improved and used for timber hauling would reduce road density and reduce the total miles of future road maintenance needed. By closing and re-vegetating the 26 miles of temporary roads needed for timber hauling, disturbance effects would be short term with no effect on road density.

3.9.3 Cumulative Effects

This section would disclose any cumulative effects on the transportation system from past, ongoing, and reasonably foreseeable future actions. The cumulative effects analysis area is defined and a summary list of past, ongoing, and reasonably foreseeable future actions is included in Appendix B.

Future or continued road maintenance would be scheduled according to need and the maintenance level identified for each road. Level 3 road maintenance is currently planned annually. Maintenance on level 1 and 2 roads is scheduled as funding becomes available, with safety needs corrected as they are identified. BMPs would be included in road reconstruction, reconditioning, and maintenance as part of the Timber Sale Contract. These BMPs designed for timber purchaser implementation would reduce impacts to soil, water, and other resources.

Source of rock and gravel for road improvement work would be from the Ekalaka area, out side of the project area, the pit or source area would be enlarger or have additional disturbance.

A foreseeable future activity could be possible additional road decommissioning in the project area. This future road decommissioning would be analyzed under a separate NEPA document.

3.10 Required Disclosures and Unique Characteristics

This section discloses information and impacts to unique characteristics of the Ekalaka Hazardous Fuel Project and the Ekalaka Hills Land Unit.

3.10.1 Air Quality

This proposal would have some short-term impacts on air quality standards, due to pile burning, but air quality levels and would comply with all State and Federal air quality regulations. Any prescribed fire activities would be accomplished during weather conditions that would minimize any impacts of smoke on communities and the air quality of monitored reference sites.

3.10.2 American Indian Treaty Rights

This proposal would not conflict with any treaty provisions of any Tribal group.

3.10.3 Congressionally Designated Areas

Wilderness: There are no lands designated on the Sioux Ranger District including the Ekalaka Hills Land Unit and project area as Wilderness; therefore, there would be no impacts on Wilderness.

Wilderness Study Areas: There are no lands designated on the Sioux Ranger District including the Ekalaka Hills Land Unit and project area as Wilderness Study Areas (WSA) or recommended for wilderness classification; therefore, there would be no impacts on any WSA.

National Recreation Areas: There are no lands designated on the Sioux Ranger District including the Ekalaka Hills Land Unit and project area as National Recreational Areas; therefore, there would be no impacts on any National Recreational Area.

3.10.4 Cultural Resources

All treatment areas would be inventoried for cultural resources. Cultural resources identified in the project area would be protected or treated under the supervision of the Forest Archeologist. The project would comply with all aspects of the National Historic Preservation Act.

3.10.5 Energy Requirements and Conservation Potential of Alternatives

The energy consumption associated with the alternatives, as well as the differences between the alternatives, is not measurable.

3.10.6 Environmental Justice in Minority Populations and Low-Income Populations

Executive Order 12898 (Feb. 11, 1994) requires all Federal Agencies to make environmental justice part of each agencies mission, by identifying and addressing, as appropriate, disproportionately high, and negative human health or environmental effects on minority populations or low-income

populations. There would be no effects on minority or low-income populations by any of the alternatives for this project.

3.10.7 Even-Aged Vegetation Management

The National Forest Management Act (NFMA) of 1976 requires the disclosure of any silviculture prescription that creates an opening larger than 40 acres, using even-aged vegetation management. The project proposes to create openings of 1 acre or less. The project does not propose any even-aged silviculture prescriptions (clearcut, seed-tree, or shelterwood) that would create any forest openings > 40 acres in any green-forested site.

3.10.8 Floodplains (Executive Order 11988)

The Ekalaka Hills Land Unit including the project area and adjacent areas do not contain floodplains as defined by E.O. 11988. Based on ESRI/FEMA Flood Hazard Maps and the secondary analysis, the Ekalaka Hazardous Fuel project is not located in a floodplain; therefore, the project would not impact any floodplains.

3.10.9 Inventoried Roadless Areas (Ira) or Unroaded Areas

There are no Inventoried Roadless Areas (IRAs) located on the Sioux Ranger District including the Ekalaka Hills Land Unit and project area. In addition there are no unroaded areas of more than 1000 acres. Therefore, there would be no impacts on IRAs or unroaded areas.

3.10.10 Irreversible and Irretrievable Commitments of Resources

There are no irreversible or irretrievable commitments of resources as a result of implementation of the project alternatives. Treatment areas would be retained for forest production and range forage production.

3.10.11 Landmarks

There are no National Landmarks in the Ekalaka Hills Land unit or in the project area. Therefore, no impacts would occur for any National Landmark.

However, the Sioux Ranger District does contain two National Natural Landmarks that were established upon recommendation by the USDA Forest Service and the USDI Park Service in 1977.

The Castles Natural Landmark is a sandstone formation that resembles a medieval castle and encompasses approximately 1,000 acres in the Slim Buttes Land Unit, and is located in T18N, R8E, and Section 17.

The Capitol Rock Natural Landmark is a sandstone formation resembling the Nation's Capitol building. The Landmark encompasses 240 acres in the Long Pines Land Unit, and is located in T3S, R62E, Section 17.

Both of these existing National Landmark areas are at least 10 air miles southeast of the project area. With the distance that separates Castles Natural Landmark and Capitol Rock National Landmark from the project area, there would be no visual or environmental effects to either of these areas.

3.10.12 Parklands

There are no lands within the Ekalaka Hills Land Unit or the proposed project that would be characterized as parklands; therefore, there would be no impacts on any parklands.

3.10.13 Prime Farmlands, Rangelands, and Forestlands

Prime Farmland: The Ekalaka Hills Land Unit including the project is not located in or adjacent to prime farmlands; therefore, there would be no impacts to Prime Farmlands.

Prime Rangeland: the Ekalaka Hills Land Unit would not contain prime rangeland because of soils and climate, and none of the proposed activities in the Ekalaka Hazardous Fuel project would convert rangelands to other uses. Therefore, there would be no impacts on Prime Rangelands.

Prime Forestland: The Ekalaka Hills Land Unit including the project area would not convert forestlands to other uses. All lands designated as forested would be retained and managed as forested; therefore, there would be no negative impacts on Prime Forestland.

3.10.14 Municipal Watersheds

No municipal watersheds occur in the Ekalaka Hills Land Unit including the project area; therefore there would be no impacts on municipal watersheds.

3.10.15 Relationship of Short-Term Uses and Long-Term Productivity

The project does propose harvest of timber; however the long-term productivity of soils and forested vegetation would be improved by the project treatments to reduce hazardous fuel loading in the long-term. Long-term productivity would be improved for the Ekalaka Hills Unit.

3.10.16 Research Natural Areas (RNA)

There are no research natural areas on the Sioux Ranger District including the Ekalaka Hills Land Unit and project area; therefore, there would be no impacts on RNAs.

3.10.17 Social Groups

The project would have no affects on any social groups, including minorities, Native American Indians, women, or the civil liberties of any American citizen.

3.10.18 Threatened and Endangered Species (T&E)

No Threatened, Endangered, or Proposed Listed Species is known in the project area and no negative effects would occur on any Threatened or Endangered plant or wildlife species.

3.10.19 Unavoidable Negative Effects

There would be unavoidable short-term (<10 years) minor negative effects in terms of soil disturbance, soil displacement, and some minor soil compaction. There would be unavoidable short-term negative effects on some wildlife species.

3.10.20 Water Quality

The Montana Best Management Practices for Forestry Practices, and Forest Service Soil and Water Conservation Practices' standards would be implemented to meet state and federal water quality regulations. There are no perennial streams in the project area. The project would have no effect on water quality.

3.10.21 Wetlands (Executive Order 11990)

The Ekalaka Hills Land Unit including the project area does not contain wetlands as defined by E.O. 11990. Therefore, the project would not have any impacts on wetlands.

3.10.22 Wild and Scenic Rivers

There are no lands designated or proposed for Wild and Scenic Rivers on the Sioux Ranger District including the Ekalaka Hills Unit and project area; therefore, the project would not impact any Wild and Scenic Rivers.

3.11 List of Preparers

This section includes a list of preparers of the environmental document. The following individuals were primarily responsible for developing and reviewing the environmental analysis.

Enterprise T.E.A.M.S, USDA-Forest Service

Allison Kuehl
Position: Wildlife Biologist
Contribution: Wildlife analysis

Greg D. Lind
Position: IDT Leader
Contribution: IDT Leader, EA document preparation, TES plants analysis

P. Cavan Maloney
Position: Hydrologist
Contribution: Watershed and soils analysis

Neil McCusker
Position: Silviculturist
Contribution: Silvicultural and vegetation analysis

Francis Mohr
Position: Fuels/Fire Specialist
Contribution: Fuels/fire analysis

Lucretia Smith
Position: Botanist/Range Management/GIS support
Contribution: Sensitive plants, noxious weeds, range analysis, and GIS support

Frank Yurczyk
Position: Timber Forester
Contribution: Timber harvest and roads analysis

North State Resources, Inc.

5000 Bechelli Lane, Suite 203
Redding, CA 96002
http://www.nsrnet.com/

Connie Carpenter
Position: Fuels/Fire Specialist t
Contribution: Fuels/fire analysis

Custer National Forest, USDA-Forest Service

John Clark
Position: Forest Timber Management Officer
Contribution: Primary reviewer of the environmental analysis

Laurie Walters-Clark
Position: District Resource Assistant
Contribution: Reviewer of range and noxious weed analysis

George Foley
Position: District Ranger, Sioux Ranger District
Contribution: IDT direction, Line Officer to Fall 2003

John Lane
Position: Forest Soils Scientist
Contribution: Reviewer of soils and watershed analysis

Halcyon LaPoint
Position: Forest Archeologist
Contribution: Cultural analysis

Rhonda O'Byrne
Position: District Ranger, Sioux Ranger District
Contribution: IDT direction, Line Officer May 2004 to present.

Jane Pedrotti
Position: Resource Assistant
Contribution: Responsible for project record and NEPA mail-lists

Kim Reid
Position: Forest Range Program Manager
Contribution: Reviewer of sensitive plant, range and noxious weed analysis

Dennis Sandbak
Position: Forest Silviculturist
Contribution: Reviewer of silviculture and vegetation analysis

Mark Slacks
Position: Forest NEPA Coordinator
Contribution: NEPA guidance and review

Tom Whitford
Position: Forest Wildlife Biologist, Acting District Ranger
Contribution: Wildlife analysis and review and Line officer direction from Fall 2003-May 2004

3.12 Literature Citations

Literature Citations
Fire/Fuels
Agee, J.K. 2000. Fire Ecology of Pacific Northwest Forests. Island Press, Covelo, California. 493p.
Anderson, W.A. 1969. Disaster warning and communication process in two communities. J. Commun
Anderson, Hal E., 1982. Aids to Determining Fuel Models For Estimating Fire Behavior. Intermountain Forest and Range Experiment Station. General Technical Report INT-122. Ogden, Utah.
Brown, J.K., E.D. Reinhardt and K.A. Kramer. 2003. Coarse woody debri: managing benefits and fire hazard in the recovering forest. U.S.D.A. For. Serv., Rocky Mtn. Res. Sta. Gen. Tech. Rep. RMRS-105. Fort Collins, Colorado
DeBano, L.F., D.G. Neary, and P.F. Folliott. 1998. Fire's effects on ecosystems. John Wiley & Sons, NY, 333 pp.
Finney, M.A. 2001. Design of regular landscape fuel treatment patterns for modifying fire growth and behavior. For. Sci. 47(2).
Fischer, Wouldiam C. and Bruce D. Clayton. 1983. Fire Ecology of Montana Forest Habitat Types East of the Continental Divide. General Technical Report INT-141. Intermountain Forest and Range Experimental Station. Ogden, Utah.
Green, L.R. 1977. Fuelbreaks and other fuel modification for wildland fire control. U.S.D.A. Forest Service, Pac. Southwest For. Range Exp. Stn., Berkeley, California. Gen. Tech. Rep. PSW
Hann, W. and D.L. Bunnel. 2001. Fire and land management planning and implementation across multiple scales. International Journal of Wildland Fire 10:389-403.
Hardy, Colin C., Schmidt, Kirsten M., Menakis, James P., and Sampson R.N., 2001. Spatial data for national fire planning and fuel management. International Journal of Wildland Fire. 10: 353-372
Maxwell, Wayne G. and Franklin R. Ward. 1980. Photo Series For Quantifying Natural Forest Residues in Common Vegetation Types of the Pacific Northwest. PNW 105. Pacific Northwest Forest and Range Experiment Station. Portland, Oregon.
Mohr, F.R. 1971. Priority Evaluation of Fire Hazard in the Douglas Fire Protection Association District in Oregon. Thesis submitted with MS Forest Management Degree. Oregon State University. Corvallis, Oregon.
National Wildfire Coordinating Group. 1996. *National Wildfire Coordinating Group Glossary of Wildland Fire Terminology,* , November 1996. http://www.nwcg.gov/teams/pmo/products/wfglossary/e.htm
Parrish, J. Barry, et.al., 1996. A Century of Change in Black Hills Forest and Riparian Ecosystems. Publication # B 722. USFS Agricultural Experimental Station and South Dakota State University.
Pollett, J. and P.N. Omi. 1999. *Effect of thinning and prescribed burning on wildfire severity in ponderosa pine forests*. Proceedings from: The Joint Fire Science Conference and Workshop, Grove Hotel, Boise, ID June 15-17, 1999. Univ. of Idaho and the Int. Assoc. of Wildland Fire.
Rothermel, Richard C. 1983. How to predict the spread and intensity of forest and range fires. Gen. Tech. Rep. INT-143. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. 161 p.

Literature Citations
Schmidt, Kirsten M.; Menakis, James P.; Hardy, Colin C.; Hann, Wendall J.; Bunnell, David L. 2002. Development of coarse-scale spatial data for wildland fire and fuel management. Gen. Tech. Rep. RMRS-GTR-87. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 41 p. + CD.
Stevensville Ranger District, Bitterroot National Forest. Sheafman Fuels Reduction Project Environmental Assessment, and Decision Notice. May 2001.
USDA Forest Service. 1987. Custer National Forest Land and Resource Management Plan.
USDA Forest Service Rocky Mountain Region. 1990. Photo Series for Quantifying Forest Residues in the Black Hills Ponderosa Pine Type. Pub. # A-89-1-90. Office of Aviation and Fire Management, Region 2.
USDA Forest Service. 1990. Photo Series for Quantifying Fuels. Miscellaneous Reports and Updates, The National Fire Plan.
USDA Forest Service. 2001. Miscellaneous Reports and Updates, The National Fire Plan. Internet, www.na.fs.fed.us/nfp/hazfuel/reports/brief_nfp_keypoint_hazfuel.
USDA Forest Service. 2002. Analysis of support hazardous fuel reduction projects. U.S.D.A. For. Serv. Forest and Range Management, Fire and Aviation Management Briefing Paper.
VanWagtendonk, J. W. 1996. Use of a deterministic fire growth model to test fuel treatments. Sieera Nevada Ecosystem Project, Vol. II, Univ. of CA Davis – Center for Water and Wildland Resources, Davis, California. p. 1155-1165
Forest Vegetation/Silviculture
Arno, Stephen F. 1987. Fire Ecology and Its Management Implications in Ponderosa Pine Forests. In: Ponderosa Pine: The Species and Its Management Symposium, Sep 29-Oct 1. Spokane, WA. Pp 133-139.
Auclair, Allan N.D., and J.A. Bedford. 1994. Conceptual origins of catastrophic forest mortality in the western United States. In: Sampson, R.N.; Adams, D. (eds.) 1994. Assessing Forest Ecosystem Health in the Inland West. Haworth Press: Binghamton, NY.
Covington, W.W.; and M.M. Moore. 1994. Post-settlement Changes in Natural Fire Regimes and Forest Structure: Ecological Restoration of Old-Growth Ponderosa Pine Forests. In: Sampson, R.N.; Adams, D. (eds.) 1994. Assessing Forest Ecosystem Health in the Inland West. Haworth Press: Binghamton, NY.
Fischer, Wouldiam C. and Bruce D. Clayton. 1983. Fire Ecology of Montana Forest Habitat Types East of the Continental Divide. USDA, Forest Service, Intermountain Forest and Range Experiment Station, General Technical Report. INT-141. 83 p.
Furniss, R.L and V.M. Carolin. 1977. Western Forest Insects. USDA, Forest Service, Miscellaneous Publication No. 1339. 654 p.
Graham R.T., et. al. 1999. The Effects of Thinning and Similar Stand Treatments on Fire Behavior in Western Forests. USDA, Forest Service, Pacific Northwest Research Station, General Technical Report, PNW-GTR-463. 27 p.
McCambridge, John A. and R.E. Stevens. 1982. Effectiveness of Thinning Ponderosa Pine Stands in Reducing Mountain Pine Beetle-Caused Tree Losses in the Black Hills. USDA, Forest Service, Rocky Mountain Forest and Range Experiment Station, Research Note RM-414. 3 pp.
Monnig, Edward and James Byler. 1992. Forest Health and Ecological Integrity in the Northern Rockies. USDA Forest Service, Northern Region FPM Report 92-7.

Literature Citations
Mutch, Robert, W. 1994. Restoring Forest Health: Do We Have the Would to Apply Science Findings. In: Proceedings of Forest Health and Fire Danger in Inland Western Forests, Spokane, WA. 18-22 p.
Pfister, Robert D., Bernard L. Kovalchik, Stephen F. Arno, and Richard C. Presby. 1977. Forest Habitat Types of Montana. USDA Forest Service, Intermountain Forest and Range Experiment Station, General Technical Report INT-34.
Samman, Safiya, and Jesse Logan, Team Leaders and Technical Editors. 2000. Assessment and Response to Bark Beetle Outbreaks in the Rocky Mountain Area. USDA Forest Service, Rocky Mountain Research Station, General Technical Report RMRS-GTR-62
Sandbak, Dennis. 19xx. Target Stand Attributes, Description and Conditions for the Long Pines Unit of the Sioux Ranger District, Custer National Forest. Unpublished Sioux Ranger District Silviculture Records.
Schmid, J.M. and S.A. Mata. 1992. Stand Density and Mountain Pine Beetle-Caused Tree Mortality in Ponderosa Pine Stands. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Research Note RM-515.
Schmid, J.M., S.A. Mata, and R.A. Obedzinski. 1994. Hazard Rating Ponderosa Pine Stands for Mountain Pine Beetles in the Black Hills. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Research Note RM-529.
Green, P., J. Joy, D. Sirucek, W. Hann, A. Zack, and B. Naumann. 1992. Old Growth Forest Types of the Northern Region. USDA Forest Service, Northern Region, R-1 SES 4/92.
USDA Forest Service. 1998. Northern Region Overview.
Watershed-Soils
Brown, James K, et al. In Press. Managing benefits and fire hazard in the recovering forest.
Elliot, Bill, et al. 1999. WEPP: ROAD (Draft 12/99). WEPP interface for predicting Road Runoff, Erosion, and Sediment Delivery. Technical Documentation. U.S.D.A. Forest Service Rocky, Mountain Research Station and San Dimas Technology and Development Center.
Graham, Russell T.; et al. 1994. Managing coarse woody debris in forests of the Rocky Mountains. Research Paper INT-RP-477. Ogden, Utah: United States Department of Agriculture, Forest Service, Intermountain Research Station. 13 pp.
Graham, Russell T, et al. 1999. Fuel: Logs, Sticks, Needles, Duff, and Much More. Proceedings from the Joint Fire Science Conference and Workshop, Vol. II and I. Boise, Idaho.
McIver, James D.; Starr, Lynn, tech. eds. 2000. Environmental effects of postfire logging: literature review and annotated bibliography. Gen. Tech. Rep. PNW-GTR-486. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 72 p.
Wildlife
Bartelt, P.E. 1977. Management of the American goshawk in the Black Hills National Forest. Masters thesis. Univ. of South Dakota. 102 pp.
Braun, C. E., J. H. Enderson, M. R. Fuller, Y. B. Linhart, and C. D. Marti. 1996. Northern goshawk and forest management in the southwestern United States. Wildl. Soc. Tech. Rev. 96-2. 19 pp.
BBS Data – See Sauer, Hines, and Fallon.
Brown, N.L. 1996. Western Burrowing Owl. http://arnica.csustan.edu/ESRPP/burowl.htm 3 p.

Literature Citations
Bull, Evelyn L. and J.H.Hohmann. 1994. Breeding biology of northern goshawks in northeastern Oregon. Studies in Avian Biology No. 16:103-105, 1994.
DeGraaf, R.M., V.E. Scott, R.H. Hamre, L. Ernst, S.H. Anderson. 1991. Forest and rangeland birds of the United States, natural history and habitat use. Agriculture Handbook 688. 625p.
Ensign, John. 2003 and 2004. Montana Fish, Game and Parks biologist. Personal Communication with John about what species he had observed or knew were documented within the Ekalaka Hills and surrounding area, and any monitoring data he may have.
Erickson, M.G. 1987. Nest site habitat selection of the goshawk (*Accipiter gentilis)* in the Black Hills National Forest of South Dakota. Masters thesis. Univ. of South Dakota. 49 pp
Halls, L.K. 1984. White-tailed Deer Ecology and Management. Stackpole Books. Harrisburg, PA. 870p.
Hershey, T.J. and T.A. Leege. 1976. Influences of logging on elk on summer range in north-central Idaho. Proc. Elk-Logging-Roads Symp., Univ. of Idaho, Moscow. pp 73-80.
Idaho Department of Fish and Game (IDF&G). 1984. Guidelines for evaluating and managing summer elk habitat in northern Idaho. Wildlife Bulletin No. 11, 1984.
Lyon, L.J., T.N. Lonner, J.P. Weigand, C.L. Marcum, W.D. Edge, J.D. Jones, D.W. McCleerey, and J.L. Hicks. 1985. Coordinating Elk and Timber Management. – Federal Aid in Restoration Project W120R. 15p.
Montana Bald Eagle Working Group (MBEWG). 1991. Habitat management guide for bald eagles in Northwestern Montana. 29p. (ref pgs 7, 24)
Natureserve: An online encyclopedia of life [web application). 2004. Version 1.5. Arlington, Virginia, USA: Association for Biodiversity Information. Available: http://www.natureserve.org/
Reel, S., L. Schassberger, and W. Ruediger. 1989. Caring for our natural community: Region 1 - hreatened, Endangered and Sensitive Species Program. USDA, USFS, Northern Region, Wildlife and Fisheries, Missoula, Montana. 333 pp.
Reynolds, R.T. et. al. 1992. Management recommendations for the northern goshawk in the southwestern United States. USDA Forest Service Gen. Tech. Rep. RM-217.
Risdahl, Greg. 2004. Former Montana Fish, Game and Parks biologist. Personal communication with Greg about the Ekalaka Hills, species found there, and any monitoring data he had for the area.
Rumble, M. A., and S. H. Anderson. 1995. Evaluating the habitat capability model for Merriam's turkeys. Res. Pap. Rm-320. Fort Collins, Colorado: USDA, USFS, Rocky Mountain Forest And Range Experiment station. 8 pp.
Sasse, Donald. 2003 Personal Communication about what species he had observed, suspected to be within the Ekalaka Hills, and any monitoring or historical data he may have.
Sauer, J. R., J. E. Hines, and J. Fallon. 2001. The North American Breeding Bird Survey, Results and Analysis 1966 - 2000. Version 2001.2, *USGS Patuxent Wildlife Research Center*, Laurel, MD
USDA Forest Service. 2000. Expert Interview Summary for the Black Hills National Forest Land and Resource Management Plan Amendment. USDA Forest Service, Black hills National Forest, Custer, South Dakota
USDA. 1991. Management Guidelines for the Northern Goshawk in the Southwestern Region. Prepared by Northern Goshawk Scientific Committee, Southwest Region. 184p.
USDA Forest Service. 1986. Custer National Forest, Land and Resource Management Plan. USDA, Forest Service, Billings, Montana. 186 pp. Document on file.

Literature Citations
USDA Forest Service. 1990. Deer Guidelines: Ashland Ranger District, Custer National Forest, Montana. 9 pp. and appendices
Whitford, Tom. 2003 and 2004. Personal Communication about what species he had observed and suspected to be present within the Ekalaka Hills Unit.
Rare Plants
Heidel, B. 2001. Plant Species of Concern. Montana Natural Heritage Program, Helena. 38pp
Heidel, B. L. and K. D. Dueholm. 1995. Sensitive plant species survey in the Sioux District of Custer National Forest; Carter County, Montana and Harding County, South Dakota. Unpublished report to the Custer National Forest. Montana Natural Heritage Program, Helena. 95 pp. plus appendices.
Reid, Kim. Sioux RD Sensitive Plants Power Point Presentation, Custer National Forest, R1 1999 Listing.
Reid, Kim. Custer National Forest. 2004. Ongoing personal communications.
USDA, Forest Service. 1999. Sioux RD Sensitive Plants. Custer National Forest. R1 March 1999 Listing.
Range Resource/Noxious Weeds
USDA-Forest Service. 1986. Custer National Forest. Noxious Weed Treatment Program – Final Environmental Impact Statement. 78 pp.
Heritage Resources
Beckes, M.R. and J.D. Keyser. 1983. The Prehistory of the Custer National Forest: An Overview. USDA, Custer National Forest, Billings, MT.
Deaver, Sherri and Ann Kooistra-Manning. 1995 Ethnographic Overview of the McKenzie, Medora, Sioux, Ashland and Beartooth Ranger Districts of the Custer National Forest. Ms. On File, Custer National Forest, Billings.
Frison, G. 1991. Prehistoric Hunters of the High Plains. Academic Press, New York.
Larson, T.K. and P.H. Sanders. 1989. *Cultural Resource Inventory of the Brewer Salvage Timber Sale, Long Pines Unit, Sioux Ranger District, Custer National Forest, Carter County, Montana.* Larsen
Redman, Louis A. 2003. A Level III Heritage Resource Survey for the Ekalaka Fuels Treatment Project on the Custer National Forest in Carter County, Montana. Ms. On File, Custer National Forest, Billings, MT
Economics
IMPLAN; IMPLAN Professional Version 2.0. 1999. Minnesota IMPLAN Group, Inc. Social Accounting and Impact Analysis Software.
Jones, J. G. J. R. Sullivan, K. Krueger. 2002. A Guide to the PLATA Default Database Builder. USDA Forest Service, Rocky Mountain Research Station. General Technical Report RMRS-000
Jones, J. G. J. R. Sullivan, K. Krueger. 2002. A Guide to the PLATA Project Builder. USDA Forest Service, Rocky Mountain Research Station. General Technical Report RMRS-000
Stockman, K.D., and F. J. Stewart. 2002. Eastern Montana National Forest Economic Assessment. CD ROM Available from Northern Regional Economist.
U.S. Census Bureau, Census 1990 (Government Information Sharing Project, website) U.S. Census Bureau, Census 2000, (www.census.gov).
USFS. 1998. Timber Sale Program Annual Report for the Northern Region – Fiscal Year 1998. USDA Forest Service, Northern Region. TSPIRS Report FY 1998.