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Beaverhead-
Deerlodge

National Forest

Wise River
Ranger District

SEYMOUR, SULLIVAN, and DEEP CREEKS

WATERSHED ASSESSMENT

2012

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TABLE OF CONTENTS

List of Tables

List of Figures

I. GOALS AND METHODS

The 2009 Beaverhead-Deerlodge National Forest (BDNF) Land and Resource Management Plan (Revised Forest Plan) directs us, through Goals and Objectives, to restore key watersheds and maintain all other watersheds to ensure long term ecological integrity of ecosystems, conserve genetic integrity of native species, attain desired stream function and support beneficial uses. The tool for accomplishing this, according to the Revised Forest Plan, is watershed analysis (Objectives, page 16). The BDNF coordinates Watershed Assessment of key watersheds with priority areas which contribute to the Northern Region Integrated Restoration Strategy. The Integrated Restoration Strategy identifies the Seymour-Deep Creek watersheds as a priority area for restoration.

The Northern Region Integrated Restoration Strategy was developed, starting in 2006, to accomplish regional ecosystem restoration and protection of social values at risk (http://www.fs.fed.us/r1/projects/int-restoration/overview.shtml). The Region identified the following agents which affect resource conditions:

- drought,
- forest insects and pathogens,
- invasive plant and animal species,
- forest colonization into grasslands,
- uncharacteristically dense vegetation that creates hazardous fuel conditions, and
- erosion, sedimentation, and toxic chemicals.

The Seymour-Deep Watershed Assessment area has a high potential for contributing positive actions in resolving the Northern Region Integrated Restoration Strategy concerns as well as a high potential for meeting desired conditions, goals and objectives of the 2009 Revised Forest Plan. The Deep Creek watershed was identified in the 2009 Revised Forest Plan amongst a group 56 fish key watersheds, and the Seymour and Sullivan Creeks watersheds were identified as two of the 15 restoration key watersheds. Since the priority watersheds were designated by the Revised Forest Plan, the HUC (Hydrologic Unit Code) boundaries have been redrawn, and the Sullivan Creek watershed is now a part of the now much larger Deep Creek watershed. The western ~60% of the Deep Creek watershed is a restoration key watershed (formerly the Sullivan Creek HUC), and the eastern ~40% of Deep Creek watershed is a fish key watershed (see Figure 1). All three watersheds are high priority for assessment and action.

The goal for fish key watersheds is that populations of westslope cutthroat trout exhibit numbers, life histories, age classes, recruitment levels, and reproductive characteristics representative of historic conditions (Aquatic Resources, p. 13 of the Revised Forest Plan). The goal for restoration key watersheds is that fish habitat, riparian habitat, and water quality are recovered to desired conditions developed through watershed assessments.

Watershed Analysis as a Planning Tool

Watershed analysis is a process used to describe the human, biological and physical conditions, processes, and interactions within a watershed. The analysis focuses on specific issues, values and uses identified within the landscape that are essential for making sound management decisions. For each resource of concern, the analysis describes past trends, existing conditions and desired conditions in both biophysical and social terms. The intention of this document is to present our current understanding of the processes and interactions of concern within the Seymour and Deep Creek watersheds based on information developed by an 8-person interdisciplinary team.

Watershed analysis is an intermediate step between land management planning (Forest Plans) and project planning. It is a stage-setting process which enhances our ability to guide the general type, location, and sequence of appropriate management activities within a watershed. One product of the watershed analysis is a description of management opportunities that will help to bring resources towards desired conditions. Opportunities are derived from the gap between existing and desired conditions. From a list of general opportunities, potential projects are identified for consideration by forest managers.

The type of information collected varies for each landscape but always includes descriptions of the following conditions within the landscape:

- basic geology, landform and soils
- watershed condition
- distribution of fish species
- vegetation conditions and changes
- key wildlife habitats
- recreation use and travel patterns
- resource uses
- cultural or historic uses

A watershed assessment makes no decisions, nor does it initiate or result in land management allocations. It does not select projects for implementation. Rather, the Wise River Ranger District will use this analysis to determine which specific projects would move the watersheds toward the desired condition described in the Beaverhead- Deerlodge National Forest Land and Resource Management Plan. Proposed projects will then be analyzed individually by a separate interdisciplinary team. Project analysis will include involvement by the public and result in a site-specific decision as required by the National Environmental Policy Act (NEPA).

Methods

The watershed analysis was developed by an 8-member interdisciplinary team under the guidance of the Wise River District Ranger, using the "Federal Guide for Watershed Analysis – Ecosystem Analysis at the Watershed Scale (Version 2.2, August 1995)" as a guide. The purpose is to identify projects and priorities for restoring watershed and other resource

conditions. Desired conditions are based on the 2009 Revised Beaverhead-Deerlodge Forest Plan.

The interdisciplinary team identified key issues in the watershed based on previous project work in the area, the Mount Haggin Watershed Restoration Project Environmental Assessment (1995), the Big Hole Landscape Analysis (2001), resource data developed for revising the Forest Plan (2002-2008), field data collected in the summers of 2011 and 2012, and District and Forest specialists' field knowledge of the area. These issues and questions around the issues focused the analysis.

II. LANDSCAPE SETTING

The Seymour-Deep Creek Watershed Assessment area is located in Deer Lodge County and lies about 9 miles northwest of Wise River, Montana and sits northwest of the intersection of highways 43 and 274. See Figure 1. The analysis area lies on the southeastern face of the Pintler Mountains, just east of the Continental Divide. The drainages in the analysis area are Chub Creek, Seymour Creek, Sullivan Creek, Poronto Creek, Dry Creek, Twelvemile Creek, Corral Creek, Tenmile Creek, Sevenmile Creek, and Bear Trap Gulch. Streams flow south into the Big Hole River end up in the Missouri River Basin, and ultimately the Gulf of Mexico.

The Seymour-Deep Watershed Assessment area is roughly 54,600 acres (Table 1) and is bounded in the north by several high peaks in the Pintler Mountains, including Queener Mountain (10,148 feet) Kurt Peak (9,961 feet), Mt. Tiny (9,848 feet), Mt. Howe (10,272 feet), Mt. Evans (10, 641 feet), and Short Peak (10,298 feet).

Elevations range from 5,770 feet at the intersection of Highways 43 and 274, to 10,641 feet (Mt. Evans). Drainage density is moderate. Mean annual precipitation ranges from 9 to 30 inches, about 10-35 percent falling as snow, depending on elevation.

About two-thirds of the assessment area is National Forest (Table 1). The Mt. Haggin Wildlife Management area (Montana Fish, Wildlife and Parks) comprises 18%, 12% is privately owned, and the remaining 3% is BLM.

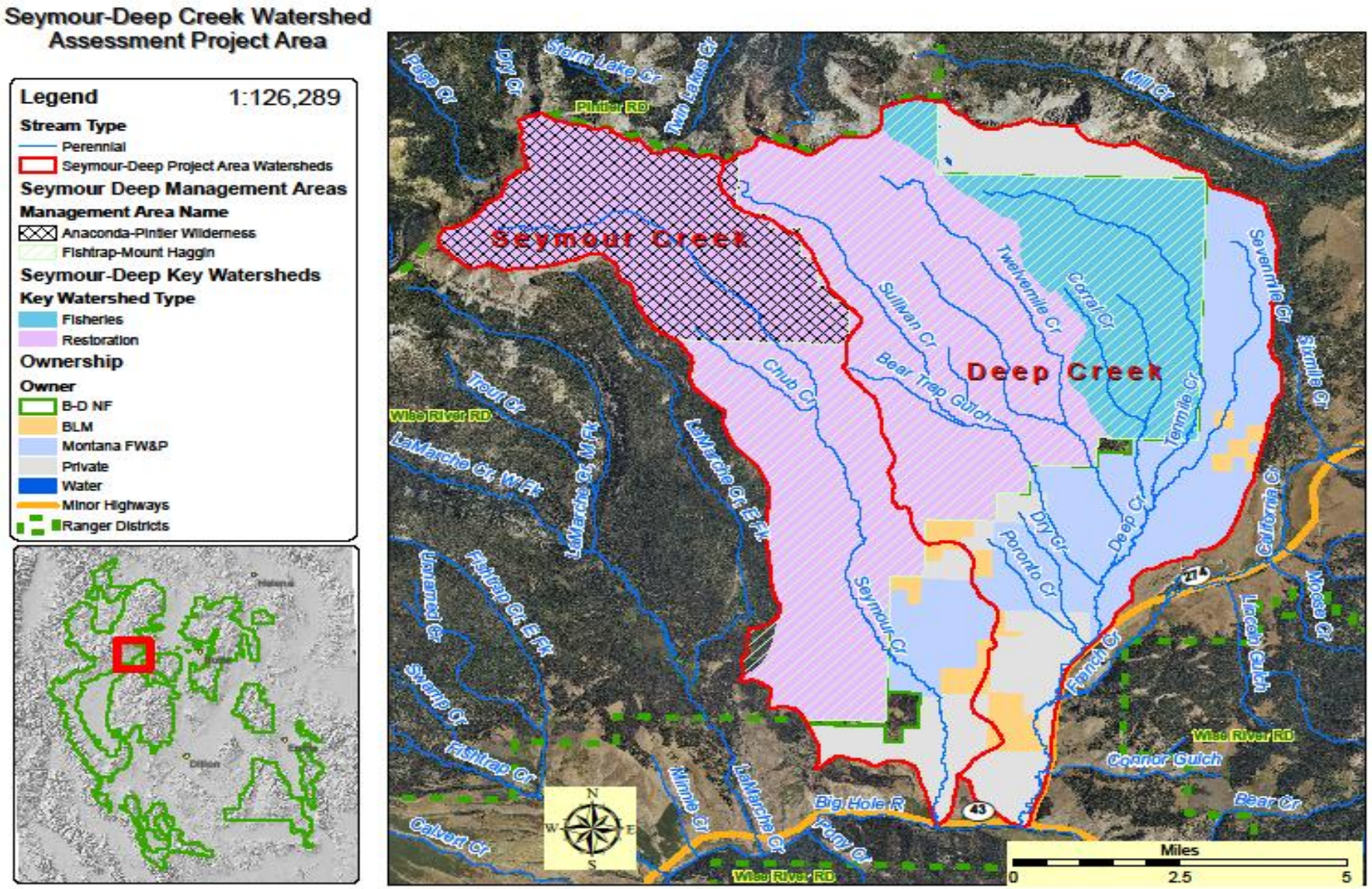

Figure 1. Map of the Seymour-Deep Watershed Assessment area.

Table 1. Land management within the Seymour and Deep Creek Watershed Assessment Project area.

Area	Acres	Percent
National Forest	36,805	67%
Mt Haggin Wildlife Management Area	9,610	18%
Bureau of Land Management	1,546	3%
Private	6,614	12%
Other (water)	23	<1
Total	**54,599**	**100**

Approximately three-fourths of the landscape is forested. Lodgepole pine is the major species, but Douglas-fir is found at lower elevations and subalpine fir is found at middle elevations. Scattered Englemann spruce grow along creek bottoms and at higher elevations. Whitebark pine is common at high elevations. Grassland parks and meadows are scattered throughout, mainly at lower elevations and along the alpine ridges. Currently, the Seymour-Deep assessment area is part of a larger epidemic of mountain pine beetle occurring across the majority of the Beaverhead-Deerlodge National Forest and on other forests in the Northern Region.

The diverse vegetation of this analysis area supports a comparable diversity of wildlife species including elk, mule deer, moose, black bear, coyotes, wolves, raptors, forest birds, birds of shrubland/grasslands and riparian bottoms, small mammals, and rodents.

III. OVERVIEW OF MANAGEMENT HISTORY

The greater Mount Haggin area wasn't settled by notable numbers of people until the turn of the 20th century when minerals were discovered and mining communities sprang up in areas like French Gulch, located just west of the analysis area. During the period 1883-1917, several hundred million boardfeet of timber were removed from the Mount Haggin area, which included a portion of the project area. The total area involved in this past harvest included forested lands on either side of highway 274, along both sides of the continental divide. This included the first large scale timber sale in Region 1, when the Forest Service was established in 1906. The Anaconda Smelter and Butte mines were the recipients of this first massive harvest. Most of the wood was cut either into 8-foot mining stulls or cordwood to fire the smelter, with the remainder processed into building materials. The harvest ended in 1916, when the mills directed their logging efforts in the Georgetown Lake area. Visible signs of this past harvest include remains of the flume built to carry the material over the divide to the railroad outside of Anaconda. Even today, 100 years after this past harvest, reforestation

has yet to establish well west of the divide, where toxins from the smelter destroyed and continue to inhibit much of the vegetation. East of the divide, natural regeneration was successful, as stands harvested from the contract that ran 1968-1993 were also harvested before the turn of the century. Along the shores of Tenmile Lakes, in the upper reaches of the analysis area, hundreds of cords of stacked wood from this initial harvest of 100 years ago remain today.

All of the current national forest lands within the current boundary of the Deep Creek watershed, and several sections of national forest lands within the Seymour Creek watershed south of the wilderness boundary, at one time belonged to the Mount Haggin Livestock Company, a subsidiary of the Anaconda Company. The Mount Haggin Livestock Company decided to type convert their lands from coniferous forest to grazing land in the 1960's. In 1968, they entered a contract with the Northern Timber Company for a timber harvest of over 70,000 acres. In 1976, with approximately 37 million board feet (MMBF) already harvested, the Nature Conservancy purchased the property from the Mount Haggin Livestock Company. Later that same year, both the Forest Service and the state of Montana reacquired the property, with approximately 23,000 acres going to the Forest Service and 55,000 acres to the State. However, the timber sale contract remained in effect, with Louisiana Pacific continuing on the contract from the Northern Timber Company. Harvest on State land ended in 1988, and the harvest on Forest Service land ended in 1993. The timber sale contract had very few provisions that would allow the Forest Service the administrative control of a standard Forest Service timber sale contract. With limited constraints, the logging contractors harvested extensive areas—approximately 100 million board feet over 10,000 acres—mainly through clearcut harvest methods, from 1968 until the end of the contract in 1993.

In 1995, the Forest Service released the Mount Haggin Watershed Restoration Project Environmental Assessment, which analyzed five alternatives to address sedimentation due to road locations and inadequate erosion control during road construction over the course of the 25-year contract. Alternative 3-Modified was selected in the decision, which involved the following:

- *Installation of erosion control measures* on all known sedimentation sources on all roads (142 miles) within the project area (national forest lands within our current Seymour-Deep analysis area), whether the road was open or closed;
    - Priorities for work included Corral Creek, Sullivan Creek, Dry Creek, and Fubar Creek (a tributary to Seymour Creek). All planned work was completed.
- *Road closures*: reduced open roads from 83 miles to 59 miles. Roads open during big-game hunting season went from 50 to 48. All planned work was completed.
- *ATV Loop trail*: included in the decision was an 11-mile ATV loop trail comprised of 8 miles of open road and 3 miles of closed road. This was never completed.

Recreation Setting

The recreation setting of the Seymour Deep analysis area affords diverse recreation opportunities. The Fishtrap-Mount Haggin Management area is partly summer non-motorized which provides wildlife habitat and quiet recreation. Also, the area between the non-motorized area and private lands offer a roaded setting with developed and dispersed campsites, roads, and trails. Hunting, camping, ATV riding, bicycling and horse riding are common activities. Snowmobile opportunities are available across the lower area though limited in some areas by terrain and vegetation. The Anaconda Pintler Wilderness Management Area provides primitive and semi-primitive non-motorized recreation settings. Local residents and destination tourists use stock or hiking to travel into or through the areas. Opportunities to camp, hunt, and fish at alpine lakes are available. Guided trips are available from local private outfitters.

National Forest Land Management Summary

Management of resources in the Seymour-Deep Watershed Assessment area is guided by the 2009 Beaverhead--Deerlodge Land and Resources Management Plan (LRMP). The LRMP goals and objectives are presented in this assessment for soils, hydrology, aquatics, vegetation, sensitive plants, invasive plants, wildlife, recreation, heritage, and livestock grazing.

The Assessment area lies within the Big Hole Landscape. The Fishtrap-Mount Haggin Management Area is managed for developed and dispersed recreation, wildlife habitat, livestock grazing, and timber harvest and production. Vegetation management direction allows for timber harvest and production and forage for livestock and big game. Deep Creek is identified by the LRMP as a fish key watershed, managed to conserve natural fish populations. Seymour and Sullivan Creeks are identified by the LRMP as restoration key watersheds, managed to restore desirable watershed conditions.

The assessment area also includes the Anaconda Pintler Wilderness Management Area at the upper, northern end of the Seymour Creek watershed. The area provides primitive and semi-primitive non-motorized recreation settings. Vegetation is managed primarily through prescribed and natural fire. Most active watershed restoration takes place in the lower reaches of Sullivan Creek restoration key watershed.

IV. WATERSHED CONDITION CLASSIFICATION

Introduction

In fiscal year 2011, every national forest across the country rated watershed health (Watershed Condition Class) on all of the watersheds within their respective boundaries. The Watershed Condition Classification (WCC) effort was developed to establish a systematic process for determining watershed condition class that all national forests can apply consistently. The next three sections which provide a brief overview of the process, “Defining Watershed Condition”, “Watershed Condition Indicators” and “Classifying

Individual Indicators" are excerpted directly from the Watershed Condition Classification Technical Guide (USDA Forest Service 2011) which can be found at http://www.fs.fed.us/publications/watershed/watershed_classification_guide.pdf

Defining Watershed Condition

Watershed condition is the state of the physical and biological characteristics and processes within a watershed that affect the hydrologic and soil functions supporting aquatic ecosystems. Watershed condition reflects a range of variability from natural pristine (functioning properly) to degraded (severely altered state or impaired). Watersheds that are functioning properly have terrestrial, riparian, and aquatic ecosystems that capture, store, and release water, sediment, wood, and nutrients within their range of natural variability for these processes. When watersheds are functioning properly, they create and sustain functional terrestrial, riparian, aquatic, and wetland habitats that are capable of supporting diverse populations of native aquatic- and riparian-dependent species. In general, the greater the departure from the natural pristine state, the more impaired the watershed condition is likely to be. Watersheds that are functioning properly are commonly referred to as healthy watersheds.

Watershed Condition Indicators

The WCC system uses 12 indicators composed of attributes related to watershed processes. The indicators and their attributes are surrogate variables representing the underlying ecological functions and processes that affect soil and hydrologic function. For most of the indicators, the Forest Service can take direct action, or cause others to take action, which contributes to maintaining or improving watershed condition. This structure provides for a direct linkage between the classification system and management or improvement activities the Forest Service conducts on the ground. Because of this linkage, when a sufficient number of properly designed and implemented restoration and/or management actions occur within a watershed, we can express the outcome as a change in condition class and use the resulting change in condition class for performance accountability purposes. Management activities that affect the watershed condition class are not limited to soil and water improvement activities; they include a broad array of resource program areas: hazardous fuel treatments, invasive species eradication, abandoned mine restoration, riparian area treatments, aquatic organism passage improvement, road maintenance and obliteration, and others. To change a watershed condition class will, in most cases, require changes within a watershed that are significant in their scope and include treatments from multiple resource areas. Sound management or improving management practices can often be as effective as implementing restoration projects and must not be overlooked. To demonstrate improvement in condition class, we will need to track activities at the smallest feasible watershed unit, the 6th-level HUC (typically, 10,000 to 40,000 acres).

The WCC system consists of 12 watershed condition indicators (see Table 2).

Table 2. Description of the 12 national core watershed condition indicators.

Aquatic Physical Indicators	
1. Water Quality	This indicator addresses the expressed alteration of physical, chemical, and biological components of water quality.
2. Water Quantity	This indicator addresses changes to the natural flow regime with respect to the magnitude, duration, or timing of the natural streamflow hydrograph.
3. Aquatic Habitat	This indicator addresses aquatic habitat condition with respect to habitat fragmentation, large woody debris, and channel shape and function.
Aquatic Biological Indicators	
4. Aquatic Biota	This indicator addresses the distribution, structure, and density of native and introduced aquatic fauna.
5. Riparian/Wetland Vegetation	This indicator addresses the function and condition of riparian vegetation along streams, water bodies, and wetlands.
Terrestrial Physical Indicators	
6. Roads and Trails	This indicator addresses changes to the hydrologic and sediment regimes because of the density, location, distribution, and maintenance of the road and trail network.
7. Soils	This indicator addresses alteration to natural soil condition, including productivity, erosion, and chemical contamination.
Terrestrial Biological Indicators	
8. Fire Regime or Wildfire	This indicator addresses the potential for altered hydrologic and sediment regimes because of departures from historical ranges of variability in vegetation, fuel composition, fire frequency, fire severity, and fire pattern.
9. Forest Cover	This indicator addresses the potential for altered hydrologic and sediment regimes because of the loss of forest cover on forest lands.
10. Rangeland Vegetation	This indicator addresses effects on soil and water because of the vegetative health of rangelands.
11. Terrestrial Invasive Species	This indicator addresses potential effects on soil, vegetation, and water resources because of terrestrial invasive species (including vertebrates, invertebrates, and plants).
12. Forest Health	This indicator addresses forest mortality effects on hydrologic and soil function because of major invasive and native forest insect and disease outbreaks and air pollution.

Classifying Individual Indicators

Each indicator attribute receives a rating. The ratings are expressions of the "best-fit" descriptor of the attribute for the entire 6th-level watershed being classified. In the absence of established numeric criteria for most of the attributes, the boundaries between the attribute condition ratings were assigned by resource specialists working on the Watershed Condition Advisory Team using professional judgment guided by the conceptual condition descriptions below.

Condition Rating 1 is synonymous with "GOOD" condition. It is the expected indicator value in a watershed with high geomorphic, hydrologic, and biotic integrity relative to natural potential condition. The rating suggests that the watershed is functioning properly with respect to that attribute.

Condition Rating 2 is synonymous with "FAIR" condition. It is the expected indicator value in a watershed with moderate geomorphic, hydrologic, and biotic integrity relative to natural potential condition. The rating suggests that the watershed is functioning at risk with respect to that attribute.

Condition Rating 3 is synonymous with "POOR" condition. It is the expected indicator value in a watershed with low geomorphic, hydrologic, and biotic integrity relative to natural potential condition. The rating suggests that the watershed is impaired or functioning at unacceptable risk with respect to that attribute.

Seymour-Deep Watershed Condition Ratings

Table 3, below, shows how the Seymour and Deep Creek watersheds were rated for the 12 national core watershed condition indicators. Class 1 (GOOD) = scores of 1.0 to 1.6, Class 2 (FAIR) = scores from 1.7 to 2.2, and Class 3 (POOR) = scores from 2.3 to 3.0. Both watersheds are classified in the "fair" class; Seymour Creek has an overall score of 1.7, while Deep Creek has an overall score of 1.9. Primary differences between the two watersheds include reduced water quality, aquatic habitat and more roads and trails in Deep Creek compared to Seymour Creek.

These conditions and site-specific recommendations to ameliorate resource issues are presented in detail in each resource section in this document.

Table 3. Ratings of the 12 national core watershed condition indicators for Seymour and Deep Creeks.

Indicator	Seymour Creek	Deep Creek
Water Quality	1.5	2.5
Water Quantity	1.0	1.0
Aquatic Habitat	1.3	1.7
Aquatic Biota	2.0	2.0
Riparian/Wetland Vegetation	2.0	2.0
Roads and Trails	2.3	3.0
Soils	1.0	1.0
Fire Regime or Wildfire	2.0	2.0
Forest Cover	1.0	1.0
Rangeland Vegetation	2.0	2.0
Terrestrial Invasive Species	1.0	1.0
Forest Health	2.0	2.0
OVERALL RATING	**1.7**	**1.9**

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V. RESOURCE AREAS

A. GEOLOGY, LANDFORMS and SOILS

1. Characterization

Geology, Landforms, and Soils: Overview

The Seymour-Deep assessment area is comprised of a diverse array of geologic types and landforms. To succinctly characterize the area, subsection descriptions were utilized (Nesser et al. 1997). Subsections were mapped at a 1:500,000 scale, and are described as smaller areas of sections with similar surficial geology, lithology, geomorphic process, soil groups, subregional climate, and potential natural communities (ECOMAP 1993). Each subsection has landscape components that differentiate it from adjacent subsections. The differentia used to place lines on the map include geologic materials, geomorphic features, and climate. Other components are used to describe each subsection but are not used to delineate the units; these are called accessory characteristics and include soils and vegetation. Two main subsections cover the area; the Anaconda Mountains Subsection, and the Southwest Montana Intermontane Basins and Valleys Subsection.

The Anaconda Mountains Subsection (M332Eg) comprises the majority of the assessment area above about 6,000 feet. This subsection is characterized by block faulted mountains that formed in monzonite and granodiorite. Elevations range from 6,000 to 10,641 feet (Mt. Evans). Drainage density is moderate. Mean annual precipitation ranges from 20 to 30 inches, about 35 percent falling as snow. Soils are shallow to deep, gravelly, cobbly and stony sandy loams and loamy sands. Volcanic ash is mixed within a thin surface soil layer at higher elevations. Productivity ranges from low to moderate. Soils have low to moderate resistance to erosion. Sizable areas have soils with water tables at or near the surface and these soils are susceptible to rutting and compaction. Principal ecological concerns affecting soil quality are wildfire and flooding. Principal management activities with the potential to affect soil quality are roads, timber harvest, off highway vehicles, grazing, mining, and recreational development.

The Southwest Montana Intermontane Basins and Valleys Subsection (M332Ej) covers the lower elevations of the analysis area from just above the forest boundary, east to highway 274 and south to the Big Hole River. Intermontane basins and broad valleys formed in alluvium, glacial deposits, and Tertiary volcanic and sedimentary materials. Elevations range from 4,700 feet to 7,600 feet. Drainage density is low. Mean annual precipitation ranges from 9 to 20 inches, about 10 percent falling as snow. Soils formed in glacial deposits are deep, cobbly and very cobbly sandy loams and loams. Productivity is low to moderate, and soils are generally resistant to erosion and other soil impacts. Other soils are deep and moderately deep, loams, clay loams and clay with variable but generally low amounts of gravels, cobbles, and stones. They have moderate productivity, are easily eroded, and are susceptible to rutting and compaction. Principal ecological concerns affecting soil quality are

invasive weeds, wildfire, and flooding. Principal management activities with the potential to affect soil quality are roads, grazing, mining, and recreational and suburban development.

More specifically, the uppermost reaches of the watersheds are comprised of Proterozoic metamorphosed gneiss, schist, and quartzite, Proterozoic quartzite with lesser amounts of phyllite and schist, Cretaceous and Eocene Granitic rocks, and Pleistocene till (primarily in the drainages). Moving downslope, Tertiary sedimentary rocks dominate, with glacial till still present in the drainages. Below the forest boundary, glacial outwash is present, primarily from the watershed divide separating Seymour Creek from Poronto Creek to just east of Sevenmile Creek. Dry, Twelvemile, Deep, Tenmile, and Sevenmile Creeks. Soils vary widely in thickness and in texture, but in soils derived from granodiorite and quartzite-type rocks are generally sandy and have high rock content (gravels, cobbles, and stones). Soils formed in Tertiary sedimentary material tend to be finer-textured and also have high rock content. In many areas, glacial deposits cover much finer-textured Tertiary sedimentary material with a high water holding capacity. These areas have higher productivity than comparable areas without Tertiary sedimentary material.

Soil Risk Ratings: Erosion, Compaction, Rutting, and Mass Wasting

Soil surveys for the Beaverhead-Deerlodge National Forest were completed in 2006 (North Zone) and 2007 (South Zone) as part of the National Cooperative Soil Survey (NCSS). The Natural Resources Conservation Service (NRCS) provides quality control for soil surveys and associated data collection under the auspices of the NCSS. Soil surveys stratify mapped areas based on soil, landform and other characteristics in order to gain information about the inherent soil properties, including how they are affected by management activities. Soil survey data are interpreted to estimate the risk that management activities will affect soils. These risk estimates are called soil interpretations. All risk ratings presented in this document are for Forest Service lands only.

NRCS produces soil interpretations through its national database. Interpretations, by design, are based on individual soil components of map units (polygons encircling areas with similar soil components). The result is multiple risk ratings for individual polygons. For project planning the Forest needs a single risk rating for each map unit that integrates the various component ratings.

Presently, NRCS interpretations focus on soil characteristics and other data in the database. Slope and slope shape are two landform attributes in the database and slope is a criterion for erosion risk interpretations. The Forest survey used landforms, which include slope and slope shape, as criteria for delineating map units. These attributes are very useful for management interpretations because they infer not only slope, slope shape, and other topographic features but also provide insights into the landforming forces that shaped them. In some cases the forces are no longer active, such as glacial landforms; in other cases they are still active, such as stream dissected landforms. The end result is that soil attributes used for interpretation can be placed within the context of the landforms on which they are

located, taking into consideration landform attributes and landform processes that are inferred to be presently active.

Therefore, we have developed a single integrated interpretation for erosion, mass failure, rutting, and soil compaction for each of the Forest map units with landform attributes. Soil data from the NRCS database and criteria from the National Forestry Manual were used to interpret map units for erosion risk where the criteria applied. The criteria were modified to fit other map units as deemed appropriate based on landform attributes.

EROSION RISK

The risk of soil erosion is a net result of the inherent ability of the soil to resist erosion, which is determined by soil characteristics (texture, rock content, etc.) and the erosive force of running water on the soil surface (slope steepness and the propensity of the landform to either concentrate or disperse runoff). We assumed that NRCS off-road/off trail erosion risk ratings are adequate erosion risk ratings for map units on stream dissected landforms.

Erosion Interpretations: Landforms and geologies with changes from NRCS ratings

Stream-dissected landforms generally will use the NRCS off-road, off-trail erosion interpretation due to the tendency of the landform to concentrate runoff. The ratings are classified by slope class; see Table 4 below.

Table 4. NRCS off-road, off-trail erosion risk ratings.

Slope class	NRCS Off-road, Off-trail erosion risk
1 (0-20%)	Slight or Moderate-slight
2 (10-35%)	Moderate
3 (25-50%)	High-Moderate
4 (45-70%)	High

Landtypes with granitic parent material are rated one class higher than standard erosion ratings, due to the erosive nature of soils derived from granite. Moderately steep and steep stream dissected landtypes comprised of 35% or greater fine and fine-loamy textures are rated 1 class higher due to the potential to concentrate runoff if rutting occurs.

Flood plains, valley bottoms, moraines, trough bottoms, outwash plains and alluvial basins with willow/sedge habitat types are rated high for granitic landtypes and high-moderate for other geologic types, due to the potential for high erosive forces over bare soil during flooding. Flood plains, valley bottoms, moraines, trough bottoms, outwash plains and alluvial basins with forested habitat types are rated high-moderate for granitic landtypes and moderate for other geologic types. Timbered flood plain landtypes typically have more relief

than meadows (willow-sedge habitat types), less area in the flood plain, more large rock content, and a lower percentage of wet soils.

Frost affected landforms, glaciated landforms, and glacial deposits are 1 class lower than NASIS standard interpretations. In the case of frost affected landforms, there is little overland flow because the landform disperses rather than focuses the water (slope shape is convex across slope and up/downslope), and high rock content also reduces runoff energy. Glaciated and glacial deposit landforms have poor or no runoff concentration due to erratic topography and high rock content.

Table 5 displays the acreages of landtypes rated as high, high-moderate, moderate, moderate-slight, and slight erosion risks for landtypes in the Seymour-Deep assessment area. See Figure 2 below.

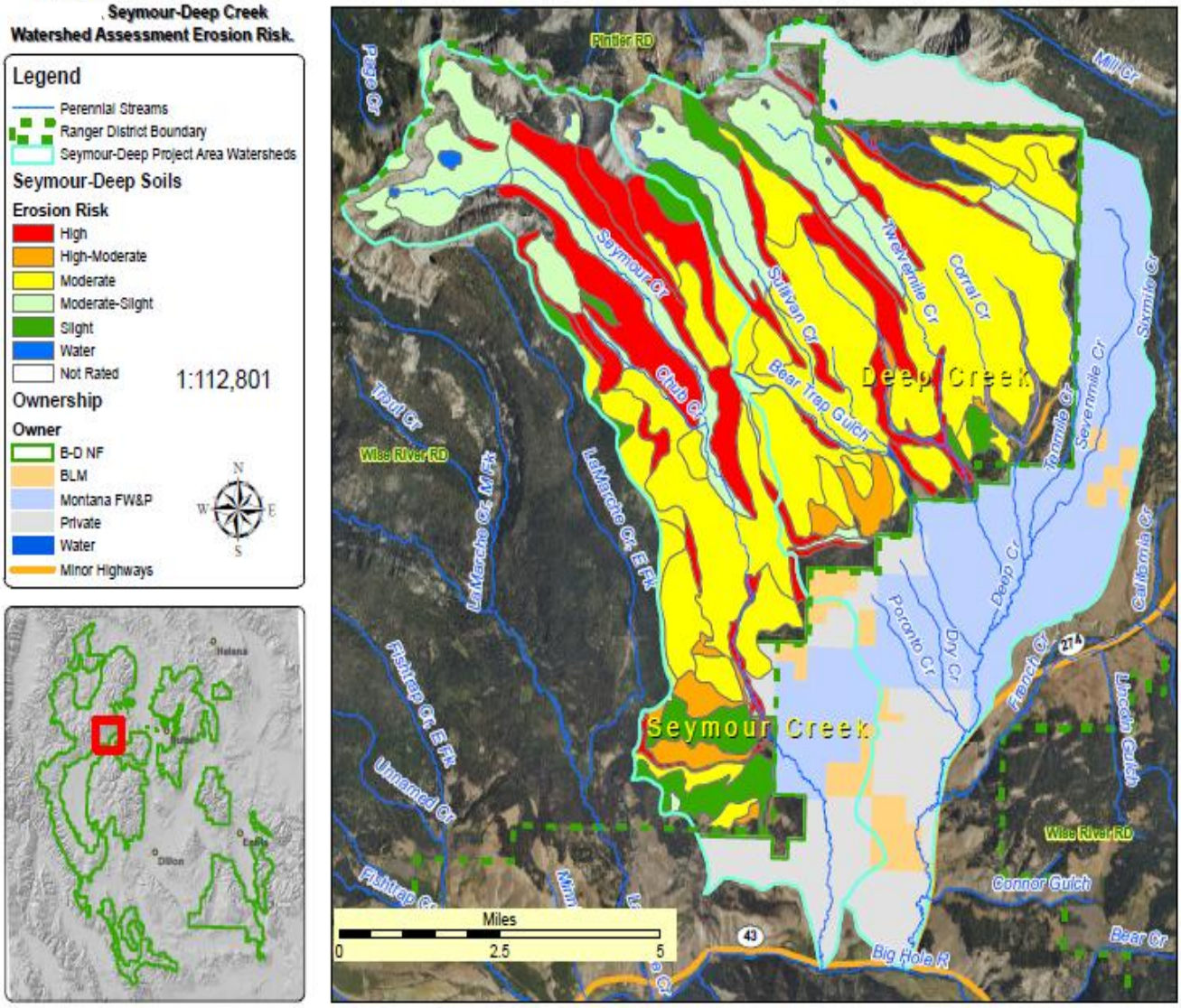

Figure 2. Seymour-Deep Creek watershed assessment erosion risk for NFS lands.

Table 5. Erosion ratings for national forest lands in the Seymour-Deep watershed assessment area, listed in total acres for each erosion class, and percentage that each class comprises.

Erosion Risk	Total Acres	Percent
High	6,187	19.8%
High-Moderate	1,266	4.1%
Moderate	14,967	47.9%
Moderate-Slight	6,098	19.5%
Slight	2,317	7.4%
Not rated (water, rock)	407	1.3%
TOTAL	**31,242**	**100.0%**

Many of the landtypes rated as high erosion risk are moderate and steep granitic landforms. Minor acreages of high and high-moderate risk soils occur in flood plains. Flood plains in granitic parent material are rated as high risk, and flood plains in other parent materials are rated high-moderate risk. This is due to the potential for high erosive forces over bare soil during flooding. Almost half of the assessment area (47.9%) is rated moderate erosion risk. These areas generally have gentler slopes and/or more erosion resistant geologic materials than landtypes that are rated high-moderate or high erosion risk. Soils derived from quartzite, for example, generally have lower erosion risk than soils derived from granitic rock types, all other factors being equal.

COMPACTION RISK

Like the other interpretations, the interpretation for compaction includes disturbance from management activities; in particular, use of equipment. NRCS interpretations for compaction assume a soil is at field capacity. This runs contrary to Forest standard operating procedure, which dictates avoiding management activities when soils are wet (such as during spring break up and during the fall before the soils freeze). The interpretations for compaction risk are as follows:

High: Perennial high water table soils comprise greater than 30% of the landtype; soils are wet year round. These areas, if managed at all, should (at a minimum) be operated on during the winter when the ground is frozen sufficiently to prevent rutting. This would be evaluated on a site-specific basis.

Moderate: Well-drained landtypes with fine or fine loamy textures (argillic horizon with <35% coarse fragments). Also includes landtypes dominated by soils with ephemeral high water

tables and 15-30% of landtype having soils with perennial high water tables. Tertiary sediments are included, even without high water tables.

Slight: All other landtypes not captured in Moderate or High.

The majority of soils in the project area have a moderate compaction risk rating (Figure 3; Table 6, below). Areas of moderate compaction risk rating occur throughout the assessment area, roughly associated with areas of glacial till, and to a lesser extent, Tertiary sediments. These soils are typically well drained soils with fine or fine loamy textures, or contain an argillic horizon with less than 35% coarse fragments. Other soils with a moderate risk rating have ephemeral high water tables in 25-50% of the map unit. Soils with a high compaction risk rating have high water tables in greater than 30% of the map unit, such as flood plain areas. Small extents of landtypes with high compaction risk occur just above the forest boundary along Twelvemile, the West Fork of Twelvemile, and Seymour Creeks, as well as an unnamed tributary to the west of Seymour Creek.

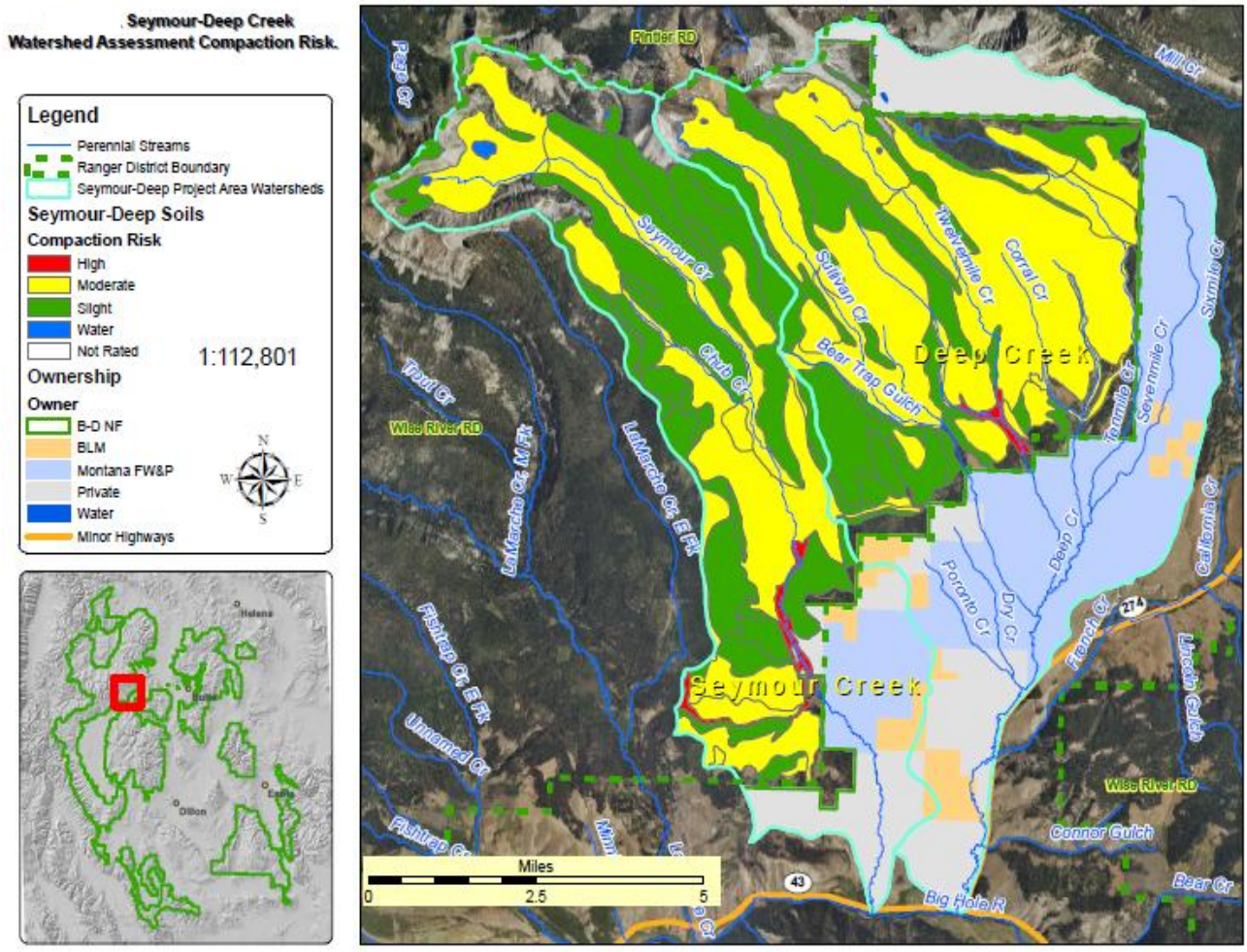

Figure 3. Seymour-Deep Creek watershed assessment compaction risk for NFS lands.

Table 6. Compaction risk ratings for national forest lands in the Seymour-Deep watershed assessment area, listed in total acres for each compaction risk class, and percentage that each class comprises.

Compaction Risk	Total Acres	Percent
High	410	1.3%
Moderate	18,057	57.8%
Slight	12,369	39.6%
Not rated (water, rock)	406	1.3%
TOTAL	**31,242**	**100.0%**

RUTTING RISK

Like the other interpretations, the interpretation for rutting includes disturbance from management activities; in particular, use of equipment. NRCS interpretations for rutting assume a soil is at field capacity. This runs contrary to Forest standard operating procedure, which dictates avoiding heavy equipment operation when soils are wet (such as during spring break up and during the fall before the soils freeze). The interpretations for rutting risk are as follows:

High: Perennial high water table soils occupy greater than 30% of the landtype; soils are wet year round. Wet areas occur in a heterogeneous mosaic such that it is difficult to avoid them. These areas, if managed at all, should (at a minimum) be operated on during the winter when the ground is frozen sufficiently to prevent rutting. This would be evaluated on a site-specific basis.

Moderate: Landtypes with soils with ephemeral high water tables (that remain wet into the operating season) that occupy greater than 30% of the map unit; also landtypes with soils with perennial water tables that occupy 15%-30% of the map unit.

Slight: All other landtypes not captured in Moderate or High.

Similar to the compaction risk ratings, the majority of the project area has a moderate rutting risk rating (Figure 4; Table 7, below). Moderate rutting risk landtypes are present throughout the project area, roughly associated with glacial till, and to a lesser extent, Tertiary sediments. These soils have areas of perennial high water tables that comprise at least 15-30% of the map unit. Soils with a high rutting risk are primarily located in flood plain areas and greater than 30% of the soils within these map units have perennial high water tables. These are the same areas described above as having high compaction risk as well.

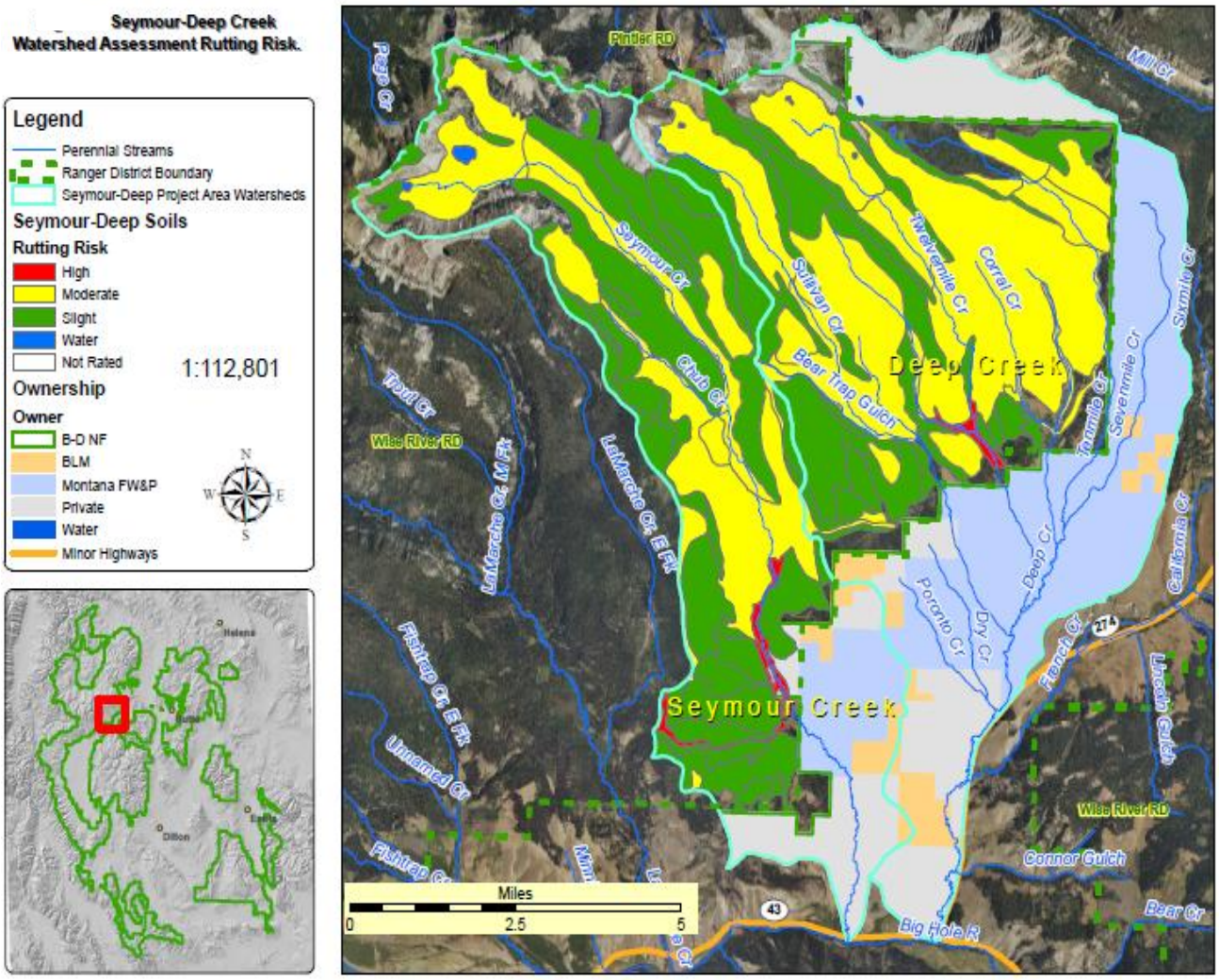

Figure 4. Seymour-Deep Creek watershed assessment rutting risk for NFS lands.

Table 7. Rutting risk ratings for national forest lands in the Seymour-Deep watershed assessment area, listed in total acres for each rutting risk class, and percentage that each class comprises.

Rutting Risk	Total Acres	Percent
High	410	1.3%
Moderate	16,569	53%
Slight	13,856	44.4%
Not rated (water, rock)	407	1.3%
TOTAL	**31,242**	**100.0%**

MASS WASTING RISK

The overriding assumption for the mass wasting interpretation is a change in slope configuration caused by road, skid trail, trail, or log landing construction. The definitions for mass wasting risk ratings are as follows:

High: Landtype has existing mass failure(s), especially with high water tables or springs. This rating also includes Tertiary sedimentary materials that have springs and high water tables on slopes steeper than 25% without mass failures, due to the naturally unstable nature of these materials.

Moderate: Landtype with small mass failure(s), especially with high water tables or springs, but can be avoided by slope modification activities (i.e. road construction). This rating also includes Tertiary sediments and Cretaceous shales (south zone) with springs and high water tables without mass failures on slopes 25% or flatter.

Slight: All other landtypes not captured in Moderate or High.

About 3% of the area has a high mass wasting risk rating (Table 8; Figure 5, below); this acreage is due to mapped landslides located:

- South of the confluence of Chub and Seymour Creeks;
- North of the upper reaches of Bear Trap Gulch;
- East of Sullivan Creek, north of the landslide on Bear Trap Gulch;
- On both sides of Tenmile Creek about a mile downstream from Tenmile Lakes.

Two small areas rated moderate mass wasting risk (110 acres total) are found just south of the upper reaches of Bear Trap Gulch, and near the south eastern edge of the forest boundary in Seymour Creek. These landtypes are derived from Tertiary sediment parent materials, with springs and/or high water tables.

Table 8. Mass wasting risk ratings for national forest lands in the Seymour-Deep watershed assessment area, listed in total acres for each mass wasting risk class, and percentage that each class comprises.

Mass Wasting Risk	Total Acres	Percent
High	1,029	3.3%
Moderate	110	0.4%
Slight	29,696	95.1%
Not Rated (water, rock)	407	1.3%
TOTAL	**31,242**	**100.0%**

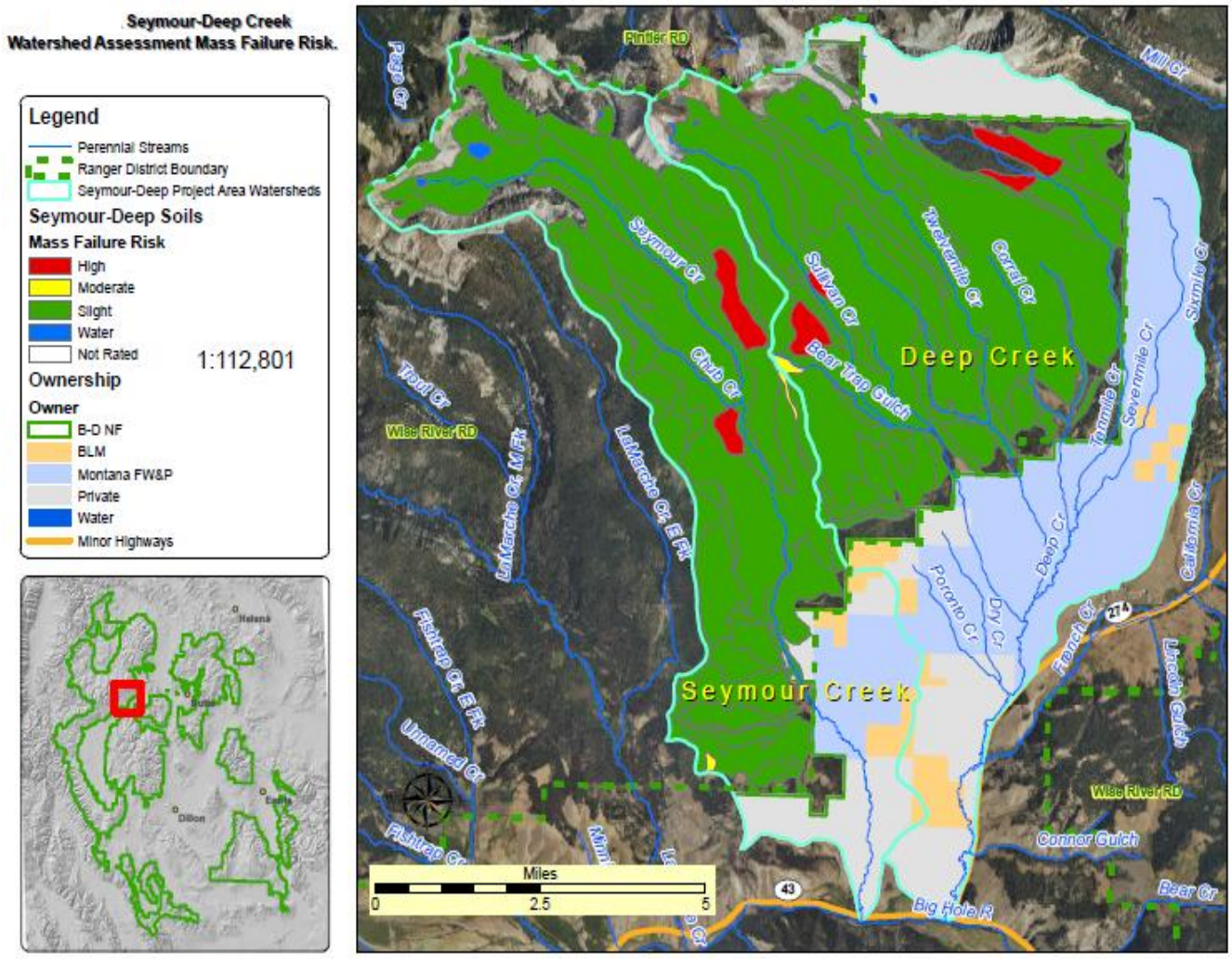

Figure 5. Seymour-Deep Creek watershed assessment mass failure risk for NFS lands.

2. Current Conditions

Current soil conditions in the Seymour-Deep assessment area are a result of the complex interplay between inherent soil characteristics and human activities that have altered the soil resource over time. Inherent soil characteristics such as texture, rock content, and drainage, as well as the landform the soils occur on and local climate, help determine susceptibility to erosion, compaction, rutting, puddling, and mass movement, which can be and have been caused by human activities. Soil risk ratings are discussed in detail in Section 1, Characterization, above. Human activities that have affected the soil resource include livestock grazing, mineral exploration and development, recreation and travel, timber production, and fire management. These are discussed below.

Effects on Soils from Livestock Grazing Management

Livestock grazing is an historic and ongoing activity within the project area. Soil impacts exist mainly on heavily used areas such as trails, salt grounds and water developments. These areas normally have bare, compacted soil and erosion which contribute to productivity reductions on small areas within range allotments. Some areas, still recovering from past heavy grazing, have additional areas of disturbance where vegetation is inadequate to protect the soil. Cattle tend to congregate throughout allotments and cause effects that, while not as obvious as described above, increase the risk of erosion. The Seymour allotment is generally in good condition and has been meeting interim grazing standards set forth in the Forest Plan (2009).

Effects on Soils from Minerals Management

Soil effects from minerals management typically consists of disturbance from roads, drill pads, open pit and underground mines and developments associated with these activities. The scale of impact varies considerably by activity. Exploratory drilling for locatable minerals can involve no more than a short temporary road and a very small pad open for a short time and rehabilitated. Likely soil productivity impacts are very low to non-existent. Open pit mines and other activities create impacts at a much larger scale where soil productivity is eliminated for periods of months to years, and in some cases, indefinitely. When the operations close, they are required to rehabilitate and adequately revegetate disturbed areas to prevent erosion and other soil impacts. Productivity may be either lower or higher than the original soil.

No large-scale mining activity has been conducted in the Seymour-Deep assessment area; therefore, no major impacts to soil productivity have occurred.

Effects on Soils from Recreation and Travel Management

Recreational and transportation developments such as campgrounds, roads and trails remove areas from the productive soil base. Soil productivity impacts are accepted as a trade-off for the desirable attributes of the facilities. However, soil productivity for campgrounds is still desired in order to maintain the vegetative environment that adds to the recreational experience even though soil productivity reductions are inevitable. These facilities affect small areas intensively managed to maintain the desired vegetative environment and prevent erosion and sediment production. There is a developed campground at Lower Seymour Lake. Dispersed, undeveloped campsites occur throughout the assessment area. These locations are generally close to roads and very limited in extent.

Roads and trails are more extensive; they have the potential to produce on- and off-site impacts on the productive soil base; and they vary from high standard low impact to low standard high impact. Motorized road and trail use, except snowmobiles, typically has a wider travel way and more mechanical surface disturbance and therefore higher erosion risk than other types of use. Road and trail vehicle access is necessary for the variety of uses on the Forest. The lower the mileage needed to achieve these ends the lower the impact on the

productive soil base. Road and trail surfaces are un-vegetated, compacted, and produce concentrated runoff. Road cuts and fills are more susceptible to erosion and produce more runoff than adjacent undisturbed soil. These attributes, if uncontrolled, have the potential to erode soil on site and off site and to deposit eroded material on soil below roads and trails. High standard roads and trails (properly located with adequate drainage and surfacing, and with vegetated cuts and fills) have few soil effects other than on the travel way. Low standard roads and trails (many are user created) are generally in poor locations, have inadequate drainage and unvegetated cuts and fills. They have the attributes described in the previous paragraph and may produce soil impacts below roads and trails.

Extensive road building occurred as a result of the long-term contract with Louisiana Pacific that the Forest Service inherited when it acquired land from the Mt. Haggin Livestock Company in 1976. Approximately 10,000 acres were harvested from 1968-1993. In 1995, the Forest Service released the Mount Haggin Watershed Restoration Project Environmental Assessment, which analyzed five alternatives to address sedimentation due to road locations and inadequate erosion control during road construction over the course of the 25-year contract. Alternative 3-Modified was selected in the decision, which involved the following:

- *Installation of erosion control measures* on all known sedimentation sources on all roads (142 miles) within the project area (national forest lands within our current Seymour-Deep analysis area), whether the road was open or closed;
    - Priorities for work included Corral Creek, Sullivan Creek, Dry Creek, and Fubar Creek (a tributary to Seymour Creek). All planned work was completed.
- *Road closures*: reduced open roads from 83 miles to 59 miles. Roads open during big-game hunting season went from 50 to 48. All planned work was completed.
- *ATV Loop trail*: included in the decision was an 11-mile ATV loop trail comprised of 8 miles of open road and 3 miles of closed road. This was never completed.

Roads and trails closed to motorized use generally have a much lower risk of erosion than those with motorized use because mechanical disturbance from motorized vehicles is eliminated and vegetative recovery gradually reduces exposed bare soil.

Travel management planning is currently underway for the Wise River Ranger District. Approximately 207 miles of road currently exist in the assessment area. Figure 6, below, displays the current recommendations of the travel planning interdisciplinary team. These recommendations have not been through the NEPA process, so are preliminary in nature. No environmental document has been released and no decision has been signed. Note that a large percentage (44.4%) is recommended to NOT be added to the system. These roads would not be added to the transportation system and would recover over time. An additional 22% that are currently on the transportation system are recommended for decommissioning. Of these 67% of total road miles, 37% of total road miles have in reality already been decommissioned or abandoned and are currently growing in with vegetation. If the recommendations are implemented, the 37% of miles of road currently recovering

vegetation and soil productivity would increase to 67% of the total miles of road, as natural recovery would be allowed to occur.

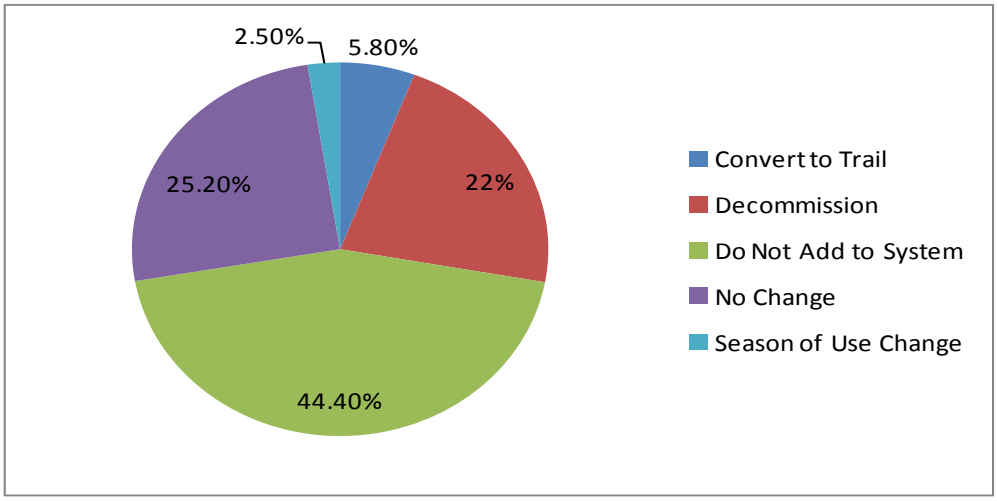

Figure 6. Percentages of roads in the Seymour-Deep assessment area, displayed by travel analysis recommendation.

Effects on Soils from Vegetation Management

Mechanical vegetation treatments are assumed to have produced soil disturbance (namely soil displacement and compaction) from equipment used for harvesting, yarding, and slash disposal. Certainly this is the case for the Seymour-Deep assessment area; 10,000 acres were mainly clear-cut harvested in the area over a 25-year period (1968-1993). Past reports list many effects of the harvest; namely the Mount Haggin Watershed Restoration Project Environmental Assessment (USDA Forest Service 1995), a project to reduce the impacts of the extensive road network constructed to facilitate the harvest, as well as the Big Hole Landscape Assessment (USDA Forest Service 2001). Effects detailed in these reports are primarily increased sedimentation and increased water yield due to the extensive road network and harvest. Two large mass failures in the Corral Creek drainage (section 16) occurred due to a skid trail that undercut the toe of a slope, compounded by water yield increases from timber harvest directly above the slide area. A field review of the assessment area in summer of 2011 failed to find the old landslides, and revealed that in general, previously harvested areas are recovering naturally. Old road beds have the most obvious impacts on productivity. Many have vegetation returning, but still suffer from increased bulk density and lack of organic matter. Over time, these areas will continue to recover and productivity will improve as roots continue to break up compacted layers and add organic matter to the soil. Past clear-cut areas investigated in the summer of 2011 generally appear to be recovering well.

Pre-commercial thinning has occurred in the regenerated stands. Because thinning of this type does not involve heavy equipment, no impacts to soils as a result of these activities have occurred.

Prescribed fire for fuel reduction and vegetation management has not likely caused soil disturbance because burns are planned in the spring and fall to prevent effects from intense soil heating. Also, the area burned is relatively small and produces a mosaic of unburned to moderately burned surfaces with little potential for erosion. These burns have the potential to prevent undesired long term soil effects from intense soil heating and from exposing large areas to soil erosion as a result of wildfire in areas with excessive fuel loads.

Effects on Soils from Fire Management

Fire is a natural process in all ecosystems managed by the BDNF. Soils and landforms reflect effects from past wildfires to varying degrees. Wildfire, by definition, is uncontrolled in terms of timing, intensity, and extent. Soil effects from wildfire are variable but the pattern usually leaves a mosaic of large areas of benign effects with small areas of damage from intense soil heating. Large areas can be exposed to erosion for varying time periods because the protective cover of vegetation, duff and litter are consumed. Wildfire may continue to burn large acreages across the forest, and could even increase over the next 15 years. Uncharacteristic wildfires will cause detrimental soil disturbance directly proportional to the amount of high intensity heating and area of bare soil. Prescribed fire usually does not cause this degree of disturbance and may have beneficial effects.

Currently, wildfire is not a significant factor in the Seymour-Deep assessment area as no major fires have burned in the area in the last 50 years.

3. Reference Conditions

Human activity in the Seymour-Deep assessment area has affected soil productivity in localized areas, depending on the activity (see Section 2, above, for a more detailed description). Most notably, roads have removed the soil they occur on from the productive base; they are in various states of recovery. Past timber harvest has reduced soil productivity mostly in small, localized areas such as old skid trails and landings that may still have residual compaction. User-created trails have created compaction and erosion in the locations they occur. Mining operations have removed topsoil and altered soil productivity on a long-term basis. Cattle activity has affected productivity in localized areas such as cattle trails, water developments, and salt grounds.

Natural disturbances have affected soil productivity in a minor way. Soils that are left undisturbed by human activities have vegetation, litter and duff cover which protects the soil from erosion. Wildfires typically have affected soils in a mosaic pattern; with the vast majority of burned areas classified low severity burned and very localized areas of high severity burned soil (such as adjacent to a log that burned). There are a few localized areas where landslides (not induced by management) have occurred. These are located:

- South of the confluence of Chub and Seymour Creeks;
- North of the upper reaches of Bear Trap Gulch;
- East of Sullivan Creek, north of the landslide on Bear Trap Gulch;
- On both sides of Tenmile Creek about a mile downstream from Tenmile Lakes.

4. Synthesis and Interpretation

The maintenance of soil productivity is the desired condition for the soil resource (USDA Forest Service 2009). While extensive management activity has occurred in the assessment area, managed areas appear to be recovering well and lingering effects were observed to occur primarily on old skid trails and landings. Other impacted sites occur primarily in localized areas of dedicated use, such as roads and campgrounds, which are provided for with Forest Plan direction and the Regional Soil Quality Standards (USDA Forest Service 1999).

Areas where we have opportunities to improve soil productivity include poorly located/unneeded road segments, unauthorized roads and trails, and also small areas of residual compaction on old roads/skid trails in previously managed timber stands.

5. Recommendations

- *Implement current travel management recommendations.* Travel management efforts are currently underway for the Wise River Ranger District. Implementation of the current recommendations would increase productivity over time on about 63 miles of road. Assuming a 14-foot wide footprint, this translates into approximately 106 acres that would slowly regain productivity over time.
- *Verify landtype mapping on the ground for proposed activities involving heavy equipment*. While there is general agreement between the landtype mapping and the geology maps available for the area, there are areas that do not match up. Additionally, the assessment area is complex and the landtype map (1:24,000) is not meant to delineate small inclusions of sensitive soils. For these reasons, it will be especially important for a soil scientist to review any proposed activities involving heavy equipment (e.g. timber sale units) on the ground to verify the mapping and assure that appropriate project design features are prescribed to protect soil productivity.

6. References

ECOMAP. 1993. National hierarchical framework of ecological units. Unpublished administrative paper. Washington, DC, U.S. Department of Agriculture, Forest Service. 20p.

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USDA Forest Service. 2001. Big Hole Landscape Assessment. USDA Forest Service, Northern Region, Beaverhead-Deerlodge National Forest, Dillon, MT.

USDA Forest Service. 2009. Revised Forest Plan for the Beaverhead-Deerlodge National Forest. USDA Forest Service, Northern Region, Beaverhead-Deerlodge National Forest, Dillon, MT.

B. WATERSHED and HYDROLOGY

1. Characterization

The Seymour-Deep watershed assessment area, located in Southwest Montana within a portion of Deer Lodge County, is defined by the Anaconda Mountain Range and consists of two subwatersheds. The Assessment area boundary is defined by the 6th code HUC boundaries for the Seymour Creek subwatershed and Deep Creek subwatershed (see Figure 7).

The assessment area is within the Upper Missouri River Basin and streams within the analysis area flow to the Big Hole River en route to the Upper Missouri River. For analysis purposes the Seymour-Deep assessment area was broken down into two 6th code HUCs that have clearly defined watersheds lying primarily within the Forest Service boundary (see Figure 7). The 6th code HUC analysis subwatersheds consist of Seymour Creek and Deep Creek. The Mount Haggin Wildlife Management Area, Montana Fish, Wildlife, & Parks, BLM, any other state and private lands existing outside of the forest boundary were not included in the hydrology assessment.

The Seymour-Deep assessment area is bounded in the north and west by several high peaks and ridgelines in the Anaconda Mountains (the continental divide); Highway 43 and the Big Hole River in the south; and Highway 289 (Mill Creek Hwy) is to the east. Total Forest Service acreage in the Seymour-Deep assessment area, consisting of the two 6th code HUCs, is roughly 55,000 acres. Elevations range from 5,770 feet at the intersection of Highways 43 and 289, to 10,641 feet (Mt. Evans). Drainage density is moderate. Mean annual precipitation ranges from 9 to 30 inches, about 10-35 percent falling as snow, depending on elevation. Snowmelt runoff begins to show up in the main stem of the Big Hole about mid-April, and continues through late June or early July. In May and June, it is often augmented by precipitation; about half the annual flow moves down the channels during this period. By August, most of the streamflow results from groundwater input to streams (baseflow); baseflow is the major component of streamflow for the next eight months.

Past and present human influences on this watershed with the potential to affect water quality include timber harvest, mining, grazing, roads and recreation.

There are ten perennial streams within the Seymour-Deep assessment area on NFS land: Chub Creek, Seymour Creek, Bear Trap Gulch, Corral Creek, Slaughterhouse Creek, Sullivan Creek, Tenmile Creek, Twelvemile Creek, West Fork Twelvemile Creek, and Unnamed Creek. Chub and Seymour Creeks are in Seymour Creek subwatershed and the other eight perennial streams are in Deep Creek subwatershed (Figure 7). According to GIS derived data the total perennial stream miles for the Seymour-Deep assessment area within Forest ownership is 48.7 miles. In addition, there are 53.9 miles of intermittent streams within the analysis area (Figure 7; Table 9).

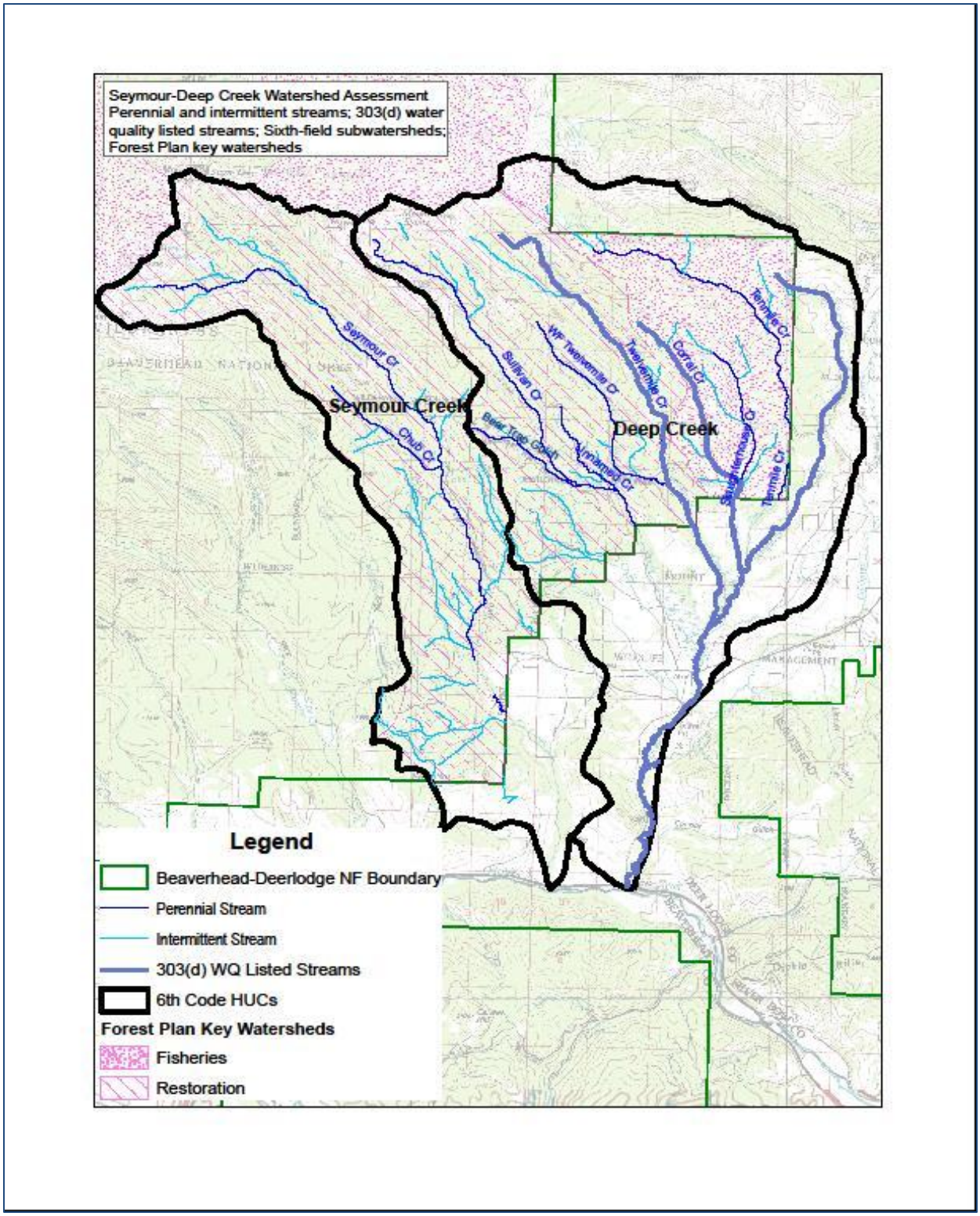

Figure 7. Map of Seymour-Deep assessment area with perennial, intermittent, and 303(d) listed streams; 6th code HUCs; and Forest Plan Key Watersheds.

Table 9. Sixth code HUC name and number, total acres, acres administered by the Forest Service, parent material, and perennial and intermittent stream miles within the Seymour-Deep Watershed Assessment area.

6th Code HUC Name and Code	Total HUC Acres	USFS Owned Acres	Parent material (geology)	Perennial Stream Miles	Intermittent Stream Miles
Seymour Creek 100200040804	21,146	16,950	•Upper: gneiss, schist, quartzite •Lower: sedimentary rock •Upper and Lower: glacial till in drainages	14.0	29.1
Deep Creek 100200040703	34,137	19,854		34.7	24.8
Totals	**55,282**	**36,804**		**48.7**	**53.9**

Total road and trail miles, roads and trails within 300 feet of perennial streams, roads and trails within 150 of an intermittent stream and stream crossings for both roads and trails have been calculated for this watershed using GIS analysis. There is a total of 199.2 miles of roads within the Seymour-Deep Watershed Assessment area. Approximately 24 miles of the road system lie within 300 feet of a perennial stream with 38 stream crossings. Fifteen miles of the road system lie within 150 feet of an intermittent stream with 78 stream crossings. There are 8.9 miles of trail within the assessment area. Less than two miles of trail lie within 300 feet of a perennial stream with 2 stream crossings, and 1.2 miles of trail are within 150 feet of an intermittent stream with 7 stream crossings (Table 10).

The 2009 Beaverhead-Deerlodge Forest Plan defines eleven management areas within the Big Hole Landscape. The assessment area lies within two of these management areas; primarily within Fishtrap-Mount Haggin and partially within Anaconda-Pintler Wilderness.

The Fishtrap-Mount Haggin area is managed as a transition between the level of activity in the Big Hole Valley and the relative solitude of the Anaconda-Pintler wilderness. Developed and dispersed recreation sites compliment wilderness recreation opportunities. Timber harvest and production may take place in the area, as well as livestock grazing. Deep Creek subwatershed is managed to conserve native fish populations. Sullivan and Seymour Creek are managed to restore desirable watershed conditions. Active restoration is most likely in the roaded parts of these two key watersheds (USDA Forest Service 2009).

The Anaconda-Pintler Wilderness area is managed to protect wilderness characteristics and values and provide primitive recreation with high levels of challenge and solitude. Most active restoration takes place in the lower reaches of Sullivan Creek key restoration watershed (USDA Forest Service 2009).

Table 10. Watershed condition by 6th code HUC to include road miles, road densities, roads miles in close proximity to streams, trail miles, miles of trail in close proximity to streams, and stream crossings for both roads and trails.

6th Code HUC Name and Code	Road Miles Per HUC	Road Density (mi/mi^2)	Road Miles w/in 300' of Perennial Stream / # Road Crossings	Roads Miles w/in 150' of Intermittent Streams / # Road Crossings	Trail Miles Per HUC	Trail Miles 300' from Perennial Streams / # Trail Crossings	Trail Miles 150' from Intermittent Streams / # Trail Crossings
Seymour Creek 100200040804	66.8	2.5	2.1 / 2	8.5 / 39	5.8	0.64 / 2	0.38 / 2
Deep Creek 100200040703	132.4	4.3	21.7 / 36	6.6 / 39*	3.1	0.96 / 0	0.78 / 5*
Totals	199.2		23.8 / 38	15.0 / 78*	8.9	1.6 / 2	1.2 / 7*

* There is an overlap of five intermittent stream crossings and 0.78 miles between roads and trails with in the Deep Creek subwatershed; the crossings appear to be trail crossings but are defined by the Road TAP as recommended to decommission.

Chapter 3 of the 2009 Beaverhead-Deerlodge Forest Plan lists specific goals, objectives and standards for 56 fish key watersheds and 15 restoration key watersheds within the Beaverhead-Deerlodge National Forest. The Seymour-Deep assessment area contains two Restoration Key Watersheds and one Fish Key Watershed (Figure 7).

Seymour Creek subwatershed is a restoration key watershed. Deep Creek subwatershed is both a restoration and fish key watershed; the western ~60% of the Deep Creek watershed is a restoration key watershed (formerly the Sullivan Creek 6th code HUC), and the eastern ~40% of Deep Creek watershed is a fish key watershed (see Figure 7). All three watersheds are high priority for assessment and action. The goal for fish key watersheds is that populations of westslope cutthroat trout exhibit numbers, life histories, age classes, recruitment levels, and reproductive characteristics representative of historic conditions (USDA Forest Service 2009). The goal for restoration key watersheds is that fish habitat, riparian habitat, and water quality are recovered to desired conditions developed through watershed assessments (Appendix A; USDA Forest Service 2009).

2. Current Conditions

Water Quality

The Clean Water Act requires each state to identify water bodies that are water quality limited (Section 303(d) and 40 CFR (Part 130)). After water quality limited water bodies have been identified, they are prioritized and targeted to measure the Total Maximum Daily Load (TMDL). When final approval is granted by the EPA, the list of water quality limited streams becomes part of an annual report to the State of Montana (305(b) Report).

Table 11. Streams within the Seymour-Deep watershed assessment area that are included in the Montana's list of water quality impaired streams (303(d) listed).

Stream	Probable Impaired Uses	Use-Support Status	Probable Causes of Impairment	Probable Sources of Impairment
Corral Creek (headwaters to mouth (Deep Creek))	Aquatic Life	Partially Supporting	Alteration in stream-side or littoral vegetative covers; Physical substrate habitat alterations; Sedimentation/ Siltation	Natural Sources; Rangeland Grazing; Silviculture Activities
Sevenmile Creek (headwaters to mouth (Deep Creek))	Aquatic Life	Partially Supporting	Alteration in stream-side or littoral vegetative covers; Sedimentation/ Siltation	Natural Sources; Rangeland Grazing; Streambank Modifications/ destablization
Twelvemile Creek (headwaters to mouth (Deep Creek))	Aquatic Life	Partially Supporting	Sedimentation/ Siltation	Grazing in Riparian or Shoreline Zones; Silviculture Harvesting

The Montana Department of Environmental Quality (DEQ) has identified three streams with water quality impairments in the Seymour-Deep assessment area (2012 Water Quality Information; Montana DEQ 2012).

One of the streams listed (Twelvemile Creek) in the Seymour-Deep Watershed Assessment area is currently Category 5, meaning that one or more uses are impaired and a TMDL is required (Table 11). The other two streams that are listed (Corral and Sevenmile Creeks) are Category 4a because the needed TMDLs have been completed. More detailed descriptions of the streams and impairments can be found in the *Middle and Lower Big Hole Planning Area TMDLs and Water Quality Improvement Plan* (which can be found at the Montana DEQ website: http://deq.mt.gov/wqinfo/TMDL/finalReports.mcpx)

Stream Morphology

The landforms throughout the Seymour-Deep assessment area are similar in both subwatersheds. The upper elevations are primarily comprised of gneiss, schist, and quartzite. Sedimentary rock is the main geologic composition in the lower elevations. Throughout the upper and lower elevations, the drainages are primarily comprised of glacial till.

The following contains the most recent descriptions of the stream morphology for the area. For further description of the historic conditions in the Seymour-Deep assessment area, the Watershed and Stream Conditions report from the Big Hole Landscape Analysis (2001) can be referenced.

Seymour Creek 6th Code HUC

This 6th code HUC is the considerably smaller of the two HUCs (21,146 acres), with over 80% of the Seymour HUC under Forest Service ownership (16,950 acres). Elevations range from 5,770 to 10,472 feet (Mt Howe). There are two perennial streams within the subwatershed with 14.0 miles of perennial streams within the HUC and 29.1 miles of intermittent streams; Seymour and Chub Creeks are the two perennial stream drainages. There are 66.8 miles of roads and 5.8 miles of trails within the subwatershed. Of these roads, 2.1 miles are within 300' of perennial streams with two perennial stream crossings and 8.5 miles lie within 150' of intermittent streams with 39 stream crossings. The PACFISH/INFISH Biological Opinion (PIBO) group has one stream survey site in this portion of the watershed on Seymour Creek (Table 12). No stream survey data has been collected by the BDNF for this portion of the watershed within the last decade.

Table 12. Seymour Creek HUC stream classification, and morphology of surveyed reaches (PIBO data).

Stream Name	Survey Year	Existing Rosgen Channel Type	W/D Ratio	Entrenchment Ratio	Sinuosity	Slope	D50	Stream Function	Trend
Seymour Creek	2008	C3 or c4	15.46	NA	1.1	1.7	51	NA	NA

Much of the lower watershed has been heavily harvested as part of the Mt. Haggin timber sale, and some stream channels (especially intermittent streams) in these areas have been impacted by logging practices and increases in water yield. During and before the timber harvests of the 1980s, only a small portion of the main stem of Seymour Creek had been harvested, and it is in generally good condition throughout.

Historically, there have been six sites surveyed in Seymour Creek. At the Wilderness boundary, the channel is an A2, and the stability rating is fair/poor (48). In Section 35, the channel is a B1, and the stability rating is poor (66), while at the forest boundary the stream

type is a B6, and the channel stability is fair (70). The B6 stream type is more sensitive than those upstream, but still seems to be maintaining its function.

Chub Creek, a tributary to Seymour near the Wilderness boundary, has two survey sites. The upper one is an A2a with a stability score of 63 (poor), while the lower reach is an A3 with a stability score of 96 (poor).

An unnamed tributary to Seymour that drains Sections 2 and 11 was heavily harvested in the past. The removal of high quantities of timber from the drainage (often up to stream's edge) increased water yield at the time and likely caused severe in-channel erosion and moved excessive amounts of bed load sediment. Most of this bed load was deposited above the road crossing in Section 11, and was not carried all the way to Seymour Creek. Multiple channels have been formed through this depositional area. Some restoration was attempted in this watershed by Louisiana Pacific, but it was largely ineffective because structures were emplaced by hand and were not adequately keyed in to the streambed and banks.

Deep Creek 6th Code HUC

This 6th code HUC is the larger of the two HUCs (34,137 acres), with less than 60% of the Deep Creek HUC under Forest Service ownership (19,854 acres). Elevations range from approx. 5,900 to 10,641 feet (Mt. Evans). The HUC contains 34.7 miles of perennial streams and 24.8 miles of intermittent streams; Bear Trap Gulch, Corral Creek, Slaughterhouse Creek, Sullivan Creek, Tenmile Creek, Twelvemile Creek, and West Fork Twelvemile Creek are the seven primary stream drainages. There are 132.4 miles of roads and 8.9 miles of trails within the subwatershed. Of these roads, 21.7 miles are within 300' of perennial streams with 36 perennial stream crossings and 6.6 miles lie within 150' of an intermittent stream with 39 stream crossings. There are six stream survey sites within the Deep Creek subwatershed (Table 13).

Table 13. Deep Creek HUC stream classification, morphology and functionality of surveyed reaches.

Stream Name	Sur-vey Year	Existing Rosgen Channel Type	W/D Ratio	Entrenchment Ratio	Sinuosity	Slope	D50	Stream Function	Trend
Ten Mile Mid	1992	C3b	13.54	3.2	1.1	6.7	166	Functioning-at-risk	Downward
Ten Mile Up	1992	C3b	19.89	3.2	1.1	5.4	107	Functioning	Static
Sullivan Down	1992	C4c	14.9	3.0	1.3	0.5	35	Functioning	Static
Sullivan Mid	1992	C3b	18.2	3.6	1.1	5	73	Functioning	Static
Sullivan Up	1992	C4b	10.3	4.1	1.1	6	100	Functioning	Static
Slaughter-house	2008	E4b	7.5	5.6	1.3	3.2	8	NA	NA

Not all streams within the Deep Creek subwatershed are mentioned below; streams with survey data collected by the BDNF or pertinent field notes are included.

TENMILE CREEK

In 1992, two reaches on Tenmile Creek were surveyed; an upper reach "Ten Mile Up" and a lower reach "Ten Mile Mid". Field measurements taken at Ten Mile Up produced a "functioning" C3b channel type (Rosgen classification, Rosgen 1996) with a static trend. At the time of the survey the banks were in good condition with >90% plant density and no note of bank trampling. Average bankfull width was 17.5 feet with an average bankfull depth of 0.88 feet. Average channel material size was small cobbles. The survey site is upstream of any influence from roads.

Field measurements taken at Ten Mile Mid produced a "functioning-at-risk" C3b channel type (Rosgen classification, Rosgen 1996) with a downward trend. At the time of the survey the banks were in good condition with >90% plant density and no note of bank trampling. Average bankfull width was 13.0 feet with an average bankfull depth of 0.96 feet. Average channel material size was cobble. The survey site is directly upstream from any influence from roads, just above the road-stream crossing of FR 2483 and Tenmile Creek.

SULLIVAN CREEK

In 1992, three reaches on Sullivan Creek were surveyed: an upper reach "Sullivan Up", a middle reach "Sullivan Mid", and a lower reach "Sullivan Down". Field measurements taken at Sullivan Up produced a "functioning" C4b channel type (Rosgen classification, Rosgen 1996) with a static trend. At the time of the survey the banks were in good condition with >90% plant density and no note of bank trampling. Average bankfull width was 14.2 feet with an average bankfull depth of 1.37 feet. Average channel material size was very course gravels. The survey site is upstream from any road-stream crossings.

Field measurements taken at Sullivan Mid produced a "functioning" C3b channel type (Rosgen classification, Rosgen 1996) with a static trend. At the time of the survey the banks were noted to be cutting and that there was heavy deposition from the bank cutting and debris. There was no note of bank trampling. Average bankfull width was 28.0 feet with an average bankfull depth of 1.52 feet. Average channel material size was small cobble. The survey site is downstream from the FR 2488 stream crossing and the Sullivan Up survey site.

Field measurements taken at Sullivan Down produced a "functioning" C4c channel type (Rosgen classification, Rosgen 1996) with a static trend. At the time of the survey the banks were in good condition with >90% plant density and no note of bank trampling. Average bankfull width was 15.3 feet with an average bankfull depth of 1.03 feet. Average channel material size was very course gravel. The survey site is upstream from Lower Dry Creek Road (FR 2483) and downstream from both of the other two Sullivan Creek survey sites.

In the 1998 analysis, cumulative distribution analysis of substrate size showed that the substrate at Sullivan Up and Mid reasonably approximated reference conditions, but the substrate at Sullivan Down was considerably finer than reference. Sullivan Up is above influences from timber harvest, Sullivan Mid is within the harvest area, and Sullivan Down is below timber harvest. The fines generated by bank erosion from water yield increase were depositing and building up in the lower reaches of Sullivan Creek during the timber harvest of the 1990s.

DRY CREEK

Dry Creek is a tributary to Sullivan Creek. During historic timber harvest, peak flows were increased in Dry Creek as a result of the harvest and led to much bed load movement and essentially buried the channel in some places. Consequently, it appeared as if the channel had gone dry as a result of logging and in 2012 is still dry throughout most of the year. Much of the bed load was deposited in flat areas, and did not move into higher-order streams. Road locations have exacerbated the channel condition.

SLAUGHTERHOUSE CREEK

In 2008, Slaughterhouse Creek was surveyed. Field measurements produced an E4b channel type (Rosgen classification, Rosgen 1996). At the time of the survey the banks were rated with a medium resistance and resilience with no note of grazing evidence. Average bankfull width was 4.2 feet with an average bankfull depth of 0.92 feet. Average channel material size was fine gravels. The survey site is downstream from a road-stream crossing.

3. Reference Conditions

Reference conditions for the watersheds are those conditions that occurred prior to anthropogenic influences of European settlement. Historical conditions in the watershed would not have included timber harvest, livestock grazing, fences, mining activities, irrigation diversions, the presence of non-native aquatic species, the exclusion of fire or the presence of developed roads and trails systems. Disturbance or elimination of vegetation from these activities has caused soil erosion and down-cutting of stream channels causing higher flows during spring runoff and high flow events.

Historically, streams would all function appropriate to the geology, natural climatic cycles, and natural disturbance processes (i.e., fire or significant runoff events). Water quality and riparian vegetation would not be impaired due to impacts from: abandoned mines, dredge mining, grazing in riparian zones, road construction and use, highways, bridges, agriculture, and infrastructure.

The presence of fire would have helped keep conifers from encroaching on riparian areas, allowing willow and aspen communities to remain healthy. Beaver activity may have been more prevalent throughout the watershed helping to trap sediment, develop additional soils in riparian areas and elevate water tables.

4. Synthesis and Interpretation

Seymour Creek 6th Code HUC

According to the 2009 Forest Plan, Seymour Creek subwatershed is primarily within the Fishtrap-Mount Haggin Management Area and is managed as a transition between the level of activity in the Big Hole Valley and the relative solitude of the Anaconda-Pintler wilderness (USDA Forest Service 2009). A smaller portion of the 6th code HUC is within the Anaconda-Pintler Wilderness area and is managed to protect wilderness characteristics and values and provide primitive recreation with high levels of challenge and solitude (USDA Forest Service 2009). Roads within the subwatershed total 66.8 miles for a road density of 2.5 mi/mi^2. Of this road system, 2.1 miles lie within 300' of a perennial stream with two stream crossings. The majority of land in the lower elevations of Seymour Creek subwatershed has been altered by past timber harvest, resulting in some degradation in stream function, especially of intermittent streams.

Seymour Creek subwatershed is a restoration key watershed emphasizing restoration of integrated ecological processes at the watershed scale and it should be given priority over other non-key watersheds for any restoration work (USDA Forest Service 2009).

Deep Creek 6th Code HUC

According to the 2009 Forest Plan, Deep Creek subwatershed is within the Fishtrap-Mount Haggin Management Area and is managed as a transition between the level of activity in the Big Hole Valley and the relative solitude of the Anaconda-Pintler wilderness (USDA Forest Service 2009). Roads within the subwatershed total 132.4 miles for a road density of 4.3 mi/mi^2. Of this road system, 21.7 miles lie within 300' of a perennial stream with 36 stream crossings. The majority of land in the lower elevations of Deep Creek subwatershed has been altered by past timber harvest, resulting in some degradation in stream function, especially of intermittent streams. Six hydrological stream surveys have been completed by the BDNF within this subwatershed; three on Sullivan Creek (Up, Mid, and Down) in 1992, two on Tenmile Creek (Mid and Up) in 1992, and one on Slaughterhouse Creek in 2008. Tenmile Mid was "functioning-at-risk" while Tenmile Up was "functioning" and all three reaches were "functioning" in Sullivan Creek. Function calls have not been made for Slaughterhouse Creek.

Deep Creek subwatershed is both a restoration and fish key watershed emphasizing conservation of westslope cutthroat trout by restoring components, processes and landforms that provide quality habitat. This area should be given priority over other non-key watersheds for any restoration work (USDA Forest Service 2009).

The Montana Department of Environmental Quality (DEQ) has identified three streams with water quality impairments in the Deep Creek 6th code HUC. One of the streams listed (Twelvemile Creek) is currently Category 5, meaning that one or more uses are impaired and a TMDL is required (Table 11). The other two streams that are listed (Corral and Sevenmile Creeks) are Category 4a because the needed TMDLs have been completed.

The recommendations below specify actions which will help achieve proper functioning streams and healthy riparian vegetation throughout the Seymour-Deep assessment area. These recommendations will help address the 303(d) stream concerns and should improve conditions that could allow those streams to be recovered and taken off the 303(d) list, and meet goals of the Forest Plan.

5. Recommendations

See Table 14 for a list of recommendations. Reverse past management's negative effects to the watershed with a focus to:

- maintain healthy and vigorous riparian vegetation to continue bank stabilization and provide shade;
- ensure existing roads and trails function properly to keep sediment out of streams;
- improve road and trail crossings at streams; and
- continue to monitor and reclaim past mining sites.

Under the 2009 Beaverhead-Deerlodge Forest Plan, the Deep Creek subwatershed was identified as a Fish and Restoration Key Watershed and Seymour Creek subwatershed was identified as a Restoration Key Watershed. These watersheds should be given priority for any management actions. Implementing strategies to achieve aquatic goals set in the Forest Plan (Appendix A) will contribute to attaining desired stream functions within the watershed.

Recommendations include efforts to reverse some of the past management's negative effects to the watershed. This includes improving road and trail crossings to decrease the amount of sediment reaching streams, ensuring that existing roads and trails are functioning properly with adequate drainage features to keep sediment out of streams, repairing/replacing culverts that are known to not be functioning properly, and maintaining healthy and vigorous riparian vegetation which will continue to stabilize banks and provide shade.

The TAP has recommended that a number of roads be decommissioned or closed. For roads that will remain on the system, a Road Condition Survey needs to be completed within the project area to determine specific roads and stream crossings that need to be modified to reduce sediment input to streams and improve crossings. Although some streams have appropriate sized bridges or culverts, many roads and trails within the watersheds need properly functioning drainage features and stable crossings to decrease levels of sediment affecting streams. There are 23.8 miles of roads within 300 feet of perennial streams and 15.0 miles of roads within 150 feet of intermittent streams within this watershed (Table 10). A portion of these routes are preventing some stream reaches from achieving properly functioning condition. A combination of surfacing, additional drainage features within the road prism, reclamation, and/or prism re-routes should be completed to effectively promote

stream function. On roads that will be decommissioned or closed, any connection between the road prisms or any crossings that may be delivering sediment to streams should be properly decommissioned so to remove any potential sediment delivery in the future.

Maintaining healthy riparian vegetation is important for proper stream function. Currently healthy riparian vegetation exists throughout the watersheds. However, riparian willow and aspen stands are being threatened by conifer encroachment. This encroachment is relatively recent and could be treated to reduce the impacts of colonization and ensure that the willows and aspen communities maintain vigor. Individual tree removal, girdling conifers to act as future large woody debris recruitment, and cutting trees and leaving them within the riparian area are all possible management activities. By maintaining a healthy willow and aspen community, stable stream banks, appropriate stream temperatures, and healthy insect communities can be maintained. In addition, the presence of these riparian species could protect stream corridors from high intensity fire more effectively than a conifer over story (Dwire, Kauffman 2003). Some projects are already being planned and executed within the project area, but mainly in aspen colonies.

Grazing has been shown to have had negative impacts within the Seymour-Deep assessment area in the past. Proper implementation of grazing standards and monitoring of allotments are critical to ensure that stream systems are allowed to move toward proper functioning condition and that no increased resource damage will occur. An updated Allotment Management Plan is being drafted currently for the North West Big Hole, including Seymour-Deep Creek subwatersheds.

Table 14. Watershed and hydrology recommendations.

Action	*Purpose* and Rationale	Sideboards	Priority
Complete Road Condition Surveys (RCSs)	*Locate any potential sediment delivery sites from the road system:* Once problem areas are identified, suggestions for fixing road segments can move forward and be prioritized		Number one hydro priority for roads
Maintain and improve design of selected roads and trails; especially stream crossings and culvert replacements with bridges or appropriate sized culverts	*Reduce sediment delivery from roads and trails to streams:* by improving the design of stream crossings and placing appropriately spaced and designed drainage features on roads, sediment input to streams from travel ways can be greatly reduced.	Any instream work will require a 124 permit.	
Decommission and/or restore roads and trails identified through route analysis	*Reduce sediment delivery from road and trails to streams in locations or with designs that cannot be brought up to a desired condition:* by removing roads from riparian areas and removing unnecessary stream crossings on roads, sediment input to streams from travel ways can be greatly reduced.	Travel planning and MVUM Any instream work will require a 124 permit.	
Fix irrigations ditches that are currently be utilized, but are in disrepair (or have water right owner fix); reclaim ditches or remove water from ditches that are no longer being maintained or utilized	*Improve stream function and decrease impacts to roads:* some irrigation ditches have lacked maintenance and are running along or down roads increasing sediment delivery to some streams	These actions will likely require cooperation form water rights' holders.	Ditch that parallels FR 2482 needs maintenance -- does diversion need maintenance work (or is even still operational?) and at the very least the ditch needs to be fixed to remove active flow over and down FR 2482
Reduce conifer colonization in aspen stands	*Improve riparian habitat and stream function:* Healthy aspen and willow stands contribute to stable stream banks, appropriate stream temperatures and protect stream corridors from high intensity fire more effectively than a conifer over story.	TMDL status and Forest Plan Standards may affect location of treatment in riparian areas.	
Improve recreation facilities like campgrounds and trailheads	*Reduce sediment delivery from recreation sites to streams:* by hardening sites, controlling traffic, and improved signing and compliance in recreation sites within RCAs, sediment delivery can be greatly reduced.		Lower Seymour Lake trailhead had stream overflow running down the trail during high flow

Action	*Purpose* and Rationale	Sideboards	Priority
			summer of 2011

6. References

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C. AQUATIC SPECIES and HABITAT

1. Characterization

The Seymour-Deep Creek Watershed Assessment (SDWA) consists of two 6th Field Hydrologic Unit Code (HUC) sub-watersheds. These sub-watersheds are Seymour Creek and Deep Creek. Both flow into the Big Hole River, tributary to the Missouri River.

Main stem stream channels, above the Forest Boundary, within the SDWA are primarily "B" channel types (Rosgen 1996). Tributary streams tend to be steeper, and "A" stream types are prevalent in the headwaters. "C" and "E" stream types occur as shorter inclusion on most of the streams, in a variety of topographical locations from cirque basins to the Forest Boundary. Lower gradient "C" channel types are prevalent along the Forest Boundary and on adjacent, downstream state and private lands. Most stream reaches at these lower elevations (Forest Boundary) possess vigorous willow communities with beaver occupancy being common. Elevations within the Forest Service ownership range from 5700 to 10600 feet.

Water resources and aquatic species within the SDWA landscape have been influenced primarily by timber harvest, livestock grazing, road and trail development, nonnative fish stocking and mining. Watershed acres, basin geology, land ownership, water quality information, road and trail mile summaries, and additional past management activities related to stream habitat condition are summarized in the Seymour-Deep Creek Watershed Assessment Hydrology Report.

The SDWA Assessment area contains one Fish Key Watershed (Deep Creek) and two Restoration Key Watersheds (Seymour Creek and Sullivan Creek). The 2009 Beaverhead-Deerlodge Forest Plan lists specific goals, objectives and standards for Fish Key and Restoration Key Watersheds (USDA Forest Service 2009). Management for fish key watersheds emphasize that populations of bull trout and westslope cutthroat trout exhibit numbers, life histories, age classes, recruitment levels and reproductive characteristics representative of historic conditions. Management goals for Restoration Key Watersheds emphasize that fish habitat, riparian habitat, and water quality are recovered to desired conditions developed through watershed assessments.

There are two perennial streams in the Seymour Creek subwatershed on USFS land (Chub Creek and Seymour Creek) and eight perennial streams in the Deep Creek subwatershed (Bear Trap Gulch, Corral Creek, Slaughterhouse Creek, Sullivan Creek, Tenmile Creek, Twelvemile Creek, West Fork Twelvemile Creek, and Unnamed Creek). There are six lakes within the SDWA, Upper and Lower Seymour Lakes in the Seymour Creek drainage, and a chain of three lakes in upper Ten Mile Creek. Several other unnamed smaller water bodies persist at mid and high elevations throughout the SDWA.

Native and nonnative salmonid (trout) species occupy waters in the SDWA. The only native salmonid species in the SDWA is the Westslope cutthroat trout (*Oncorhynchus clarkii lewisii*; WCT). Native Arctic grayling (*Thymallus arcticus*) occupy the Big Hole River and lower Deep

and Seymour creeks over 5 miles downstream of National Forest waters. Introduced, nonnative salmonid species are found throughout the SDWA; they include Eastern brook trout (*Salvelinus fontinalis*; EBT), brown trout (*Salmo trutta*), and rainbow trout (*Oncorhynchus mykiss*; RBT). Westslope cutthroat trout hybrids (crossed with either Yellowstone cutthroat trout (*Oncorhynchus clarkii bouvieri*; YCT) or RBT have replaced genetically unaltered WCT populations in several SDWA streams. Native mottled sculpin (*Cottus bairdii*) and longnose dace (*Rhinichthys cataractae*) are also prevalent throughout streams in the analysis area.

The following table displays salmonid fish species presence by stream within the SDWA area, within the National Forest boundary (Table 15). This information is based on data made available by Montana Department of Fish, Wildlife and Parks (MFWP) and electrofishing surveys conducted by the Beaverhead-Deerlodge National Forest (1996-2012). Eastern brook trout's competitive advantage and RBT's and YCT's tendency to hybridize with WCT have eliminated pure strain WCT from most streams in the SDWA. Upper Twelve Mile and Corral creeks are the only remaining, genetically unaltered, WCT occupied waters in the SDWA. These low density populations persists in isolated, relatively short (3 stream miles or less) headwater reaches. Tenmile, Seymour, and Chub creeks all harbor limited populations of hybridized WCT. As species composition data reveals in Table 15, non-native salmonid species dominate the remaining stream miles and lakes in the watershed assessment area.

Table 15. Salmonid species present in the SDWA area by stream.

Sub Watershed – 6 HUC	River/Stream/Lake Name	Salmonid Species Present
Seymour Creek	Seymour Creek	EBT, HYB, MSC, RBT,WCT
Seymour Creek	Chub Creek	EBT, HYB, WCT
Seymour Creek	Lower Seymour Lake	EBT, HYB, WCT
Seymour Creek	Upper Seymour Lake	HYB, RBT,WCT
Deep Creek	Bear Trap Gulch	Presumed Fishless
Deep Creek	Corral Creek	EBT, HYB, MSC, RBT,WCT
Deep Creek	Slaughterhouse Creek	EBT
Deep Creek	Sullivan Creek	Presumed Fishless
Deep Creek	Tenmile Creek	EBT, HYB, MSC, RBT,WCT
Deep Creek	Tenmile Lakes	EBT, HYB, WCT
Deep Creek	Twelvemile Creek	EBT, MSC, WCT
Deep Creek	West Fork Twelvemile Creek	EBT

Sub Watershed – 6 HUC	River/Stream/Lake Name	Salmonid Species Present
Deep Creek	Unnamed Creek	Presumed Fishless

EBT: Eastern Brook Trout; **HYB:** Hybridized Westslope cutthroat trout; **LND:** Longnose Dace
MSC: Mottled Sculpin; **MWF:** Mountain Whitefish; **RBT:** Rainbow Trout; **WCT:** Westslope cutthroat trout

Four native amphibian species occur within the SDWA area. One of these, the Western (Boreal) Toad (*Bufo boreas*), is a sensitive species in Region 1 of the USFS. Western toads have been documented in the upper Bear Trap Gulch drainage in the SDWA area, in adjacent watersheds, and south of the SDWA in lower Deep Creek and in the mainstem Big Hole River. The other three native amphibians include: the Columbian spotted frog (*Rana Luteiventris*), Long-toed Salamander (*Ambystoma macrodactylum*), and Rocky Mountain Tailed Frog (*Ascaphus montanus*). All three of these species have been documented in riparian, wetland, lake, and stream environments throughout the SDWA area.

2. Current Conditions

Sensitive Aquatic Species and Habitat

Aquatic habitats and fish populations within the analysis area have been primarily influenced by stocking of non-native fish, timber harvest, livestock grazing, roads, trails, recreation, and mining. The vegetation analysis for the Seymour-Deep Watershed Assessment Wildlife Report identified over 11,000 acres of timber harvested from 1960 through 1999 using several harvest strategies, including over 9,000 acres harvested using clear-cut as the primary tool. These acres now support lodgepole pine regeneration of sizes varying from 1 to 9 inches DBH. Signs of past increased sedimentation and water yield are evident in streams through much of the SDWA. These watershed detriments are primarily associated with past timber harvest and the extensive road network. However, about 37% of the 207 miles of existing roads in the SDWA were abandoned or decommissioned and have grown over with vegetation (USDA Forest Service 1995; SDWA Soils Report 2012). Historically clear-cut areas in the SDWA generally appear to be recovering well and are fairly stable landscapes, which do not exhibit signs of excessive erosion or mass wasting.

Stream systems across the SDWA area have been moderately to heavily influenced by these past and ongoing activities and consequently, most stream habitats surveyed in the SDWA in the 1980's and 1990's were documented as having poor stability ratings, accelerated sediment delivery, excessive bedload transport, and increased water yield (see SDWA Hydrology Report). There are currently two 303(d) listed streams within the SDWA area, Corral and Twelvemile creeks. Silviculture harvesting and rangeland grazing are listed as probable sources of impairment for both streams (MT DEQ 2009).

Beaver have dramatically impacted lower gradient reaches (near or immediately downstream of the Forest Boundary) of nearly every stream within the SDWA. Beaver establishment has likely occurred in the last 20 - 40 years, as there is little evidence of beaver occupancy in historic photos of the SDWA area. In these lower reaches, beaver occupancy

and dam construction has effectively elevated the water table, reduced water velocity, increased sediment deposition, reduced streambank erosion, restored and expanded fish habitat, and expanded wetland and riparian habitats.

Westslope cutthroat trout, a sensitive species and Montana's state fish, has declined in abundance, distribution, and genetic diversity throughout its native range (Shepard et al. 2003). Reduced distribution of WCT is particularly evident in the Missouri River drainage of Montana where genetically pure populations are estimated to persist in about 5% of habitat they historically occupied. Major factors contributing to this decline include competition with nonnative brook, brown, and rainbow trout (that were first introduced to Montana in the 1890's), hybridization with rainbow and Yellowstone cutthroat trout, habitat changes, and isolation to small headwater streams. Due to these threats, most remaining WCT populations in the Missouri River drainage are considered to have a low likelihood of long-term (100 years) persistence unless conservation actions are implemented (Shepard et al. 1997). Only two genetically unaltered WCT populations remain in the SDWA area. One population inhabits about 3 stream miles of upper Twelvemile Creek and a few genetically pure WCT may still persist in upper Corral Creek.

According to Maxell (2000), the Western (boreal) toad has been documented in Montana across the mountainous portion of the state west of the Beartooth Plateau and the eastern edge of the Castle, Little Belt, and Highwood mountains at elevations up to 9,220 feet (Werner et al 2004). Since the 1970's, boreal toad populations in Colorado, Utah, New Mexico, and southeast Wyoming have undergone steep declines and are considered by the U.S. Fish and Wildlife Service as a candidate species warranted but precluded from federal listing. Surveys during the late 1990's in Montana indicate that while still widespread across their native range, boreal toad occupy an extremely small proportion (5-10%) of suitable habitat and many historic populations have disappeared. These findings lead the USFS Regional Forester to list boreal toad as a sensitive species in Region 1. There is one recorded boreal toad observation within the SDWA area. This site is in the upper Bear Trap Gulch drainage, tributary to Sullivan Creek.

The Western pearlshell mussel (*Margaritifera falcata*; WPSM) is Montana's only coldwater trout stream mussel, and the only native mussel found on the west side of the state (MNHP 2011). Western pearlshell populations have undergone dramatic declines in Montana and therefore, have recently become a USFS Sensitive Species in Region 1 (2010). This species is widespread in geographic area, but is declining in terms of area occupied and the number of sites with viable individuals (MNHP 2011). Suitable WPSM stream habitats were surveyed in the SDWA in 2006, 2010, and 2012. No WPSM were documented and no historic records for this species exist in the analysis area. However, WPSM have been documented east and south of SDWA area, in the French Creek drainage (tributary to Deep Creek) and in the mainstem Big Hole River.

The mayfly *Drunella doddsi* (DD) is a management indicator species (MIS) for the Beaverhead Deerlodge NF. It was selected because it commonly occurs in streams across the Forest; and because it is influenced by changes in water quality, including sedimentation. High levels of

sediment introduction in aquatic systems are commonly synonymous with degraded habitat conditions and poor stream function. They also tend to be consistent with reduced abundances of DD and our desired aquatic species. Within the SDWA Assessment area, *Drunella doddsi* were found in invertebrate samples collected from Tenmile and Slaughterhouse creeks in 2011, but were absent from samples collected in Twelvemile and Corral creeks during the same sampling periods.

Seymour Creek 6th Code HUC

SEYMOUR CREEK

The Seymour 6th field HUC is part of the Big Hole at Fishtrap 5th field watershed, located about 22 miles north and east of Wisdom, MT. Elevation on USFS administered lands range from 10,472 feet on Mount Howe to 6,100 along at the Forest Boundary, on Seymour Creek. This sub-watershed contains only two named streams, Seymour Creek and its tributary, Chub Creek. This 6HUC also contains two named lakes, Upper and Lower Seymour lakes, plus several unnamed, non-fish-bearing ponds.

The sub-watershed drains an area of about 34 square miles, of which the Forest administers 26 square miles. It contains approximately 15 miles of perennial stream and an additional 28 miles of intermittent stream on National Forest lands. Almost 80% of perennial stream miles consist of Rosgen "B" type channels. Two-thirds of the USFS portion of this sub-watershed is covered by coniferous forest. Unvegetated rock scree slopes and alpine tundra cover about 15% of the 6HUC at upper elevations. Sagebrush and grasslands are common near the lower boundary of USFS lands.

The Forest Service administers seventy-seven percent of the land within the sub-watershed. Private land is located generally downstream of the Forest Boundary at the lower end of the 6HUC. Sixty-one percent of the USFS lands lie within the Anaconda-Pintler Wilderness area. Almost half of the USFS lands, outside the Wilderness, lie within the Seymour grazing allotment. Commercial timber harvest has occurred on almost 1/3rd USFS administered lands outside the Wilderness and some steam channels in these areas have been impacted by logging practices and water yield increases resulting from the removal of canopy cover. Seymour Creek subwatershed is a restoration key watershed emphasizing restoration of integrated ecological processes at the watershed scale and it should be given priority over other non-key watersheds for any restoration work (USDA Forest Service 2009).

The Seymour sub-watershed contains an extensive road network, developed primarily for the Mount Haggin Timber Sale. Almost 90% of the roads are comprised of native surfacing, increasing the potential for surface erosion. There are 66.8 miles of roads and 5.8 miles of trails within the subwatershed. Of these roads, 2.1 miles are within 300' of perennial streams with two perennial stream crossings and 8.5 miles lie within 150' of intermittent streams with 39 stream crossings (SDWA Hydrology Report 2012).

Historic instream habitat data for Seymour Creek was collected in 1985, 1989, and the late 1990's. These data include hollow-core substrate samples, and general habitat surveys to

classify relative abundance of different habitat types and stream channel dimensions. In 1989, a HABREACH survey, covering almost two miles of Seymour Creek, beginning at stream kilometer 7 (Figure 8), depicted a stream consisting of 38% pools, 35% riffles, 21% runs and 5% pocket water. Pools were formed by lateral scour (48%), beaver activity (22%) and plunges (27%). Large woody debris (LWD) densities averaged 334 pieces per mile throughout this reach. Cross-sectional data from 1989 described a channel 26' wide, with a wetted width of 18.7 feet. Forty percent of the streambank length was undercut. Substrate was estimated at 49% embedded, although results of a hollow-core sample yielded an estimate of 18% fines (<1/4") in the substrate.

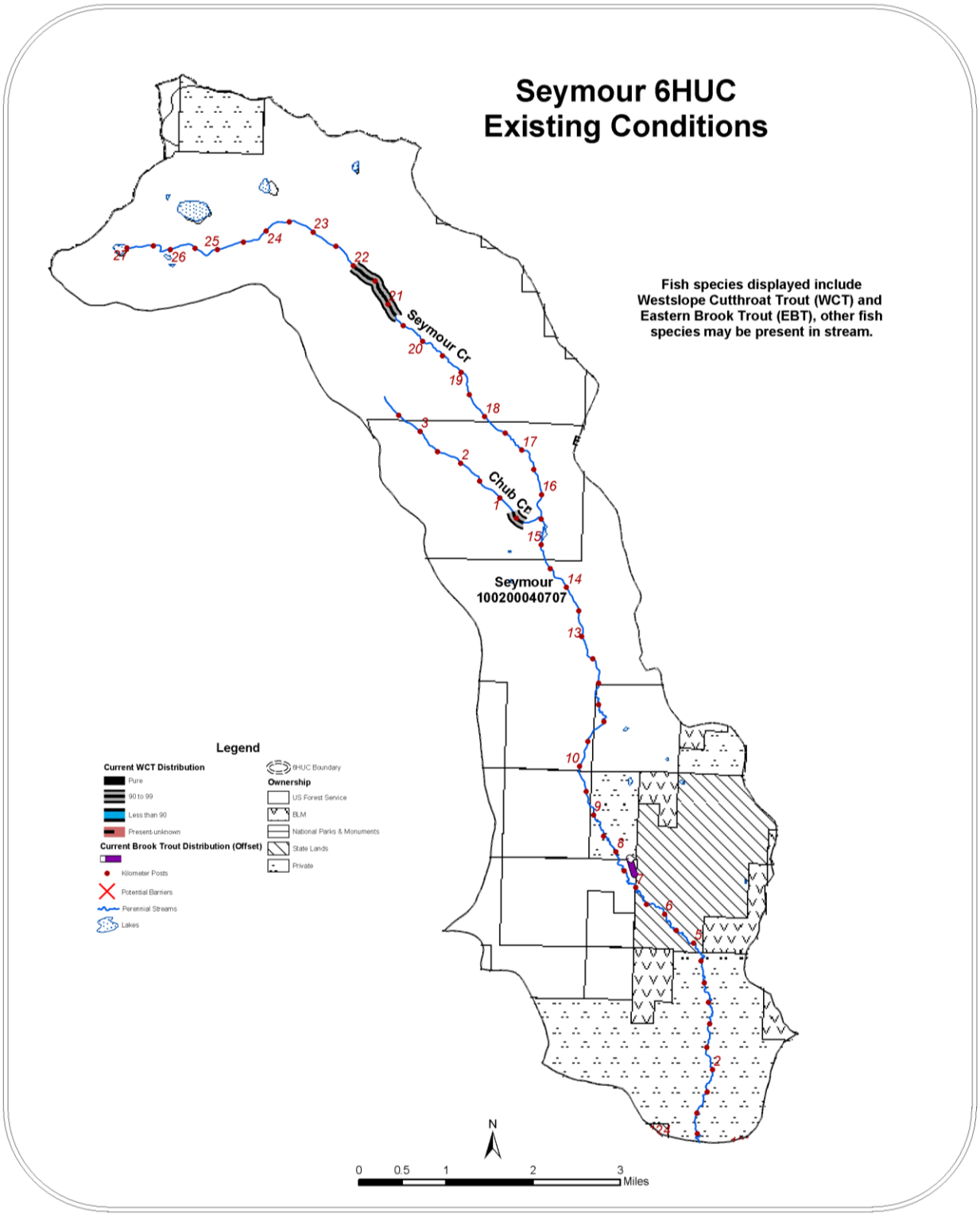

Figure 8. Existing condition map of the Seymour Creek 6HUC from the late 1990's.

In the mid-1990's six habitat sites were surveyed in Seymour Creek. At the Wilderness boundary, the channel was classified as A2 (Rosgen 1996), and received a channel stability

rating of fair/poor (48). In Section 35, the channel was classified as B1, and was also rated as poor (66), while at the forest boundary the stream type was classified as a B6, and channel stability was considered fair (70) (USDA 2001).

In 1998, habitat surveys were conducted in concert with angling surveys at stream kilometer 21 in the Anaconda-Pintler Wilderness area. Pools in this reach were primarily formed by plunges (25%) and debris dams (33%), while lateral scour was the formative feature for the remaining pool habitat (15%). Over half (55%) of the pools were considered low quality (class 3). A hollow-core substrate sample, located about one mile downstream, contained 26% (by weight) material <1/4" diameter. Stream habitat surveyed at one location in this reach in 1998 was classified as "functioning-at-risk".

Figure 9. Representative photo of Seymour Creek, upstream of Lower Seymour Lake.

Stream habitat observations in a one mile stream reach, immediately upstream of Lower Seymour Lake, in October 2011 were documented as very stable, with active beaver dams, well vegetated stream banks, abundant, high quality rearing and overwintering habitats for salmonid fishes, and commensurate LWD recruitment (Figure 9). A one pass electrofishing survey was also completed in a 500' section of this reach. Moderate densities of brook trout and mottled sculpin were recorded. Larger size classes (>100mm) of brook trout were absent during the survey. Given the time of year sampled and location in the drainage, sexually mature brook trout had likely migrated upstream to preferred spawning habitats.

Nonetheless, given the quality of habitat in this reach, there is evidence that the Seymour Creek drainage is on an upward trend towards properly functioning condition and is gradually recovering from the effects of historic timber harvest.

Fish populations were sampled in two locations in Seymour Creek in 1989. The downstream survey consisted of two-pass depletion electrofishing effort over a 500' long reach (stream km 7; Figure 8). The survey yielded an estimate of 52 brook trout between 75-150mm and 26 >150mm in the reach. An additional 7 brook trout <150mm, were captured during the survey. Mottled sculpin were also present in the sample. An angling reach was surveyed, located about 14 kilometers upstream of the electrofishing survey, in the Anaconda-Pintler Wilderness area. This survey yielded a total of nine WCT. These fish were collected and sent to the genetics lab at the University of Montana for analysis. Results of this analysis indicated these fish were slightly hybridized (99% WCT, 1% YCT) with Yellowstone cutthroat trout. In 2005, cutthroat trout from this upstream reach were again retested for genetic composition. The results came back as genetically unaltered; however, because of low sample size (n = 6) and past evidence of hybridization, the populations is still considered slightly hybridized and is managed as a conservation population of WCT.

SEYMOUR LAKES

Both Upper and Lower Seymour Lakes were formed naturally, are in pristine condition, harbor self-sustaining salmonid populations, and provide recreational fishing opportunity. Lower Seymour Lake contains a mix of brook trout and assumed to be *hybridized* WCT (Figure 10). Upper Seymour Lake harbors WCT hybrids and a remnant population of rainbow trout, which was presumed to be stocked sometime in the 1980's. No stocking records exist for either lake in the MTFWP MFISH data base.

Figure 10. Lower Seymour Lake.

CHUB CREEK

Chub Creek flows for about 4 miles before entering Seymour Creek at stream km 15.5. Past fish and habitat sampling has occurred in the lower one mile of the stream (Figure 11). The 1989 electrofishing sample covered a 100 meter reach and yielded a total of 2 EBT (94 & 117mm) and 10 WCT ranging in length between 37-85mm. Eight of the WCT were collected for genetic analysis. Results of the analysis indicate these fish are hybridized with YCT (94% WCT & 6% YCT). The 1996 sample consisted of a single pass effort over a 500' reach. This sample resulted in the capture of 2 WCT >150mm. In 2011, a 500' reach in the lower one mile of Chub Creek was again electrofished. The single pass effort produced 83 brook trout from 53-220mm, no WCT were observed or captured. Stream habitat in this reach was documented as in fair condition with "a healthy riparian area, undercut streambanks, spawning gravels throughout (but with excessive fine sediment), and fair spawning and rearing habitat for Lower Seymour Lake and Seymour Creek.

Figure 11. Chub Creek.

Deep Creek 6th Code HUC

The Deep Creek 6th field HUC lies approximately 17 miles northwest of Wise River, MT. The northern, southern, and eastern borders of the HUC are formed by the continental divide. The western border passes through higher elevations that separate Corral and Twelvemile Creeks. All streams within the HUC flow south and converge to form Deep Creek, which eventually empties into the Big Hole River.

The total area within the HUC is 14,246 acres, 50% of which is USFS land. Elevations on USFS lands range from 6,200-10,400 feet. The Deep Creek HUC also contains 184 acres of BLM land, 5,106 acres of State lands, and 1,959 acres of private land. There is a total of 132.4 miles of roads within the Deep Creek Watershed Assessment area. Approximately 21.7 miles of the road system lie within 300 feet of a perennial stream with 36 stream crossings. About 7 miles of the road system lie within 150 feet of an intermittent stream with 39 stream crossings. There are 3.1 miles of trail within the assessment area. Less than one mile of trail lies within 300 feet of a perennial stream and there are no stream crossings, and 0.76 miles of trail are within 150 feet of an intermittent stream with 5 stream crossings (SDWA Hydrology Report 2012). The greatest road density within the HUC occurs on USFS lands, particularly along

Slaughterhouse and Corral Creeks. Current USFS land uses include recreational activities associated with an extensive trail system and timber harvest.

The Deep Creek 6th field HUC contains one Fish Key Watershed (Deep Creek drainage) and one Restoration Key Watershed (Sullivan Creek). B-D Forest Plan management for fish key watersheds emphasize that populations of bull trout and westslope cutthroat trout exhibit numbers, life histories, age classes, recruitment levels and reproductive characteristics representative of historic conditions. Management goals for Restoration Key Watersheds emphasize that fish habitat, riparian habitat, and water quality are recovered to desired conditions developed through watershed assessments.

CORRAL CREEK

Corral Creek is a small (2.5-3' wetted width) first order perennial tributary to Deep Creek. The stream flows southeast throughout its length (approximately 5 miles). The upper reaches flow across USFS land while the lower reaches flow across state land (1.5 miles). On USFS lands, upstream of FS Route 2483, Corral Creek exhibits signs of past and current livestock grazing, but was considered to be in good condition overall in summer 2011, with stable and undercut streambanks, abundant pool habitat, and LWD throughout. Two large mass failures were recorder in upper Corral Creek prior to the 2001 Big Hole Landscape Assessment (USDA 2001). These failures were documented as depositing excessive sediment in the stream and the sediment deposition had masked any indications of water yield increases as a result of past timber harvest. The mass failures were a product of a skid trail undercutting the toe of a slope, compounded by water yield increases from timber harvest directly above the slide area. A field review of the assessment area in summer of 2011 failed to find the old landslides, and revealed that in general, previously harvested areas are recovering naturally (SDWA Assessment Soils Report 2012).

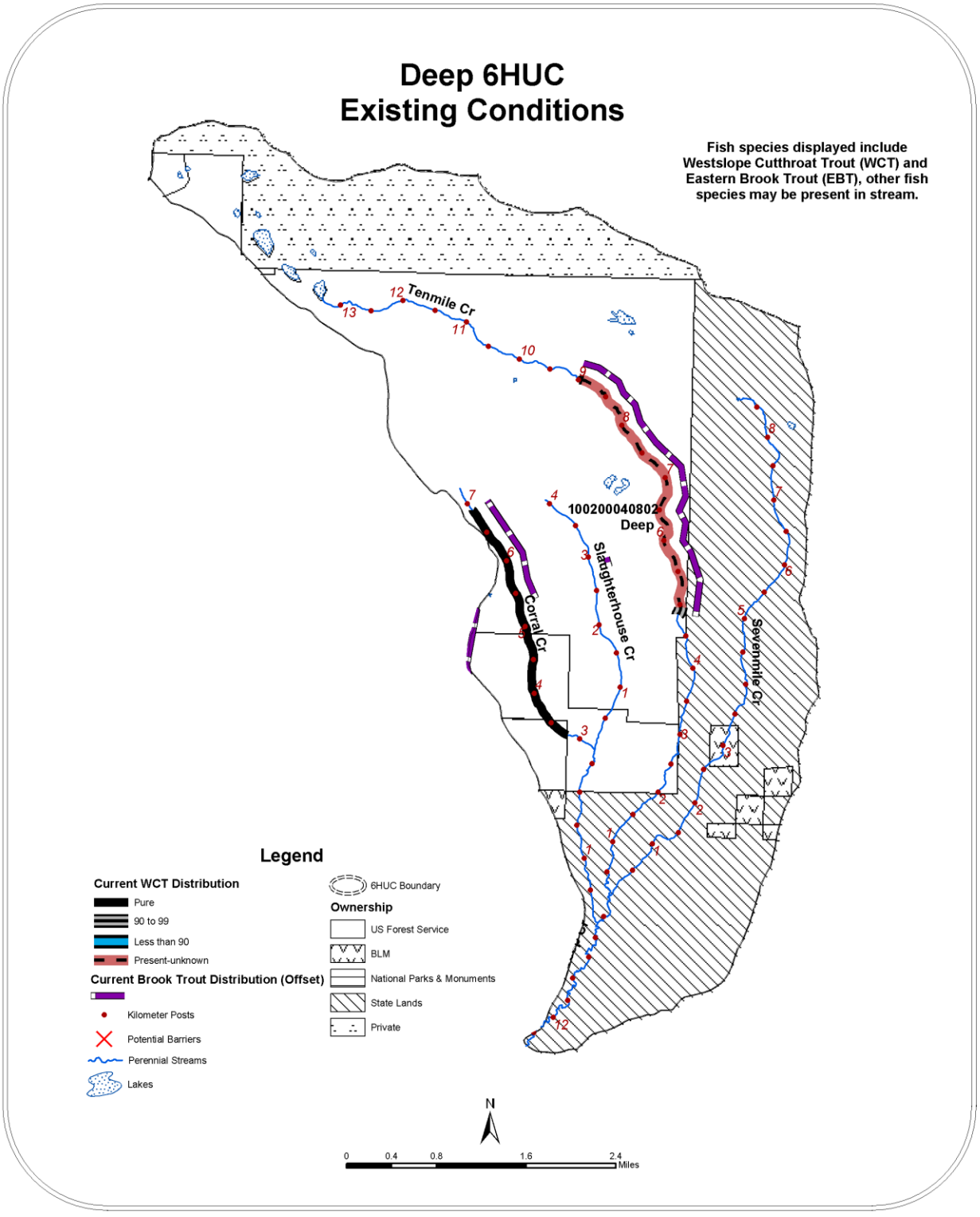

Figure 12. Existing condition map of the Deep Creek 6HUC from the late 1990's.

Three reaches of Corral Creek were surveyed for fish in 1994. A two-pass survey of reach 1 (stream km 2; Figure 12) may have yielded fish but the data had not been verified and no specific information about fish exists for the reach. A one-pass survey of reach 2 (stream km 5; Figure 12) yielded a single EBT. A two-pass survey of reach 3 (stream km 6.7; Figure 12) yielded another EBT and three WCT (76-152mm). Analysis of the three fish found them to be 100% pure WCT. The small sample size, however, means that hybridization cannot be ruled out, if WCT are still present in the creek.

Figure 13. Corral Creek upstream of culvert on FS Route 2483.

In 2011, a 500' one-pass electrofishing survey was conducted immediately upstream of FS Route 2483 on Corral Creek (Figure 13). Forty-eight brook trout between 32-100mm were captured. No WCT were observed or captured. The reach sampled corresponds with reach 2 from the 1994 fisheries survey, where only one brook trout was captured. A new culvert that accommodates upstream fish passage had been recently installed (2010) in FS Route 2483 at the Corral Creek stream crossing. The increased connectivity provided by this new culvert may have allowed recent upstream passage of brook trout from the lower Corral Creek drainage. No additional electrofishing surveys were conducted further up the Corral Creek drainage in 2011. It is unknown if WCT still persist in the Corral Creek drainage.

Past fisheries reports have made recommendations to build a fish passage barrier at the confluence of Corral and Slaughterhouse creeks on USFS lands for WCT restoration and population expansion (Figure 8; Figure 14). Figure 14 below is of the confluence of these streams. The site is not conducive to barrier construction; it is in a broad flood plain and is very low gradient. Because of this and the limited quantity of habitat available in the Corral and Slaughterhouse creek drainages, upstream of the confluence, no further WCT restoration projects are being proposed in these drainages at this time.

Figure 14. The confluence of Corral and Slaughterhouse Creeks on USFS lands.

SLAUGHTERHOUSE CREEK

Slaughterhouse Creek is a first order tributary to Corral Creek. Water flows south throughout the creek's length (approximately 3 stream miles). A one-pass electrofishing survey was conducted in Slaughterhouse Creek on USFS in 1994 (location unknown). Seventeen brook trout (75-150mm) were captured. No other fisheries data exist for the creek. Five culverts exist between one and three miles above the mouth of the stream. The outlets of several of the culverts produce 7-12" cascades onto rocks or riprap and these cascades may be barriers to upstream fish movements. The culvert on FS Route 2483 was reviewed in 2011, it is undersized, partially plugged, and does not accommodate upstream passage of all life stages of salmonid fishes (Figure 15). An undeveloped ford was

documented about 500ft upstream of the undersized culvert on FS Route 2483. The stream channel at the ford crossing is over widened and has high fine sediment accumulation (Figure 16).

Figure 15. Slaughterhouse Creek culvert on USFS Route 2483.

Figure 16. Unimproved ford on Slaughterhouse Creek.

SULLIVAN CREEK

Sullivan Creek is a 2nd order tributary to Deep Creek. It flows southeast for about 10 stream miles from its headwaters in the Anaconda-Pinter Wilderness Area to Deep Creek. The upper 7 stream miles are on USFS administered lands. Sullivan has two tributaries, Bear Gulch and Dry Creek. Bear Gulch is perennial and presumed fishless and Dry Gulch flows intermittently.

Hydrology analyses of three locations (upper, mid, and lower) in the Sullivan Creek drainage in 1992 and 1998 state that all survey locations were "functional" but the drainage was highly influenced by the extensive road network and stream crossings. Reaches immediately downstream of historic timber harvest units received "poor" channel stability ratings and there was evidence of growing mid-channel and point bars, and some accelerated bank erosion was taking place (USDA Forest Service 2001). Also in 1992, several pebble counts were performed in Sullivan Creek. For similar stream types, the D50 in Sullivan was much smaller than the reference (Sullivan D50 = 100, 73; Tenmile Creek D50 = 140, 200). This information led the State of Montana to determine water quality law had been violated and timber harvest was suspended in Sullivan and Dry Creeks (USDA Forest Service 2001). Numerous problems relating to road drainage, piling slash in stream channels, debris buildup, and culverts exist throughout this watershed. Electrofishing surveys were

conducted in Sullivan Creek in 1980, 1989 and 1994. Brook trout were found in the lower 1 mile of Sullivan Creek in 1980 and 1989, and no fish were observed or captured upstream on USFS lands in 1994 (MFISH 2012).

TENMILE CREEK

Tenmile Creek is a perennial tributary to Deep Creek. Tenmile Lakes, located close to the continental divide, form the headwaters for the stream. Upper Tenmile Lake in the extreme headwaters is on private land. The entire chain of lakes (3) is presumed to harbor WCT, but may also have remnant rainbow and/or Yellowstone cutthroat trout from historic stocking. However, no stocking records exist for these lakes.

Hydrologic data were collected from two reaches of Tenmile Creek in 1992. The Upper reach was categorized as a "functioning" C3b channel with a static trend and the Mid reach came out as a "functioning-at-risk" C3b channel with a downward trend. The Mid survey site was directly upstream from any influence from roads, just above the road-stream crossing of FR 2483 and Tenmile Creek. In 2011, this same reach (Mid) was electrofished and stream habitat was noted as "riparian in excellent condition, large diameter trees, high streambank stability, low percent fine sediment, and frequent pools with formative features of LWD and boulder" (Figure 17). Therefore, habitat conditions in this reach have apparently improved since 1992.

A double culvert stream crossing on USFS Route 2483 likely hinders upstream passage of salmonids from lower Tenmile Creek. This crossing is undersized, partially plugged, perched on the outlet, and has effectively limited sediment transport and over widened the stream channel immediately up and downstream of the crossing (Figure 18). These culverts should be replaced with a fish barrier/road crossing structure for WCT restoration in the upper Tenmile Creek drainage.

Figure 17. Tenmile Creek, upstream of USFS Route 2483 (Mid reach from 1992).

Electrofishing surveys from 1989-2010 have produced brook trout and WCT hybrids from the double culvert crossing on USFS Route 2483 upstream to stream km 6.1. In 2011, a 500' one-pass electrofishing section was surveyed in the 1992 Mid hydrology reach. Thirty-nine brook trout from 48-210mm in length and one rainbow trout (270mm) were captured.

Genetics data analysis of 17 WCT captured in 1989 found 91% of the relevant loci to be indicative of WCT while 9.4% were indicative of rainbow trout. Analysis of five WCT from the 1993 sample found 100% of the relevant loci to be indicative of WCT. The accuracy of this finding was called into question by the small sample size and the fact that an earlier analysis found less than pure WCT in the stream. In 2010, analysis of 13 WCT from upper Tenmile Creek found 99.7% of the relevant loci indicative of WCT while 0.3% were indicative of rainbow trout.

Figure 18. Tenmile Creek double culvert stream crossing on USFS Route 2483.

TWELVEMILE CREEK

Twelvemile Creek is a 3rd order tributary to Deep Creek. It flows southeast for about 9 stream miles from its headwaters in the Anaconda-Pinter Wilderness Area to Deep Creek. The upper 7.5 stream miles are on USFS administered lands. Twelvemile Creek has one substantial tributary, West Fork Twelvemile Creek. The Twelvemile Creek stream/road crossing on USFS Route 2483 was recently fitted with a full span bridge that provides seamless aquatic organism passage (Figure 19).

Figure 19. Downstream view from Twelvemile Creek bridge on USFS Route 2483.

Twelvemile Creek was considered a reference stream for sediment analysis comparisons in Sullivan Creek in the 1992 hydrology analysis because no past timber harvest occurred in the drainage. Aquatic habitat surveys have not been conducted in the Twelvemile drainage recent years, but "excellent stream habitat quality" was noted in 2011 during macroinvertebrate and electrofishing surveys. The Twelvemile Creek drainage was described as "no evidence of water yield increases affecting the channel, but road problems exist" in the 2001 Big Hole Landscape Assessment (USDA Forest Service 2001).

Electrofishing surveys from 1980, 1989, and 1994 report brook trout from mouth to stream mile 6.9 in the main stem of the Twelvemile Creek drainage. Westslope cutthroat trout were found from stream mile 5.5 to 6.8 in 2005 and 2010. Genetics data analysis of a total of 42 WCT captured in 2005 and 2012 found 100% of the relevant loci to be indicative of WCT. Therefore, upper Twelvemile Creek remains the only genetically unaltered WCT population remaining in the SDWA (with any certainty).

West Fork Twelvemile Creek

West Fork Twelvemile Creek is also in relatively good condition overall, the lower end of the drainage, near it's confluence with Twelvemile Creek is a willow dominant valley bottom

with active beaver occupancy and considerable high quality habitat for fish and amphibian species (Figure 20).

Figure 20. Lower West Fork Twelvemile Creek.

USFS Route 2490 is delivering sediment directly into the stream. The two road segments of USFS Route 2490 parallel both sides West Fork Twelvemile Creek and they historically connected at the top of the drainage and provided a "loop" route. The roads no longer connect, both dead end, and obliterating and closing one of them or converting one of them to a nonmotorized trail could bring marked watershed improvement to the drainage. The Twelvemile Creek culvert on USFS Route 2483 is undersized and deeply inset and should be replaced with a full span bridge, similar to the bridge recently installed in main stem Twelvemile Creek.

Twenty-six brook trout were captured in a 250' one-pass electrofishing survey 0.5 miles upstream of USFS Route 2483 in West Fork Twelvemile Creek in 2011. No other fisheries data could be found for this drainage.

3. Reference Conditions

Historic conditions for the SDWA would not include the presence of timber harvest, domestic livestock grazing, developed road and trail systems, mining activity, irrigation diversions, dams, exclusions of fire, or the presence of non-native aquatic species.

Fisheries habitat in all streams would reflect conditions commensurate with their potential based on landform, geology, and climate. Historically, streams would all be functioning appropriately apart from natural disturbances, such as fire or significant runoff events. Beaver activity would have most likely been more prevalent throughout the watershed. This activity would have helped control increased sediment introduction from the naturally unstable soil types. There would be no elevated levels of metals within streams without the presence of mining activity. Sediment levels would be significantly lower within stream systems than what occurs today. However, because of the somewhat unstable soil types and granitic parent material within the watershed increased sediment levels could have affected stream function to some extent.

Historically, salmonid presence within any of the streams of the watershed would have been Westslope cutthroat trout and possibly Arctic grayling. These populations would have been migratory within the watershed because no dams or irrigation diversions to stop access to tributary streams or the Big Hole River would have existed. Habitats were probably appropriate to support these aquatic species. Amphibian species were probably more broadly distributed throughout the watershed and most likely in higher numbers. Historic amphibian population levels would be a reflection of no introduced diseases that are currently affecting amphibian populations and not necessarily a reflection of past management activities.

Riparian vegetation was located throughout the stream bottoms. Natural fire had kept conifer encroachment from the riparian bottoms which allowed willows, cottonwoods, and aspen to remain healthy and vigorous.

4. Synthesis and Interpretation

Past and current management activities have had negative effects on streams, stream function, bank stability, riparian vegetation and native aquatic species.

Sedimentation due to naturally unstable soil types was potentially an issue historically but management activities have significantly increased this problem. Roads and trials, past timber harvest, livestock, water diversions and past mining activities have all significantly increased sediment levels within streams. These same activities have also affected stream function. Bank stability, width to depth ratios, and other stream function parameters have been negatively affected by these management activities.

The streams within the headwater portion of this watershed are generally stable and functioning properly. Apart from some nonmotorized trail systems, management activities have generally not affected the Wilderness portion of the watershed. Most management activity has occurred in the mid to lower elevations of the analysis area.

The presence and persistence of non-native salmonid species within most of the SDWA area is likely to remain the existing condition. Non-native species do have significant recreational fishing value for recreationist and are a good indicator of aquatic health. However, nonnative expansion has occurred throughout several of the major drainages in the SDWA in the last 10 years. Westslope cutthroat trout restoration and population maintenance opportunities exist in the Seymour, Tenmile and Twelvemile Creek drainages. These native species restoration opportunities should be considered high priority aquatics projects and pursued as interagency partnership projects between the USDA Forest Service and the Montana Department of Fish, Wildlife and Parks.

5. Recommendations

Recommendations for the SDWA should include efforts to reverse some of the past management's negative effects to the watershed. This includes improving road and trail crossings to decrease the amount of sediment reaching streams, ensuring that existing roads and trails are functioning properly with adequate drainage features to keep sediment out of streams, repairing/replacing culverts that are not functioning properly, and maintaining healthy and vigorous riparian vegetation which will continue to stabilize banks and provide shade.

Roads and trails are contributing to increases in sedimentation for several streams within the SDWA. A significant portion of the travel routes in the SDWA are preventing streams from achieving properly functioning condition. A combination of surfacing, additional drainage features within the road prism, reclamation, and culvert replacement should be completed to effectively promote stream function.

Table 16 displays all aquatics opportunities identified in the SDWA by 6th field HUC.

Table 16. Aquatics Opportunities and Data Gaps for the SDWA.

6th Field HUC	Stream Name	FS Route	Recommendation	Remarks
Seymour and Deep	NA	All	Incorporate All Road and Trail Related Improvement Recommendations for the SDWA Hydrology Report	Reduce erosion/sediment
Seymour	Seymour Creek	2469	Incorporate a Fish passage Barrier into the Bridge Design on Seymour FS Route 2496, Stream Mile 12 (Figure 8).	WCT restoration/population maintenance: 13.5 miles of stream habitat for WCT (including Chub Creek and Upper and Lower Seymour lakes).

6th Field HUC	Stream Name	FS Route	Recommendation	Remarks
Deep	Corral Creek		Conduct Upstream Electrofishing and Habitat Surveys and WCT Assess Genetics.	WCT restoration/population maintenance
Deep	Slaughterhouse Creek	2483	Replace 5 Culverts, Obliterate and Restore Undeveloped Ford, Road Maintenance,	Replace plugged and undersized culverts, reduce erosion/sediment
Deep	Slaughterhouse Creek	2495, 2496	Resurface and Incorporate Road BMPs or Obliterate Roads (Figure 21).	Reduce erosion/sediment
Deep	Tenmile Creek	2483	Replace the Double Culvert on FS Route 2483 with a Fish Passage Barrier/Box Culvert Design. Restore Upper Drainage to Genetically Unaltered WCT.	WCT restoration/population maintenance: 7.5 miles of stream habitat for WCT (including the Tenmile chain of lakes).
Deep	Twelvemile Creek		Eastern Brook Trout Removals in Twelvemile Creek Where Sympatric with WCT.	WCT restoration/population maintenance
Deep	WF Twelvemile Creek	2483	Replace the Culvert on FS Route 2483 with a Fish Passage Barrier/Box Culvert Design. Restore Upper Drainage to Genetically Unaltered WCT.	WCT restoration/population maintenance: 7.5 miles of stream habitat for WCT

Figure 21. USFS Route 2495, Slaughterhouse Creek Road.

Maintaining healthy riparian vegetation is important for proper stream function. Currently there exists healthy riparian vegetation throughout the SDWA. However this riparian vegetation (willows and aspen) is being threatened by conifer encroachment. This encroachment is relatively recent and could be treated to reduce the impacts of encroachment and ensure that the willows and aspen communities maintain vigor. Individual tree removal, girdling conifers to act as future large woody debris recruitment, and cutting trees and leaving them within the riparian area are all possible management activities. By maintaining a healthy willow and aspen community, stable stream banks, appropriate stream temperatures, and healthy insect communities can be maintained.

Currently within the analysis area there is very active fire wood gathering in response to the existing condition of beetle killed lodge pole pine. Monitoring of this activity is important to ensure that fire wood gatherers are not taking dead trees out of the riparian corridors that are providing bank stabilization or would act as future large woody debris recruitment. Signs should be posted along riparian corridors where high frequency dispersed camping occurs to deter fire wood gatherers and campers from harvesting trees within 150’ of perennial stream channels.

Livestock grazing has had some had negative impacts in tributaries and main stem stream channels within the SDWA. Proper implementation of grazing standards and monitoring of

allotments are critical to ensure that stream systems are allowed to move toward proper functioning condition and that no increased resource damage will occur.

Amphibian monitoring in the SDWA (Bear Trap Gulch; boreal toad breeding site) and wetland habitats throughout the area provides opportunities to try to understand how, or if, management activities and environmental changes are, or are not, impacting amphibian populations in the SDWA. If monitoring detects any changes to population viability due to management actions then mitigation measures should be implemented to protect these populations.

All of these above recommendations will help the SDWA to have properly functioning streams, healthy riparian vegetation, and viable aquatic species populations. These recommendations will help address 303(d) stream concerns and should improve conditions that could allow those streams to be recovered and be taken off the 303(d) list.

Native species expansion should be a key component of watershed restoration in the SDWA. Three opportunities exist to reintroduce and markedly expand existing Westslope cutthroat trout populations in the watershed.

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D. VEGETATION

1. Characterization

The Seymour - Deep Creek Watershed Assessment area is about 54,600 acres and includes the following drainages: Chub Creek, Seymour Creek, Sullivan Creek, Poronto Creek, Dry Creek, Twelvemile Creek, Corral Creek, Tenmile Creek, Sevenmile Creek, and Bear Trap Gulch. Streams flow south into the Big Hole River. This vegetation report only considers the National Forest System lands, which total 45,727 acres. The assessment area is south of and includes a portion of the Anaconda-Pintler Wilderness, and is west of the community of Wise River, Montana.

DOMINANT PROCESSES

Composition and configuration of vegetation in the Seymour - Deep Creek watersheds prior to European settlement was shaped by natural disturbances and processes and, to a lesser extent, Native American land management. Natural disturbances and processes that influenced and will continue to influence vegetation in this area include climate variability, watershed processes (i.e. flooding, mass wasting, debris flows, avalanches), fire events, and insect population dynamics. Native American land management was characterized by fire ignitions for travel corridors, forage improvement, game habitat improvement, and maintenance of native plant food sources. Although scientific research specific to the watershed analysis area is currently lacking, results of studies completed in ecosystems and landscapes of the western United States and northern Rocky Mountains can be used to assess the historic conditions and processes that operated in these watersheds.

In the past 100 or so years vegetation in the Seymour - Deep Creek assessment area after European settlement has been shaped by timber harvest to support mining activity around the turn of the century, and from the 1960s through the early 1990s the watersheds saw extensive logging.

GEOLOGICAL PROCESSES

Geological processes operate on a temporal scale of thousands to millions of years. These processes are commonly slow and influence areas larger than most other processes influencing the analysis area. The large and long temporal and spatial scales of geologic processes shaped the current topography, rock formations, and parent material that exist within the Seymour - Deep Creek watersheds. Geological changes since the last ice age (18,000 to 12,000 years ago) in these watersheds include erosion and deposition, vegetation migration, and tectonic movement. Natural leveling processes of geological erosion include surface erosion and mass wasting (i.e. landslides, debris avalanches, slumps and earth flows, creep, and debris torrents) (Brooks et. al 2003, Pierce et al. 2004).

CLIMATE

Variations in monthly normal (30 year average) temperature, precipitation, humidity, and wind define climate for any given area at any given time (Robinson & Henderson-Sellers 1999). However static climate may seem for an area, spatial and temporal climate variability has influenced vegetation in the western US for centuries (Whitlock et al. 2003). Periods of warming and cooling and/or high and low precipitation, such as the cool-moist conditions associated with the last phase of the little ice age (1800-1850), was driven by ocean-atmosphere interactions prior to onset of modern industrialization effects to global climate. Tree ring reconstructions of climate shape our current understanding of historical climate variability in the western US, a source of information limited in time by the longevity of the tree species used to compile past climate information.

Fluctuations in temperature and precipitation that characterized historic climate likely influenced vegetation distribution and patch size in the Seymour - Deep Creek assessment area by affecting other processes such as germination and establishment of native species, fire regimes, insect activity, erosion, and stream morphology.

A 20-year period of dry summers beginning in 1855 facilitated Douglas-fir (*Pseudotsuga menziezii* var *glauca*) expansion from small ecotone patches to sagebrush (*Artemesia tridentata vaseyana*) and grassland ecosystems (Heyerdahl et al. 2006). Dry summers in this community type negatively affect shallow rooted grass and herbaceous species and encouraged establishment of deeper rooted mountain big sagebrush that are nurse plants for Douglas-fir. These climate conditions of the late 1800s in combination with livestock grazing also facilitated the succession of juniper species in the western United States into sagebrush and grass dominated communities. This variation in climate, in combination with European settlement in the region, facilitated changes in the sagebrush and grassland communities of the Seymour - Deep Creek assessment area.

Since the little ice age subsided (1850), global average temperatures have increased due to natural climate variability and human induced climate change. During the 20th century, periods of drought and abundant moisture occurred in the southwest Montana (Figure 22). Recent variation in regional climate formed the human perception of seasonal temperature and precipitation variation. The climate of Wise River, Montana is used to describe the climate of the assessment area (Figure 23). Winter and summer jet stream position influence annual climate variability that result in these normals. Average precipitation is highest in late spring (μ = 2.1 inches June) and lowest in winter months (μ = 0.4 inches February); while average temperature is highest in summer months (μ = 61°F July) and lowest in winter (μ = 12°F January). Precipitation and temperature normals reflect that the Seymour - Deep Creek assessment area experiences cool and moist springs, often hot and dry summers, cool and dry falls, and cold and dry winters. These normals are characteristic of continental climates influenced by continental polar, maritime polar, and to a lesser extent, continental tropical air masses that shift according to summer and winter jet stream position.

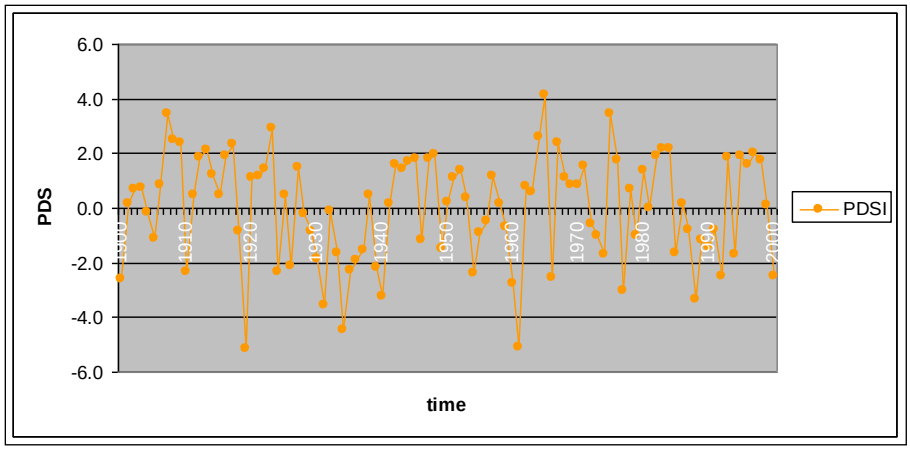

Figure 22. Palmer Drought Severity Index of southwest Montana from 1900 – 2000 (NOAA 2005).

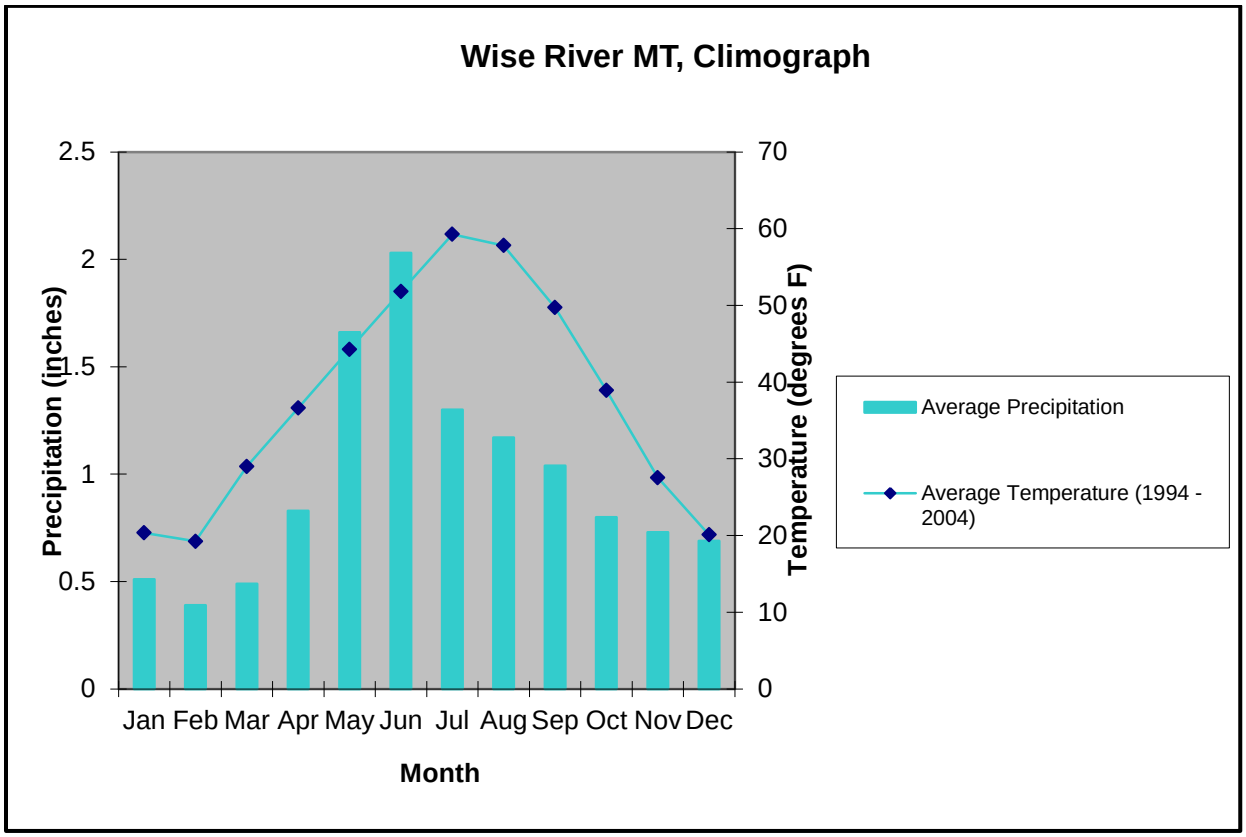

Figure 23. Average Monthly precipitation and temperature for Wise River, Montana from 1971-2000 (NOAA 2005).

As climate is anticipated to become warmer and drier in the future (IPCC 2007), precipitation and temperature trends in the assessment area are anticipated to change in response.

Warmer springs may lead to earlier snow pack ripening and runoff, influencing riparian and upland vegetation. Longer fire seasons are likely to result from a change in these two climate elements and increased fire behavior may contribute to changes in erosion that influence stream morphology and habitat (Mote et al. 2005, Wondzell & King 2003).

INSECTS

Mountain pine beetle (MPB) populations have been cyclic in conifer stands of the Seymour - Deep Creek area. This insect affects two tree species in the area, lodgepole pine (*Pinus contorta*) and whitebark pine (*Pinus albicaulis*). Twenty to forty year cycles of population increases lasting up to 11 years initially kill larger individual trees before successively killing smaller individuals (Cole & Amman 1980). Up to 60% of trees greater than 8 inches in diameter are killed when MPB populations are epidemic. Currently, the Seymour - Deep Creek assessment area is part of a larger epidemic occurring across the majority of the Beaverhead-Deerlodge National Forest and on other forests in Region 1.

Lodgepole pine stands can sustain several episodes of MPB infestation, each episode killing many of the larger trees in a stand and creating conditions for seedling growth. Whitebark pine in the Seymour - Deep Creek area is less continuous than lodgepole pine and largely represented within mid-successional stands characteristic of subalpine fir (*Abies lasiocarpa*) - Engelmann spruce (*Picea* engelmannii) mature and old communities.

Low elevation stands have been most impacted by MPB, reducing the presence of lodgepole pine as a significant stand component. Mid elevation stands comprised of mostly lodgepole pine have also been greatly impacted by MPB, allowing opportunity for shade tolerant subalpine fir and Engelmann spruce to increase. At high elevations where lodgepole pine and whitebark pine are a lesser component of coniferous vegetation, mortality has occurred with the extent currently not known.

Figure 24 below displays the USFS Aerial Disease Survey (ADS) data showing the progression of MPB infestation from 2000 through 2009. Table 17 summarizes the annual affected acreage totals and the total number of trees estimated to have been attacked over the entire Seymour - Deep Creek area, including non-federal lands for these years. Note that acreage totals can have overlap from year-to-year, as MPB attacks can be progressive over several years within a particular acre.

Table 17. Mountain pine beetle affected acres by year, from aerial disease survey data, years 2000 through 2009.

2000 Acres	2005 Acres	2007 Acres	2008 Acres	2009 Acres
5	164	131	8,171	14,679

Note: Acreage totals from year-to-year are not cumulative: MPB attacks are typically the same acre.

MPB populations have been maintained and increasing year-by-year due to the recent above average winter and spring temperatures, allowing a high over-winter success. Lodgepole pine stand conditions across the BDNF are conducive for carrying epidemic populations and without a change in over-winter temperatures to colder extremes, the epidemic will continue until the host species of the appropriate diameter (about 6 inches and larger) have been exhausted. Within the Seymour - Deep Creek watershed assessment area on NFS lands, it is estimated that about 86 percent of the lodgepole pine stands have been affected by MPB (14,700 acres out of 17,150 of suitable lodgepole pine beetle habitat).

Western spruce budworm (WSB) occurrence has been most evident at lower elevations where Douglas-fir occurs. WSB population booms last up to 30 years and cause mortality in small and defoliation of large Douglas-fir trees. Increasingly dense, later successional stands of Douglas-fir are susceptible to WSB because these stands are often stressed by competition.

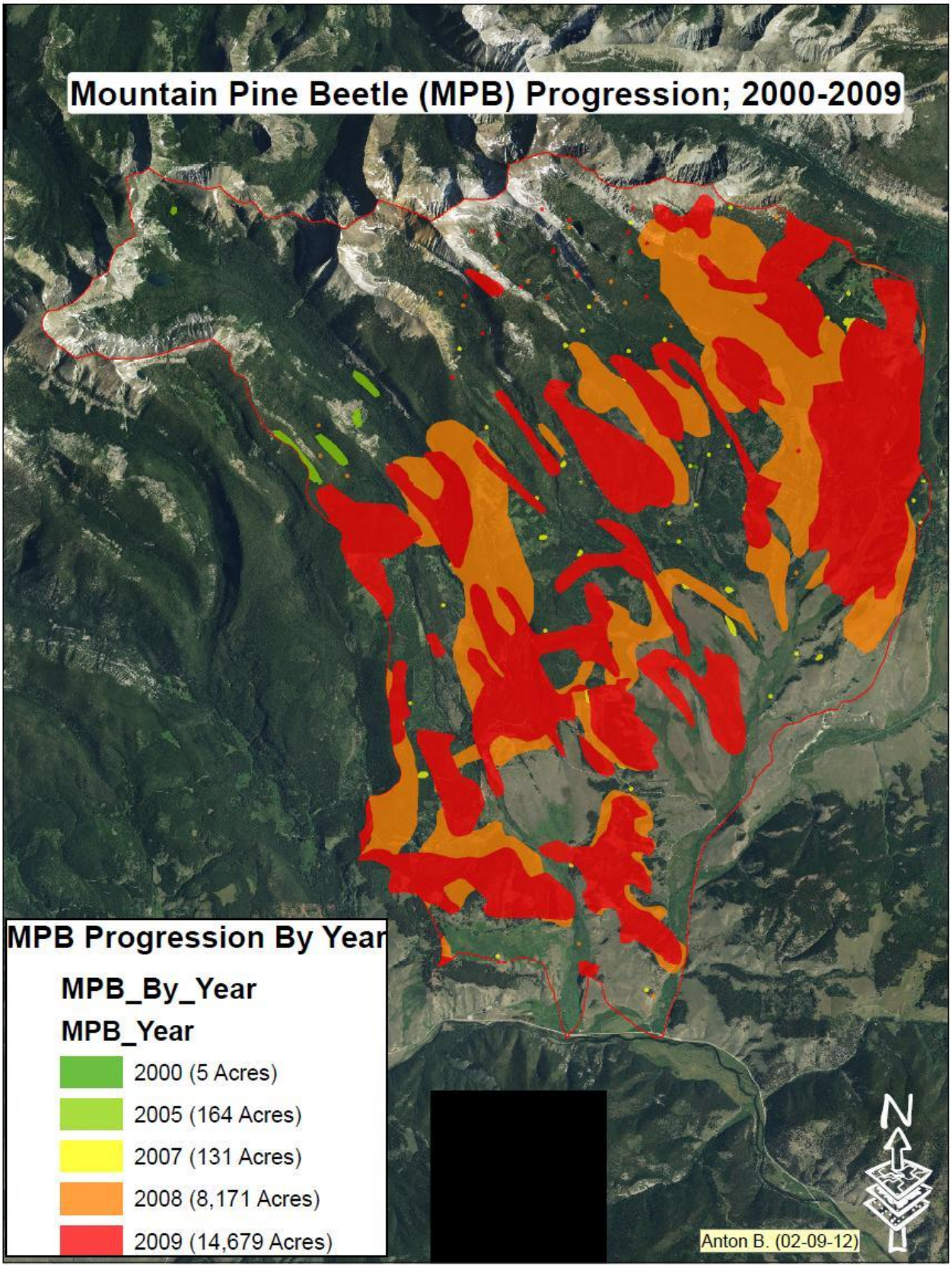

Figure 24. Mountain Pine Beetle Progression by Year.

RUSTS, FUNGI, AND MICROBES

Rusts, fungi and microbes occur throughout the Seymour - Deep Creek assessment area. The majority of these species occur at natural levels, are native to the greater ecosystem, regulate natural intra- and inter-specific competition, and are important ecosystem elements for decomposition and soil nutrient cycling. In aspen stands fungi and other microbial species kill individual trees, disrupting the stand hormone ratio that results in suckering and stand sustainability. Following conifer mortality from insect activity fungi weakens the boles of trees, resulting in an increase in downed wood that is cycled through the soil ecosystem by fungal and microbial activity.

The bulk of rust, fungi and microbes occurring in the Seymour - Deep Creek assessment area are important components of ecosystem function and structure. Alternatively, white pine blister rust is a non-native species that has negatively affected five-needle pines in the western US during a portion of its life cycle (McDonald & Hoff 2001). Limber and whitebark pines are the only five needle pines on the Beaverhead-Deerlodge National Forest with whitebark pine occurring in about 13 percent of the assessment area. This rust affects vigor and cone crops of whitebark pines, which occur at upper elevations of the watershed. In portions of the BDNF white pine blister rust has resulted in widespread mortality of whitebark pine; although a comprehensive field review of higher elevations within the Seymour - Deep Creek area has not been done, it is thought that most of the whitebark pine stands have been impacted by a combination of blister rust and mountain pine beetles.

FIRE

Fire was historically the predominant natural disturbance in the Seymour - Deep Creek watershed area and lightning ignitions largely determined where and when fires started (Agee 1993, Baker 2002, Pyne 1982); while indigenous burning is presumed to have occurred at lower elevations within the assessment area (Kimmer & Lake 2001).

Fire regimes are differentiated by the frequency, extent, severity, and timing of fire events associated with vegetation. High frequency, low severity fire regimes were historically typical of low elevation dry forests such as Douglas-fir. Senesced grass and herb communities fueled understory fires in these forests, allowing dominant conifer species to survive multiple low intensity fire events that killed seedlings and created low density stands (Heyerdahl et al. 2006). Mixed severity fire regimes historically occurred in several forest types in the region such as early seral subalpine fir forest types dominated by lodgepole pine (Arno 1980, Arno et al. 2000). With less frequent fires than those of lower elevation forests fuel loads increased and when fire spread in these forests low severity surface fire, single or clustered tree torching, and high severity crown fire were typical within a single fire perimeter. High elevation forests such as subalpine fir and whitebark pine experienced low frequency, high severity fire regimes (Agee 1993).

Fire frequency determines vegetation successional stage and fuel conditions and past fire shape and size play a role in fuel connectivity and landscape heterogeneity or homogeneity (Arno et al. 2000, Turner et al. 1998). Summer persistent snow pack in high elevation forests

historically resulted in high fuel moisture and low potential for fire spread on an annual basis; causing high fuel loading, easy fire spread from surface to crown, and canopy consumption when fire eventually occurred in these forests (Romme 1982). These trends in fire and the relationship between fire and climate in the northern Rocky Mountains existed in the distant (Heyerdahl et al. 2008) and recent past (Morgan et al. 2008). See Table 18 for prescribed fire acres within the assessment area.

Table 18. Prescribed fire totals, 1960-2010 presented in 10-year increments.

Activity	1960-1969	1970-1979	1980-1989	1990-1999	2000-2010	Total Acres
Broadcast Burning	-0-	9	36	-0-	-0-	45
Pile Burning*	-0-	**1,689	**4,715	***4,883	-0-	11,287
Underburning	-0-	-0-	-0-	290	-0-	290
Wildlife Habitat Prescribed fire	-0-	-0-	-0-	-0-	-0-	-0-
Total	-0-	1,698	4,751	5,173	-0-	11,622

*Database records display each pile burned; above acreages are piles converted to acres using:

** 1 acre=0.10 acre dozer pile

***1 acre=0.25 acre landing pile

Although a combination of disturbance factors contribute to size class distribution in forest types, the dominant disturbance factor determining size is fire when an active component, or the lack of fire with fire suppression management strategies. Below is a distribution of size classes by forest type (Table 19); the absence of fire with the past century of management strategies on Federal lands has resulted in a skewing towards larger size classes. Early seral conditions have only been created through timber harvest practices (see following section). The old growth component is within the mid- to late-seral size classes in the Seymour - Deep Creek assessment area.

Table 19. Size Class distribution, Acres by Forest Type.

Species	Size Class	Acres
Douglas-fir	Early seral - Seedling	48
	Mid seral - Pole	93
	Mid to late seral - Sawtimber	983
Lodgepole	Early seral - Seedling	6,080
	Mid seral - Pole	7,676

Species	Size Class	Acres
	Mid to late seral - Sawtimber	9,473
Mixed conifer	Early seral - Seedling	97
	Mid seral - Pole	381
	Mid to late seral - Sawtimber	2,843
Whitebark pine	Early seral - Seedling	92
	Mid seral - Pole	590
	Mid to late seral - Sawtimber	5,206

Old growth forests are distinguished by old trees and structural characteristics developed over time (Green et al 1992). An analysis of old growth as part of Forest Plan revision using FIA data was completed (Bush et al 2006). The old growth analysis was over large landscapes across the Beaverhead-Deerlodge National Forest; the results are presented for the Big Hole Landscape which includes the Seymour - Deep Creek assessment area. In the Big Hole landscape, Bush et al (2006) estimate that 13.5 % of the Forest is in old growth with a 90% confidence interval of 9.1 – 18.3%. No old growth mapping specific to the Seymour - Deep Creek Watershed Assessment area is available. Existing old growth compared to historical abundance follows the same trend as mature and older trees; the present amount of old growth is near the upper range of historical conditions. In addition, the Big Hole Landscape old growth estimate done by Bush and Leach indicates that old growth in the Big Hole is not deficient at the regional scale.

FLOODING

Flooding was likely the most significant process in riparian areas, ranging from annual floods to large events that significantly altered stream channels. Flood frequency likely varied annually in the assessment area and was highly dependent on annual snow pack properties, storm characteristics during spring (regional storm activity) and summer (localized storm activity) months, and upstream lake holding capacities.

Beaver presence and stream damming historically led to sediment impoundment and changes in channel morphology associated with flooding. This modification of the stream environment resulted in seasonal and annual water persistence in the stream channel and floodplain that facilitated surface to ground water connectivity and maintenance of riparian vegetation.

TIMBER HARVEST

Timber was harvested in the Seymour - Deep Creek watershed assessment area almost exclusively to support mining. During the period 1883-1917, several hundred million board

feet of timber were removed from the Mount Haggin area, which included a portion of the assessment area. The total area involved in this past harvest included forested lands on either side of Highway 274, along both sides of the continental divide. This included the first large scale timber sale in Region 1, when the Forest Service was established in 1906. Almost all of the harvested volume went to the Anaconda Smelter and Butte mines. Most of the wood was cut either into 8-foot mining stulls or cordwood to fire the smelter, with the remainder processed into building materials. The harvest ended in 1916, when the mills directed their logging efforts in the Georgetown Lake area. Visible signs of this past harvest include remains of the flume built to carry the material over the Continental Divide to the railroad outside of Anaconda. East of the Divide, including the assessment area, natural regeneration was successful. Later, the same acres were harvested from the natural regeneration that occurred from the earlier harvest (the trees had matured into sawlog-sized trees) with a long-term contract on private land that ran from years 1968 through 1993.

All of the current National Forest System lands within the current boundary of the Deep Creek watershed, and several sections of National Forest System lands within the Seymour Creek watershed south of the wilderness boundary were privately owned, belonging to the Mount Haggin Livestock Company, a subsidiary of the Anaconda Company. The Mount Haggin Livestock Company decided to convert their lands from coniferous forest to grazing land in the 1960's. In 1968, they entered a contract with the Northern Timber Company for a timber harvest of over 70,000 acres. In 1976, with approximately 37 million board feet (MMBF) already harvested, the Nature Conservancy purchased the property from the Mount Haggin Livestock Company. Later that same year, both the Forest Service and the state of Montana re-acquired the property, with approximately 23,000 acres going to the Forest Service and 55,000 acres to the State. However, the timber sale contract remained in effect, with Louisiana Pacific continuing on the contract from the Northern Timber Company. Harvest on State land ended in 1988, and the harvest on Forest Service land ended in 1993. The timber sale contract had very few provisions that would allow the Forest Service the administrative control of a standard Forest Service timber sale contract. With limited constraints, the logging contractors harvested extensive areas—approximately 100 million board feet over 10,000 acres—mainly through clearcut harvest methods, from 1968 until the end of the contract in 1993.

Timber harvest has declined in recent years, with the only harvest to occur in the last decade being hazard tree removal along roads and in recreation sites. The decline in timber harvest across the west can be attributed to several factors; evolving administrative and judicial interpretation of agency legal requirements, advances in scientific understanding of how ecosystems work, and shifting public attitudes concerning management priorities for national Forest lands. The Beaverhead-Deerlodge was never one of the higher producing timber forests in the Northern Region, and still is not. However, the level of timber produced by the Forest over the last 10 years (16 million board feet average) has been important in sustaining local mills. Timber harvest activities are displayed below in tables 20 and 21.

Table 20. Timber harvest acre totals, 1960-2010, presented in 10-year increments.

Activity	1960-1969	1970-1979	1980-1989	1990-1999	2000-2010	Total Acres
Clearcut	988	4,211	2,129	1,945	--	**9,273**
Sanitation	--	--	21	128	--	**149**
Selection	--	478	13	113	--	**604**
Commercial thin	184	562	79	154	--	**979**
Total:	**1,172**	**5,251**	**2,242**	**2,340**	**--**	**11,005**

*Average unit size for all harvest units is 46 acres

Table 21. Harvest unit statistics by harvest type, including total number of harvest units, total acres, and the average unit size in acres.

Activity	Total number of harvest units	Total acres	Unit Average acres
Clearcut	205	9,273	46
Sanitation	4	149	43
Selection	14	604	48
Commercial thin	18	979	44
All harvest activities:	**241**	**11,005**	**46**

Precommercial thinning has occurred on a large number of acres within the assessment area. A total of 3,963 acres has been thinned out of the 9,273 acres of past clearcut harvest, or 43% of the total past clearcut units. Many of these units are now of size that could be commercially thinned through a post and pole harvest.

2. Current Conditions

ALL VEGETATION GROUPS INTRODUCTION

DATA SOURCES

Published literature was used to describe reference conditions, identify factors contributing to change and develop desired future conditions for vegetation resources in the assessment area. Local data sources were used to identify existing conditions: Beaverhead-Deerlodge National Forest Land and Resource Management Plan Final EIS (2009); Forest Service Activity Tracking System (FACTS), an activity tracking system; and VMap, which is a multi-level geospatial database, remote sensing derived product with aerial photo interpretation

and field data collection used to determine accuracy in composition in forested and non-forested vegetation types.

EXISTING VEGETATION SUMMARY

Vegetation within the Seymour - Deep Creek Watershed Assessment area is summarized below in Table 22 and displayed with Figure 25. The specific vegetation type analysis that follows (Table 22) focuses only on National Forest System (NFS) lands acreage.

Table 22. Acres of mapped cover types.

Cover description	Acres on NFS Lands
Aspen	79
Dry grasslands, meadow	4,199
Xeric shrublands (sagebrush)	778
Mesic shrublands (willow)	2,109
Douglas-fir	1,123
Lodgepole pine	23,228
Mixed conifer (subalpine fir, Engelmann spruce)	3,323
Whitebark pine	5,888
Rock – sparsely vegetated	4,132
Water	131
Totals	**45,727**

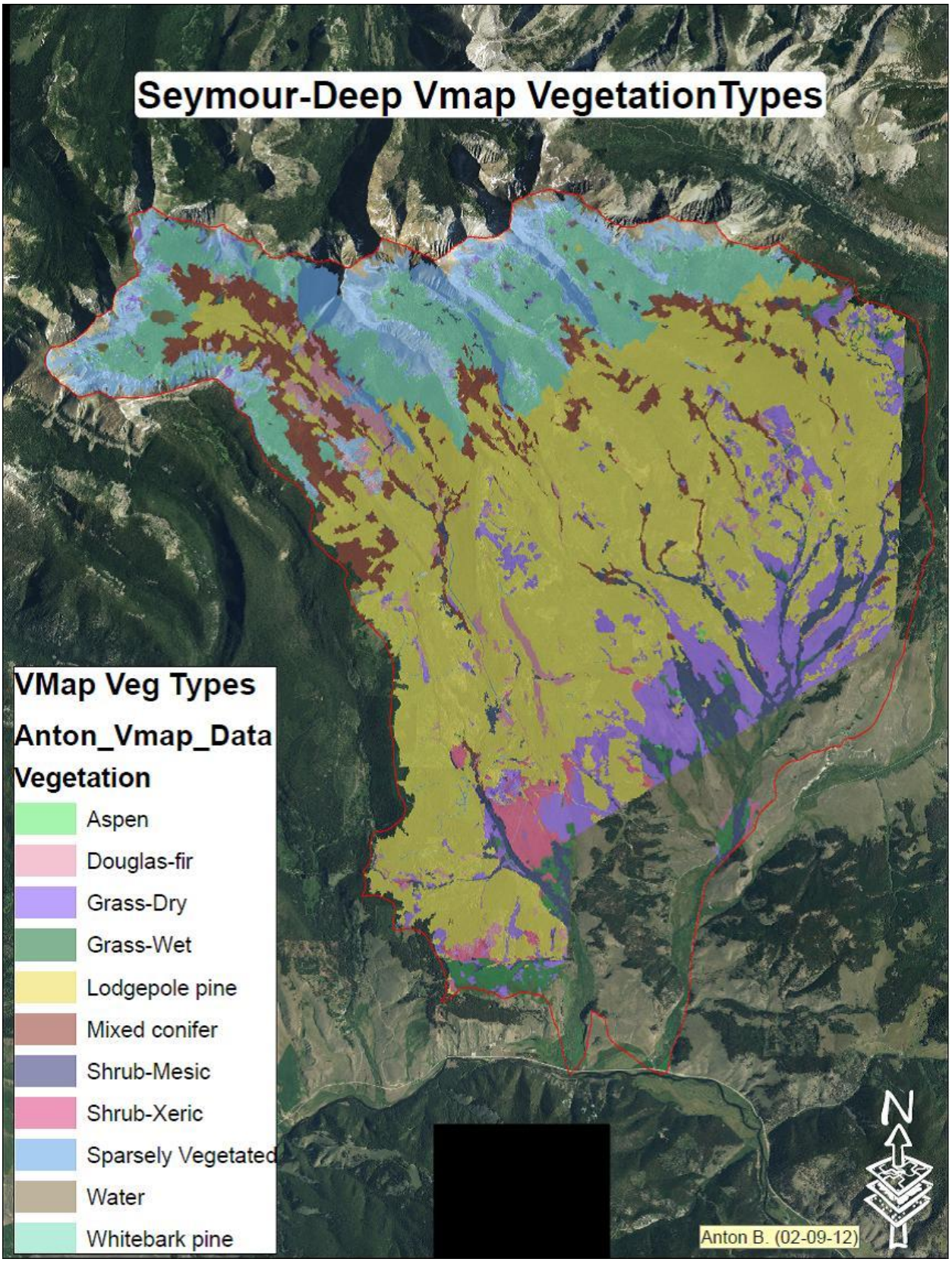

Figure 25. VMap Vegetation Types.

RIPARIAN HABITATS

The current condition of riparian habitats is of concern, and with a longer time period for data collection in the Seymour - Deep Creek assessment area, a more concise picture of historic, current and desired conditions could have been produced. The riparian habitats are discussed at length in the watershed/hydrology and aquatics sections of this watershed assessment.

ASPEN

When historical aspen distribution is compared to current aspen distribution in Montana, results suggest aspen has declined by over 60 percent (Bartos 2001). In the Gravelly Mountains, aspen declined by approximately 45 percent from 1947 to 1992 (Wirth et al. 1996). The reduction in aspen patch size and distribution in the Gravelly Mountains can be attributed to conifer expansion and disruption of fire return intervals, as well as domestic and wild ungulate grazing. Similar trends are observed in the Seymour - Deep Creek Watershed Assessment area.

Monitoring of past aspen treatments across the Forest has found that browsing is the single most inhibitor of aspen regeneration with stand replacement treatments on the Forest (USDA 2009). Beaverhead-Deerlodge NF monitoring used a treatment rating system on the BDNF (excluding Madison Ranger District) indicated that 30% of the monitored aspen treatments were successful or progressing and 70% were static or failures (USDA 2009). Adequate fencing is considered to be 100% effective in protecting aspen sprouts and saplings from browsing. Conifer clearing adjacent to and within aspen stands is considered one of the more successful treatments to enhance aspen (USDA 2009).

Decline in aspen associated with conifer competition has been well documented with research on the BDNF (Wirth et al 1996), in Montana (Steed and Kearns 2010), and for the species-wide distribution in the western United States (Bartos 2001). Within the project, informal walk-through surveys show that conifer competition and crowding out of aspen by conifers is the principle concern with aspen health and viability.

Field survey and photo interpretation indicate aspen occurs on 79 acres across the entire Seymour - Deep Creek Watershed assessment area; there are 360 small clones about 0.2 acres in size, with the largest clone 2.4 acres. There is likely more aspen that is not accounted for through surveys or visible from photos within conifer stands in the assessment area. A significant amount of aspen occurs to the north and south of the assessment area.

BIG SAGEBRUSH STEPPE AND GRASSLAND

Existing vegetation maps indicate dry grasslands occupy 4,199 acres of the Seymour - Deep Creek assessment area and sagebrush steppe accounts for 778 acres (Table 22 above). Fire exclusion and the introduction of livestock grazing to the assessment area may have shifted acres from dry grasslands to sagebrush dominated lands. Elimination of fire from the

landscape similarly increased shrub densities, fuel, and conifer presence in sagebrush steppe communities. Fire was important in the past at creating heterogeneous landscapes of Douglas-fir savannas, mountain big sagebrush and grasslands; in the continued absence of fire, these landscapes are likely to become more homogeneous as trees dominate much of the landscape (Heyerdahl et al 2006).

COOL, DRY DOUGLAS-FIR HABITATS

Along with dry grassland parks, Douglas-fir occurs in the low to middle elevations of the Seymour - Deep Creek Watershed Assessment area. Cool dry, habitats dominated by Douglas-fir is the least common occurring conifer vegetation type in the Seymour - Deep Creek assessment area (2 percent or 1,124 acres in the assessment area). In contrast to pre-settlement conditions, Douglas-fir stands in these watersheds are continuous, mid-successional, densely stocked, and establishing into sagebrush-steppe, grassland, aspen, and riparian communities. Highly dense stands of Douglas-fir have been affected by western spruce budworm.

COOL HABITATS DOMINATED BY LODGEPOLE PINE

Cool habitats dominated by lodgepole pine are the most common occurring vegetation type in the Seymour - Deep Creek assessment area (51 percent or 23,229 acres). Fire suppression management strategies have likely contributed to more homogeneous conditions than historically characterized in this area. Intraspecific competition of maturing stands coupled with drought has resulted in stand conditions susceptible to mountain pine beetle activity in the Seymour - Deep Creek area, as well as in adjacent areas on the Beaverhead-Deerlodge National Forest; mortality in lodgepole pine stands is quite severe from a current MPB epidemic (see previous discussion on MPB in this section as well as Table 17).

DRY, LOWER SUBALPINE HABITATS

Most of the mixed conifer acres in the assessment area are currently in a mid- to late seral condition, which may represent historic conditions.

COLD MOIST UPPER SUBALPINE & TIMBERLINE

Cold, moist upper subalpine and timberline habitats that are predominately whitebark pine occupy less than 13 percent (5,888 acres) of the Seymour - Deep Creek assessment area.

Significant changes to whitebark pine are occurring due to white pine blister rust and MPB (see previous discussion in this document). Although extensive field review of these upper elevations has not occurred for this assessment, it is known that significant mortality is changing stand structures in whitebark pine.

3. Reference Conditions

ASPEN

Quaking aspen (*Populus tremuloides*) is the most widespread deciduous tree species in North America (Little 1971) and has declined by 50 to 90 percent in western landscapes (Bartos 2001). Throughout its distribution, aspen exists in a diversity of landscapes and this varied existence has resulted in a similar diversity of ecological roles (Romme et al. 1992). Approximately 75 percent of all historical and current North American aspen occurs in Colorado (50%) and Utah (25%) as large stands; while in the northern Rocky Mountains, aspen historically occurred and currently exists in relatively small patches at the sagebrush steppe and coniferous forest ecotonal band (Romme et al. 1992).

Successful reproduction from seed is infrequent and episodic in western aspen, with estimated seedling establishment intervals of 200-400 years (Jelinski & Cheliak 1992). Regeneration from seed historically occurred during periods of cool climatic conditions (e.g. Little Ice Age; Tuskan et al. 1996), indicating the current rise in global average climate may not be conducive to reliance on sexual reproduction as a means of maintaining this species on western landscapes. With limited opportunities for sexual reproduction, once aspen is lost from a landscape it generally will not reestablish from seed.

Aspen is a disturbance dependent species; with fire as the primary and disease the secondary disturbance agents. Single aspen trees are typically joined by subterranean root systems, resulting in stands of genetically identical interconnected trees that are commonly referred to as clones. Reproduction is largely accomplished by suckering from underground root systems following disturbance or die back that disrupts the hormonal balance between above (trees) and below (roots) ground bodies. When trees are killed or stressed the flow of sucker suppressing hormones (auxins) from the crown is disrupted, influencing the hormone ratio in favor of sucker stimulation (via cytokinin). New trees will grow from sprouting suckers in the post-disturbance environment, if they escape browsing pressure of wild and domestic ungulates.

Historically, fire disturbances in the northern Rocky Mountains maintained stand vigor by killing or severely stressing trees and allowing for sucker production from clonal roots. High fire frequency at the steppe-conifer zone of elevation prior to European settlement in southwest Montana limited distribution of coniferous and sagebrush-steppe communities, effectively regulating competition between aspen and these adjacent vegetation types. Although aspen clones in southwest Montana were historically smaller and occupied smaller portions of the landscape than clones of Colorado and Utah, aspen clones were most likely more vigorous and larger in the past.

BIG SAGEBRUSH STEPPE AND GRASSLAND

Mountain big sagebrush (*Artemesia tridentata* ssp.*vaseyanna*) is the most common sagebrush steppe community type in the assessment area. This dominant sagebrush community type tolerates the most mesic conditions of the three different big sagebrush

communities that occur on the Forest, located at mid to upper foothill locations and in parks within coniferous vegetation, and associated with a high diversity of bunchgrasses and perennial vegetation. Sagebrush steppe community types historically included a large grass component and fire was the dominant agent of change (Heyerdahl et al 2006). In a study done in the Fleecer Mountains south of Butte (east of the assessment area) it was discovered that prior to 1855, fires occurred frequently enough in the study area to limit Douglas-fir establishment, but not so frequently that they eliminated mountain big sagebrush (Heyerdahl et al 2006).

Fire frequency and extent historically shaped the mosaic of grass and sagebrush succession that characterized sagebrush steppe landscape of the Seymour - Deep Creek assessment area prior to European settlement. Frequent fire suppressed big sagebrush and favored grass species domination most locations, while fire exclusion favored late succession sagebrush stand development and conifer expansion into sagebrush communities. Estimated fire frequency for the grassland-sagebrush mosaic was 5 to 60 years and fire extent was historically limited by fuel continuity and fire weather.

Douglas-fir

Cool, dry Douglas-fir habitat types were historically maintained by fire at mid elevations between the dry foothills and moister upper elevations. Many pre-settlement stands occurred as small, scattered stands in a mosaic of sagebrush-grasslands. Prior to European settlement, fire occurred frequently in Douglas-fir stands and limited the extent of this habitat type in the Seymour - Deep Creek assessment area. Thick bark insulated the cambium of mature individuals, providing for individual persistence and seeding onto the fire prepared seedbed. Competition between overstory and understory vegetation on droughty sites generally did not support seedling survival and regeneration; however in locations where seedling survival was high, fire likely acted as a thinning agent that allowed for stand longevity in the past (Arno & Gruell 1983; Fischer & Clayton 1983; Heyerdahl et al 2006).

Low severity and frequent fire historically maintained open stands with grassland and shrub components. Occasional associate conifer species historically occurred in cool-dry Douglas-fir stands and included Rocky Mountain juniper, lodgepole pine, Engelmann spruce, and whitebark pine in the Seymour - Deep Creek assessment area. The presence and proportion of associate plant species was historically determined by frequency and severity of fire in Douglas-fir stands of the assessment area and the successional stage of these stands at the time of fire disturbance.

In stand initiation, fire likely reduced grass cover and prepared sites for seedling establishment. Adequate seed source, germination conditions, and soil moisture combined to assist seedling establishment and even–age stand development. Fire events during this stage of stand development would have resulted in seedling mortality and regression to grassland. Stands comprised of pole-sized individuals were able to survive cool, low severity surface fires because these events thinned stands; while severe fire at this stage of stand

development would have resulted in conifer mortality and regression to grassland. Historically mature Douglas-fir stands had been exposed to these thinning events and cool, low severity surface fires entering these stands reduced fuel loads and temporarily reduced competition by removing understory vegetation. Stands in time developed into mature or old communities that were maintained by repeated exposure to cool surface fires that maintained low fuel loads. When fire weather was favorable for high severity fire in these Douglas-fir stands, or if fire had missed an area over several intervals and multi-story conditions had developed, the stand in one fire event was reverted to grassland and the successional cycle was reset (Fisher & Clayton 1983).

COOL HABITATS DOMINATED BY LODGEPOLE PINE

Cool habitats dominated by lodgepole pine were historically common in the Seymour - Deep Creek assessment area. Two habitat types represented the broader cool habitat types dominated by lodgepole pine: habitats where lodgepole pine was the climax species and occurred as pure stands prior to climax; and mixed conifer habitats where lodgepole pine was dominant in most stands. Fire disturbances historically characterized the mosaic of age classes and stand successional stages of cool habitats dominated by lodgepole pine that characterized mid to upper elevations in the Seymour - Deep Creek area. Although the thin bark of lodgepole pine as a species made stands susceptible to mortality from fire events, several key characteristics facilitated stand regeneration following fire (Fisher & Clayton 1983).

Cone serotiny historically allowed for seed storage in canopy seedbanks that were released by crown scorching and locations historically exposed to higher fire frequency historically had a higher proportion of serotonous cones than non-serotonous cones (Perry & Lotan 1979). Early and prolific seed production, highly viable seed (up to 80 years), and high seedling survival and rapid growth were historically traits that allowed for rapid regeneration following fire. Habitats characterized as mixed conifer with lodgepole pine as a dominant species were moister and supported Douglas-fir, Engelmann spruce, and subalpine fir at mid to late stages of succession. These associate conifer species lack traits that favor rapid post-fire regeneration and were typically killed or reduced in numbers during mixed-severity to high severity fire events that historically characterized high elevation forests.

Dense lodgepole pine stands dominated cool habitats, and are the most common vegetation type in the Seymour - Deep Creek area. Habitat types below 7,500 feet experienced more frequent fire than those above this elevation. At lower elevations fire perpetuated lodgepole pine by eliminating shade tolerant species from stands. Fischer and Clayton (1983) indicate that lodgepole pine dominated areas occurred in patches of 5 to 100's of acres. Lodgepole pine dominated this part of the Seymour - Deep Creek assessment area with stand replacement fires; with successful regeneration mechanisms, lodgepole pine occupied large areas with smaller amounts of other conifer species present dependent on fire patterns, frequencies and micro-habitats. This portion of the Seymour - Deep Creek area typically was single-aged and uniform in structure (Fisher & Clayton 1983). Stands older than

60 years were more dense and susceptible to increased competition, insect activity (most notably mountain pine beetle mortality) and dwarf mistletoe.

At elevations higher than 7,500 feet fire season historically was shorter due to cooler temperatures and snow pack persistence into summer months. Temperatures and productivity was lower at these locations and resulted in slower fuel accumulation, insect activity was limited, and fire potential was lower than lower elevation sites. Stands dominated by lodgepole pine above 7,500 feet elevation had a fire regime similar to subalpine fir, with fire frequency of approximately 150 years and stand replacing fire return intervals of 300 to 400 years (Romme 1980) that resulted in landscapes with a mosaic of age classes (Fisher & Clayton 1983).

Where lodgepole pine was the climax species, succession was dominated by this species regardless of fire frequency and stand structure reflected fire history. After initial succession of forbs and shrubs, a seedling/sapling stage occupied most stands and any fire during this stage of succession returned the stand to the initial species composition. Stands that were not exposed to fire matured; well stocked pole sized stands exposed to cool fires were thinned, while those exposed to moderate to severe fire reverted to the herb and shrub successional stage. Lodgepole pine stands lacking fire disturbance were dense with a large downed wood component, created through windthrow or insect associated mortality. Mature to climax stands exposed to cool fires were thinned and resulted in open, late successional stands. When lodgepole pine stands were at or near climax and exposed to fire, fuel loads and canopy spacing frequently resulted in high severity fire, stand mortality, and regeneration (Fisher & Clayton 1983).

Where habitat types were dominated by lodgepole pine but climax species were Douglas-fir, Engelmann spruce or subalpine fir, post-fire forest succession was similar to that described for pure lodgepole pine stands but understory species composition was different. Some climax species were present at the seedling stage and lodgepole dominated canopies of pole sized stands had a greater proportion of shade-tolerant climax species in the understory. Fire absence resulted in continued perpetuation of shade-tolerant climax species until lodgepole canopies were eventually overtopped. Cool fires interrupted successional development in a similar fashion described for the lodgepole climax habitat types, but these events were less frequent and of smaller extent. Moderate fires in pole and mature stands favored lodgepole by killing associate conifer species that were less fire resistant and thinning the stands. Severe fires at any stage of successional development reverted stands to the early forb and shrub state, favoring lodgepole pine as the early species in establishment (Fisher & Clayton 1983).

MIXED CONIFER: DRY, LOWER SUBALPINE HABITATS

Dry, lower subalpine habitats subalpine habitats characterized by Engelmann spruce or subalpine fir are a small percentage of the assessment area (7% or 3,321 acres). These conifer vegetation types were characterized by mixed conifer stands for stages of successional development and supported various densities of Douglas-fir, lodgepole pine, and whitebark

pine. Fire disturbances historically produced a mosaic of age classes and stand successional stages of these subalpine habitats (Fisher & Clayton 1983).

The dry, lower subalpine habitats of the Seymour - Deep Creek assessment area had a similar relationship to fire as mixed conifer stands dominated by lodgepole pine described in the previous section. Fire frequency was low for these habitats and ranged from 50 to approximately 130 years. Pole sized and mature stands that experienced cool fires were thinned and Douglas-fir was favored over the thinner barked and more flammable associate species; whereas moderate to severe fires favored lodgepole pine. Stands maturing to mature to old communities, where subalpine fir or Engelmann spruce were the dominant species and the stand had a multi-storied structure required a long fire-free period that was likely associated with cool climates or terrain variable that created favorable microsites or places that fire missed. Mature and old stands exposed to fire were commonly returned to early successional stages due to large amount of downed fuel, ladder fuel, and the fire weather conditions that were favorable to fire entering a stand and spreading through coniferous canopy.

WHITEBARK PINE: COLD, MOIST UPPER SUBALPINE AND TIMBERLINE HABITATS

Cold, moist upper subalpine and timberline habitats characterized by forested stands of predominately whitebark pine and subalpine fir historically occupied portions of the Seymour - Deep Creek assessment area. At timberline, alpine larch (*Larix lyallii*) may be present in some stands. Ground vegetation varied in species composition and percent cover, but was generally sparser than other habitats in the assessment area. Climate and soil conditions were the primary factors that historically influenced these habitats in the Seymour - Deep Creek assessment area. Windthrow, avalanches, and insect activity likely influenced stands of these habitats more in the past than fire. Despite the susceptibility to lightning, the low productivity and fuel connectivity of these sites resulted in a historically low fire frequency. When conditions facilitated fire, events were historically stand-replacing due to heavy fuel loads and fire in-tolerance of species typical of these locations (Fisher & Clayton 1983, Romme 1980).

4. Synthesis and Interpretation

The Beaverhead-Deerlodge Forest Plan (2009a) has several objectives for vegetation. These are presented here. The recommendations section (below) describes activities that would bring current conditions closer to the desired conditions (objectives) in the Forest Plan.

The Beaverhead-Deerlodge Forest Plan (2009a) has an objective of increasing aspen on 67,000 acres Forest-wide in a 10 year period. Surveys conducted in the eastern side of the Seymour - Deep Creek assessment area indicate relatively few aspen stands in upland areas contained within conifer stands.

As discussed previously, fire management practices in the last century have had a dramatic influence on Douglas-fir stand size class as well as allowing colonization of Douglas-fir in unique habitats that historically were free of conifers (dry grassland parks).

Without fire or commercial removal, and with the high levels of insects, substantial acres of FM 8 are converting to FM 10 over the next 15 years.

5. Recommendations

Aspen

The most recent monitoring report for the Beaverhead-Deerlodge National Forest found that non-stand replacement treatments such as conifer clearing adjacent to and within aspen stands are effective in stimulating long term sprouting even if browsing continues to limit growth (USDA 2009). Treatment areas can continue to exhibit dense sprouting after 25 years (USDA 2009): an effective approach is to treat many acres of aspen thereby distributing the effects of browsing over a larger number of acres. This approach allows some of the sprouting to successfully grow above browse height, effectively recruiting young growth to older aspen stands.

Site specific field reviews of aspen stands will need to be done to determine suitable stands for treatment. In general, all aspen stands in the Seymour - Deep Creek assessment area are at high risk due to either singularly or cumulatively: conifer encroachment and overtopping; browsing; and age. The overriding objective with aspen would be to treat as many acres as possible in conducive stands to ensure full vigor can be achieved.

Aspen stand vigor can be increased by removing existing conifers from around the aspen clone in upland stand sites. All aspen stand acreage in upland and riparian associated stands where access is feasible should have the conifers removed around the clones.

Big Sagebrush Steppe and Grassland

Use fire to create the mosaic of big sagebrush and grassland communities that historically occurred within the Seymour - Deep Creek assessment area. Where possible, remove the conifer succession into sagebrush steppe vegetation; this may be through a combination of mechanical means and the use of fire. Caution with treatments adjacent to major travel routes is recommended; these locations typically support noxious weeds that have a high risk of spread into disturbed natural vegetation (Sheley et al. 2002). An assurance of adequate recovery by native vegetation prior to potential exposure to non-native plants is the best alternative.

Cool, Dry Douglas-fir Habitats

The management recommendation is to push back colonization of Douglas-fir and other conifers out of sites that historically lacked the conifer. The additional management recommendation is to reduce stand densities on as many acres of Douglas-fir stands as possible. Where allowed, use timber harvesting systems on operable (ground-based to allow thinning) acres, whereby the largest trees are retained.

Achieving the objective of sustaining most of the larger, older Douglas-fir trees in a stand may only be possible if as many stands of Douglas-fir are thinned as possible. Large trees are

lacking in the assessment area, and Douglas-fir offers the best opportunity to develop this needed structure. When an increase of Douglas-fir bark beetle populations develop, stands of larger trees are attacked and become the foci for development of an outbreak. However, mortality from DFB is less in stands with lower basal areas or in thinned stands.

Cool Habitats Dominated By Lodgepole Pine

There is a need to salvage mortality in lodgepole pine created from the MPB epidemic. There is an opportunity to salvage harvest off of predominately the existing road system (some temporary road may be needed) using ground-based equipment capturing product value prior to deterioration, creating additional opportunities for land stewardship projects. Although over time, the lodgepole pine stands killed by MBP will regenerate, the downfall will create heavy fuel loading. There is an opportunity to strategically harvest in areas to break up fuel continuity and create elk and other wildlife movement corridors.

There is also an opportunity to create a strategic fuels treatment plan that would allow for fire starts to burn in portions of the Seymour - Deep Creek Watershed Assessment area to create early successional conditions. Given that a large percentage of the assessment area is roadless, the advantage of fire use management would enhance opportunities for resource benefits (i.e. to facilitate landscape heterogeneity).

Dry, Lower Subalpine Habitats

Where lodgepole pine dominates the overstory and has been attacked by MPB, there is an opportunity to salvage harvest the lodgepole pine creating stands that are early successional without heavy fuel loading. These stands would maintain a mixed conifer component with other species maintained.

There is a need to increase landscape heterogeneity by creating a patch mosaic of varying successional stands. The objective is to create early-seral conditions for the early seral species lodgepole and whitebark pine. Where commercial harvest is not available, this objective would be met through the use of fire.

Cold Moist Upper Subalpine & Timberline

A concerted effort to ensure the regeneration of whitebark pine needs to be accomplished; this is either through affirmation that natural regeneration has occurred, openings in mixed conifer stands take place to allow for natural regeneration, or planting of rust resistant stock occurs. Monitoring of whitebark pine across the BDNF indicates that natural regeneration with the ongoing overstory tree mortality associated with the MPB epidemic and existing blister rust infection-induced mortality is occurring. The most effective means for regenerating whitebark pine is to allow fire to burn in these timberline habitats when ignitions are natural. Management ignition may need to occur in strategic locations when conditions exist to promote regeneration. There is a need to conduct additional site specific inventory, mapping and analysis to implement these recommendations.

The following table summarizes the recommendations of each vegetation type within the Seymour - Deep Creek Watershed Assessment area.

Table 23. Recommendtions by vegetation type.

Vegetation Type: Action	Purpose and Rationale	Acres	Sideboards	Priority
Aspen: remove conifer competition within and adjacent to aspen clones, to improve clonal vigor.	*Restore a declining, unique component of forest vegetation to a condition more reflective of past conditions.* Aspen stands are at risk of loss due to encroachment, overtopping, browse and age. (All acres.)	79	None.	All acres with conifer competition.
Sagebrush Steppe and Grassland: reduce conifer colonization; create age diversity, to improve dry shrubland and grassland conditions.	*Restore sagebrush/grasslands to a more resilient condition reflective of natural disturbances*: Fire exclusion may have increased shrub densities and average age of sagebrush steppe communities. Conifers have colonized both grassland and sagebrush steppe communities. (All acres.)	5,000	Ensure weed spread is minimized.	All acres with conifer encroachment.
Willow: remove conifer competition within willow stands, to improve willow component.	*Improve willow conditions; remove conifer colonization and overtopping.* Fire exclusion has allowed conifers to occupy willow habitats. (All acres.)	2,000	None.	All acres with conifer competition.
Douglas-fir: reduce stand density and promote large tree development	*Increase landscape vegetative heterogeneity, species diversity and resilience:* Lack of fire has resulted in a change from open-grown stands of large diameter trees and a mosaic of different age classes and tree densities to a more continuous cover of mature trees and reduced landscape diversity. (2/3 of mid- to late-seral acres.)	600	None.	Treat as many acres as possible to enhance large tree recruitment and increase resiliency.
Lodgepole Pine: salvage mortality caused by mountain pine beetle; reduce stand densities in early to mid- seral stands	*Capture product value prior to deterioration; create opportunities for stewardship projects. Reduce stand density in early to mid-seral lodgepole pine stands to increase resilience to natural disturbances.* (1/4 of mid- to late-seral acres.)	4,000	None.	Stands that have good economic value. Stands with acceptable access, including consideration of temporary road construction.
Mixed Conifer type: increase landscape heterogeneity by creating a patch mosaic of varying successional stands	*Create early-seral conditions for early seral lodgepole and whitebark pine establishment primarily through the use of fire; forest vegetation structure provides the basis for maintaining forested ecological communities of sufficient diversity.* (2/3 of mid- to late-seral acres.)	2,000	Fuel model 10 stands.	All acres where WBP regeneration can be encouraged.
Whitebark Pine: remove other conifer species that are competing with whitebark pine; ensure	*Ensure continued presence of this keystone species in this landscape; create new opportunities for regeneration where needed (focusing on mixed conifer and/or*	5,800	Increase opportunity for WBP regeneration,	All acres where WBP can and needs to be enhanced or opportunity for

Vegetation Type: Action	Purpose and Rationale	Acres	Sideboards	Priority
regeneration of whitebark pine is occurring post-beetle and blister rust mortality.	*stands where other conifers are colonizing whitebark pine stands), or plant rust-resistant wbp where naturals are not occurring. Use prescribed or natural fire where possible.* (All acres.)		or growing space for existing WBP regeneration.	increasing WBP regeneration occurs.

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E. THREATENED, ENDANGERED, and SENSITIVE PLANTS

1. Characterization

The Beaverhead-Deerlodge National Forest is directed by the Forest Plan (2009) to maintain and restore rare plant populations and their habitat. The Seymour/Deep watershed with its varied plant communities and large elevational range provide for a diverse array of plant species. The conifer forests that cover the majority of the watershed have a fairly uniform mix of species. We find much of our species diversity tied to the open grasslands in the valley bottoms, alpine areas on the mountain peaks and the many riparian areas found throughout the drainages. The majority of our unique, limited distribution species are found in these habitats.

Threatened and Endangered Plants

There are no federally listed threatened or endangered plant species in the project area or within the boundary of the Beaverhead-Deerlodge National Forest. Therefore, federally listed plants will not be discussed in detail.

Sensitive Plants

The Region 1 Threatened, Endangered, and Sensitive Plant List for Montana (USDA Forest Service 2011) has been reviewed and those species known or suspected to occur on lands managed by the BDNF have been selected to create the Beaverhead-Deerlodge National Forest Listed and Sensitive Plant List, comprised of 39 species. Forest Service sensitive species are defined as "those plant and animal species identified by a Regional Forester for which population viability is a concern, as evidenced by: a) significant current or predicted downward trends in population numbers or density, or b) significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution" (FSM 2670.22). The list of plant species considered sensitive is based on the most current Region 1 Sensitive Plant List dated May 27, 2011 and updated on August 26, 2011.

GIS resources, including the Montana Natural Heritage Database (MNHP 2012) were reviewed to determine any known occurrences of the listed or sensitive plants within the project area.

2. Current Conditions

Of the thirty nine listed sensitive plants for the Beaverhead-Deerlodge four are known within the Seymour-Deep watersheds and seven species are known in close proximity to the watersheds but have not been found within. There are eleven other plant species found within and adjacent to the watershed that the Montana Natural Heritage Program tracks as Species of Concern(SOC) but do not currently meet the criteria for inclusion on the Forest sensitive list.

Tables 25 and 26 list the species found within and adjacent to the Seymour-Deep watersheds. In review of the preferred habitats that the sensitive and SOC plant species prefer we find them primarily high on the mountain peaks or low in the valley grasslands. Table 24 summarizes the habitat preferences of these species.

Table 24. Preferred habitats of sensitive and species of concern plant species.

HABITAT	SENSITIVE SPECIES	SPECIES OF CONCERN	TOTAL
Alpine	3	7	10
Riparian / Wetlands	1	3	4
Dry Sagebrush / Grasslands	2	1	3
Moist Grasslands / Meadows	1	0	1
Various Mesic Sites	3	0	3
Forest	1	0	1

Ten species are found along the ridges and peaks of Anaconda-Pintler Range. For two of the sensitive plant species, *Antennaria densifolia* and *Saussurea weberi*, these are the only known occurrence in the state. Many of the SOC plants need further study and inventory to determine if listing is warranted. The three sensitive species, *A. densifolia, S. weberi* and *Micranthes tempestiva* are all found on Forest Service lands in the drainage. The high elevations where these plants occur minimize any potential for threats to populations or the species as a whole. Trail construction and maintenance has the highest potential for impact to these species.

Only one of the four riparian/wetland species seems to be truly rare in the state. *Thalictrum alpinum* is known from approximately 24 sites scattered across western Montana. Most populations are small and can be threatened by hydrologic alterations. This sensitive species is not found in the assessment area. The closest known population is found seven miles north of the assessment area. The remaining species need more study to determine if listing is warranted. With further inventory additional populations will most likely be found. A unique feature of the Seymour-Deep watersheds is the abundance of small lakes, potholes and wet meadows scattered throughout the drainages at all elevations. These wetlands provide habitat for quite a diversity of plant species. Further plant inventory focused on these sites will greatly enhance our knowledge of the flora of this area. There are approximately 420 potholes and wet/moist meadows found scattered within the Seymour/Deep watersheds. These unique habitats cover only 390 acres and range from 0.05 to 11 acres in size. The very limited extent of these plant communities is inversely related to the plant diversity they bring to the area. In addition to these plant communities there are over 2000 acres of willow dominated mesic riparian areas found along the lower reaches of the streams draining these watersheds.

Of the three species that grow in the Dry Sagebrush/Grasslands only one has been found in these watersheds, *Balsamorhiza hookerii*. This species is an SOC and known only in the valley bottom on Montana Fish, Wildlife and Parks lands. All three species are larger plants and easily seen during survey work. No populations of *B. hookeri, Penstemon lemhiensis* and *Phlox kelseyi var. missoulensis* have been found on Forest Service lands in the Seymour-Deep watersheds. The limited nature of the preferred habitat for these species in the watershed and surveys to date suggest a low probability for discovering future populations on National Forest System lands. All three species can be harmed by noxious weed treatment efforts, poor livestock grazing management and heavy recreational use.

The one sensitive plant species found in the Moist Grassland / Meadows habitats, *Juncus hallii* has just recently been dropped from tracking by the Montana Natural Heritage Program. The plant is found across the mountainous portions of southwest and central Montana. Further surveys will most likely find additional populations and threats appear to be minimal. This species will be dropped from the Forest Service sensitive species list during the next update.

The three species listed for Various Mesic Sites are all species within the genus *Botrychium*. This genus is notorious for its difficulty in identification and the overall taxonomy is also in a state of transition (Ahlenslager & Potash, 2007. Anderson & Cariveau, 2004. Zika etal. 1995). No *Botrychium* have been located in the Seymour-Deep watershed but populations are known approximately two to seven miles to the north. These species are small and easily missed during plant surveys. The various species tend to like a variety of moist habitats from grasslands to road edges. Some seem to do quite well in disturbed areas. It is highly likely that further surveys focused on this suite of species will find populations within the drainage. This genus needs extra focus and inventory to better understand the various species on the Forest and across Montana. With this additional information a truer determination of their status can be made. Due to the habitats these species prefer they can be threatened by noxious weed treatments, road maintenance and recreation activities.

The one Forest habitat species found in the area is *Pinus albicaulis*, Whitebark Pine. The species has had local heavy impacts by high levels of mountain pine beetle populations and whitepine blister rust across western Montana. Within the Seymour-Deep watershed *P. albicaulis* is common. The extent of impact by pine beetle and blister rust has not been completely assessed but large continuous blocks of mortality are not evident as they are elsewhere on the Forest. The majority of mortality is in the large mature trees. Seedlings/saplings can be affected by blister rust but field surveys are showing many sites to have health numbers of young *P. albicaulis* surviving in areas where high mature tree mortality is evident. Efforts should be undertaken to reduce the impacts of management actions on this species.

Table 25. Plants of concern known within the Seymour-Deep watershed assessment area (MNHP, 2012).

SCIENTIFIC NAME	COMMON NAME	GOBLE RANK	STATE RANK	STATE RANK REASONS	FS STATUS	HABITAT
Antennaria densifolia	Dense-leaved Pussytoes	G3	S1	Known from one high elevation site in the Anaconda-Pintler Wilderness on the border of Deerlodge and Granite counties. The single occurrence is in a designated wilderness, which should protect it from most human-caused disturbance. However, it is susceptible to trail-building and maintenance activities.	SENSITIVE	Alpine
Balsamorhiza hookeri	Hooker's Balsamroot	G5	S3	Known in Montana only from the vicinity of Monida and within the Mount Haggin WMA.		Sagebrush grassland
Carex incurviformis	Coastal Sand Sedge	G4G5	S2?	Five known occurrences in Montana, three are in Wilderness areas or Glacier National Park. However, all populations are apparently small to moderate in size based on limited survey data for the species. All occurrences are in alpine habitat that is not generally subject to human impacts.		Alpine Wetland/ Riparian
Draba crassa	Thick-leaf Whitlow-grass	G3	S2S3	Scattered across southwest Montana where it is known from alpine slopes in several mountain ranges. Overall abundance and distribution is still poorly known, though it is likely to be more common than collections indicate.		Alpine
Eriogonum capistratum var. muhlickii	Muhlick's Buckwheat	G4T3	S3	Rare to Uncommon. This entity is restricted to high elevation sites in the Bitterroot Range and in the Anaconda-Pintlers, where it may be locally common in some areas. Good population data are lacking for most occurrences, though it's long-term viability does not appear to be a major concern at this time due, in part, to the remoteness of its habitat.		Alpine

SCIENTIFIC NAME	COMMON NAME	GOBLE RANK	STATE RANK	STATE RANK REASONS	FS STATUS	HABITAT
Micranthes tempestiva	Storm Saxifrage	G2	S2	State endemic known from approximately a dozen extant sites in southwest Montana. The high elevation habitat of the species in conjuction with approximately half of the populations in designated wilderness areas minimize the potential for negative impacts to the species.	SENSITIVE	Alpine
Pinus albicaulis	Whitebark Pine	G4	S2	Whitebark pine is a common component of subalpine forests and a dominant species of treeline and krummholtz habitats. It occurs in almost all major mountain ranges of western and central Montana. Populations of whitebark pine in Montana and across most of western North America have been severely impacted by past mountain pine beetle outbreaks and by the introduced pathogen, white pine blister rust. The results of which have been major declines in whitebark pine populations across large areas of its range. Additionally, negative impacts associated with encroachment and increased competition from other trees, primarily subalpine fir have occurred as a result of fire suppression in subalpine habitats.	SENSITIVE	Subalpine forest, timberline
Polystichum kruckebergii	Kruckeberg's Swordfern	G4	S1	Sparsely distributed across western Montana on alpine and subalpine cliffs and talus slopes. Very little data are available for the locations in Montana, though the habitats occupied by the species are not generally impacted by human activities or disturbance.		Alpine
Ranunculus hyperboreus	High-arctic Buttercup	G5	S3	Known from several southwest and south-central counties in Montana. May be more widespread and abundant than the current collections indicate. Additional review and data collection is needed to determine if Species of Concern status is warranted.		Wetland/ Riparian (Montane)

SCIENTIFIC NAME	COMMON NAME	GOBLE RANK	STATE RANK	STATE RANK REASONS	FS STATUS	HABITAT
Salix cascadensis	Cascade Willow	G4G5	S2	Rare in Montana. Species is known in Montana only from a small area of the Anaconda-Pintlers. The remote, high-elevation habitat should greatly minimize the potential for any negative impacts to the viability of the species in the state. Accurate estimates of population levels are lacking.		Alpine
Saussurea weberi	Weber's Saw-wort	G2G3	S2	Known from one large occurrence in the Anaconda-Pintler Range in the alpine zone. The remote, high-elevation habitat should greatly minimize the potential for any negative impacts to the viability of the species in the state. Population estimates from the single, documented occurrence vary widely. Additional population data are needed.	SENSITIVE	Alpine
Selaginella selaginoides	Low Spike-moss	G5	S2S3	Rare in Montana, where it is known from a few occurrences from the southwest portion of the state. Little survey data are available for known occurrences.		Wet, mossy soil (montane/ subalpine)

Table 26. Plants of concern known adjacent to the Seymour-Deep watershed assessment area (MNHP, 2012).

SCIENTIFIC NAME	COMMON NAME	GOBLE RANK	STATE RANK	STATE RANK REASONS	FS STATUS	HABITAT
Botrychium crenulatum	Wavy Moonwort	G3	S3	This moonwort species is known from numerous observations in western Montana. Most populations are located on either National Forest or State lands. Populations are generally small in size and occupy roadsides or other similarly open or disturbed habitats. As such, it is vulnerable to activities such as weed invasion, weed spraying and road maintenance.	SENSITIVE	Various Mesic Sites
Botrychium hesperium	Western Moonwort	G3G4	S3	This moonwort species is known from 25-30 extant sites in western Montana, almost all are in Glacier National Park or on National Forest lands. Many sites are poorly documented in terms of population size or are small in size, though several sites have been observed with >100 plants. Many populations occur on roadsides or other similarly open or disturbed habitats. As such, the species is vulnerable to activities such as weed invasion, weed spraying and road maintenance.	SENSITIVE	Various Mesic Sites
Botrychium paradoxum	Peculiar Moonwort	G3G4	S3	This moonwort species is known to occur in western Montana from over two dozen extant occurrences, almost all of which are on federally-managed lands. Many occurrences are small in size and occupy mesic meadows and bunchgrass communities. Potential impacts to these sites include livestock grazing, weed invasion and recreational uses. Though some threats exist to individual occurrences, the species as a whole is not highly threatened by any single or combination of potential impacts in the state.	SENSITIVE	Meadows (Mesic Montane/Subalpine)

SCIENTIFIC NAME	COMMON NAME	GOBLE RANK	STATE RANK	STATE RANK REASONS	FS STATUS	HABITAT
Carex stevenii	Steven's Scandinavian Sedge	G4?	S2?	Rare in Montana, where it is currently known from a few scattered sites in mountainous areas across the southern half of the state. Additional data on population levels are needed. Survey of suitable habitats will likely document additional occurrences.		Wetland/ Riparian (Subalpine)
Juncus hallii	Hall's Rush	G4G5	S4	Rare, though widespread across the mountainous portions of southwest and central Montana. Threats and potential negative impacts to most known occurrences appear to be minimal. Removed from the SOC list 3/12/2012.	SENSITIVE	Parklands (Subalpine) Moist Meadows/ Slopes
Kobresia simpliciuscula	Simple Kobresia	G5	S3	Rare in Montana, where it is known from over a dozen sites from montane wetlands to mesic, alpine tundra. The species has a wide distribution and is scattered across the mountainous portion of the state.		Alpine
Penstemon lemhiensis	Lemhi Beardtongue	G3	S3	Penstemon lemhiensis is a regional endemic that occurs only in southwest Montana and adjacent Idaho. There are numerous occurrences in Beaverhead and Ravalli Counties with a few additional occurrences located in Deer Lodge and Silver Bow Counties in Montana, but most are small to moderate in size. The number of plants in Montana is estimated at approximately 10,000 individual plants based on recent survey efforts. Plants occur on a mix of federal, state and private ownerships with National Forest lands supporting the majority of the occurrences. The species is primarily sensitive to negative impacts associated with drought conditions and fire suppression, both of which are believed to have played a significant role in the	SENSITIVE	Sagebrush grasslands

SCIENTIFIC NAME	COMMON NAME	GOBLE RANK	STATE RANK	STATE RANK REASONS	FS STATUS	HABITAT
				species' decline. Additional impacts to populations are occurring from noxious weed invasion, primarily spotted knapweed in the Bitterroot region. Heavy livestock grazing also negatively impacts the species. Several occurrences are found adjacent to roadsides and thus may be impacted by activities associated with road construction, maintenance and use.		
Phlox kelseyi var. missoulensis	Missoula Phlox	G2G3	S2S3	Missoula phlox is a state endemic known from over 2 dozen occurrences in west-central Montana, most of which are moderate to large-sized. Populations occur on a mix of ownerships, including private lands which host several occurrences. The Waterworks Hill population is infested with several noxious weeds and heavy recreational trail use also occurs within the occupied habitat. Other populations appear to be at much less risk though some impacts from invasive weeds, recreational use and development are possible.	SENSITIVE	Slopes/ ridges (Open, foothills to subalpine)
Ranunculus grayi	Arctic Buttercup	G4G5	S2	Also includes R. verecundus which was formerly tracked as a separate Species of Concern.		Alpine
Thalictrum alpinum	Alpine Meadowrue	G5	S2	Rare in Montana, where it is known from approximately two dozen sites mostly on public land. Its habitat is vulnerable to hydrological alteration. Grazing can be beneficial, except where it leads to stream downcutting and loss of riparian habitat.	SENSITIVE	Wetland/ Riparian

3. Recommendations

- Initiate or increase field surveys for sensitive and SOC plant species across the watershed. Efforts should be made to compile full species lists for all vascular and non-vascular plant species in the drainage and across the Forest.
- Focus field surveys toward *Botrichium* species and riparian habitats.
- Where possible develop cooperative agreements with local and regional universities/colleges to assist in field surveys and research to better understand the flora of the Forest.
- Ensure field crews, especially noxious weed and trail crews have training covering sensitive plant identification. Training should provide them understanding as to the reasons for using alternative control methods or project design changes to avoid damaging these unique species.
- Ensure all ground disturbing activities adequately revegetate. Rely on native soil seed bank where possible. If direct seeding is required use only native plant materials and ensure all seed mixtures are certified noxious weed seed free.

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F. INVASIVE SPECIES

1. Characterization

The establishment and spread of invasive species is considered one of the four top threats to National Forest system ecosystem health. This concern is echoed in the Montana Weed Management Plan completed in 2008. Invasive plants currently infest over 8.2 million acres in Montana. The Beaverhead-Deerlodge National Forest has approximately 43,000 acres of inventoried noxious weed infestations currently. The threat invasive plants pose to native plant communities, crop land, riparian areas, city parks and peoples yards has been well documented.

The terms "weeds", "noxious weeds', "invasive species", and "invasive plants" are used synonymously throughout this report. We define invasive plants as any non-native plant, which when established is or may become destructive and difficult to control by ordinary means of cultivation or other control practices. Noxious weeds, on the other hand, are those plants that are legally listed by a state or county. Currently there are 29 terrestrial and three aquatic plant species on the Montana Noxious Weed List. In addition seven other invasive species are listed as noxious weeds by individual counties in southwest Montana, see Table 27.

The 2009 Beaverhead-Deerlodge National Forest Land and Resource Management Plan states the goal for noxious weeds is: "Prevent, reduce or eliminate infestations of non-native or noxious weed species……" The management of noxious weeds is through direction provided in a variety of documents, primarily the 2002 Beaverhead-Deerlodge National Forest Noxious Weed Control Environmental Impact Statement and Record of Decision, Best Management Practices found in Forest Service Manual 2900 and special orders such as the requirement for use of certified weed seed free forage products. Integrated pest management is the overarching design to the control program. A variety of control methods are used from manual, chemical and biological to reduce noxious weed infestations. Prevention is a key component of the noxious weed management program. Eliminating or reducing the introduction of new weeds through transportation of seeds or other plant propagules is the most cost effective means of controlling noxious weeds.

Invasive plants can substantially alter the composition of native plant communities resulting in decreases in habitat quality for wildlife, reduced forage for livestock, increased erosion and increased sediment levels in streams, and decreases in aesthetic/recreational quality of wild lands (Sheley and Petroff 1999).

Plants have a host of mechanisms for dispersal. Wind, water, animals both domestic and wild along with people can help in the movement of weed seeds from place to place. In addition wheeled motorized vehicles have the potential to spread noxious weeds. Some plants have evolved specific physical traits that allow them to expel their seeds from the pod a significant distance from the parent plant. Other plants may grow from vegetative fragments such as roots, stems or foliage.

Once introduced into an area, a weed's ability to spread depends on its physiology and whether this physiology can take advantage of the local soil characteristics and other site conditions such as sunlight, and moisture. Every plant species has evolved strategies to best ensure its establishment and survival in a plant community. While some plants require bare mineral soil to germinate and grow others may establish in heavy litter and competition from surrounding individuals. Ground disturbance provides an advantage for many weed species. Those plant species that produce massive amounts of seed and grow from tap or fibrous root systems tend to do best in these situations. Plants that have deep rhizomatous root systems generally do not need ground disturbance to spread. One leafy spurge plant may have roots that grow over 15 feet in length in a season and have been found to have roots over 30 feet long.

Wheeled motor vehicles, cars, trucks, ATVs, UTVs and motorcycles can be vectors of weed spread. The number of weeds seeds per vehicle can vary substantially. This variability may be associated with characteristics such as the season, whether the vehicle had been driven on paved or unpaved roads and the general maintenance of the vehicle (Clifford 1959; Lonsdale and Lane 1994; Hodkinson and Thompson 1997). One study found that vehicles driven several feet through a spotted knapweed infestation can accumulate more than 2,000 seeds, and ten percent of the seeds remained on the vehicle ten miles from the infestation site (Sheley and Petroff 1999, page 69).

Research has shown that motorized vehicles tend to have a greater capacity for spreading weeds than non-motorized vehicles (Tyser and Worley 1992). However, except for Londale and Lane's study, there are no data that show different types of motorized vehicles spread weeds at different rates. For example, ATVs are not shown to spread more weeds than snowmobiles, or pick-up trucks. Two studies looked at the type of route (primary, secondary roads, and non-motorized trails) in relation to the abundance of weeds. Gelbard and Belnap (2003) concluded that paved roads had more weeds than gravel roads or two-track roads in Utah's Canyonlands National Park. They determined the process of constructing paved roads disturbed more land (23 feet each side of the road) than the two-track road (3 feet). A similar study in Glacier National Park (Tyser and Worley 1992) found spotted knapweed and yellow toadflax along primary and secondary roads but not along backcountry (non-motorized) trails. Also, weed abundance was higher within the first 25 meters than at 100 meters, suggesting that the roads were the primary source for weed dispersal.

Table 27. State of Montana Noxious Weed List.

Priority 1A	These weeds are not present in Montana. Management criteria will require eradication if detected; education; and prevention. - Yellow starthistle (*Centaurea solstitialis*)
Priority 1B	These weeds have limited presence in Montana. Management criteria will require eradication or containment and education. - Dyer's woad (*Isatis tinctoria*)

	- Flowering rush (*Butomus umbellatus*) - Japanese knotweed complex (*Polygonum spp.*) - Purple loosestrife (*Lythrum spp*.) - Rush skeletonweed (*Chondrilla juncea*) - Eurasian watermilfoil (*Myriophyllum spicatum*) - Scotch broom (*Cytisus scoparius*) - Curlyleaf pondweed (*Potamogeton crispus*)
Priority 2A	These weeds are common in isolated areas of Montana. Management criteria will require eradication or containment where less abundant. **Management shall be prioritized by local weed districts.** - Tansy ragwort (*Senecio jacobaea*) - Meadow hawkweed complex (*Hieracium spp*.) - Orange hawkweed (*Hieracium aurantiacum*) - Tall buttercup (*Ranunculus acris*) - Perennial pepperweed (*Lepidium latifolium*) - Yellowflag iris (*Iris pseudacorus*) - Blueweed (*Echium vulgare*) - Hoary alyssum (*Berteroa incana*)
Priority 2B	These weeds are abundant in Montana and widespread in many counties. Management criteria will require eradication or containment where less abundant. **Management shall be prioritized by local weed districts.** - Canada thistle (*Cirsium arvense*) - Field bindweed (*Convolvulus arvensis*) - Leafy spurge (*Euphorbia esula*) - Whitetop (*Cardaria draba*) - Russian kapweed (*Centaurea repens*) - Spotted knapweed (*Centaurea stoebe* or *maculosa*) - Diffuse knapweed (*Centaurea diffusa*) - Dalmatian toadflax (*Linaria dalmatica*) - St. Johnswort (*Hypericum perforatum*)

	- Sulfur cinquefoil (*Potentilla recta*) - Common tansy (*Tanacetum vulgare*) - Oxeye daisy (*Chrysanthemum leucanthemum or Leucanthemum vulgare*) - Houndstongue (*Cynoglossum officinale*) - Yellow toadflax (*Linaria vulgaris*) - Saltcedar (*Tamarix spp.*)
Priority 3	Regulated Plants: (NOT MONTANA LISTED NOXIOUS WEEDS) These regulated plants have the potential to have significant negative impacts. The plant may not be intentionally spread or sold other than as a contaminant in agricultural products. The state recommends research, education and prevention to minimize the spread of the regulated plant. - Cheatgrass (*Bromus tectorum*) - Hydrilla (*Hydrilla verticillata*)
County Listed Species	These plant species were added by local County Weed Districts. **Management shall be prioritized by local weed districts.** - Field scabious (*Knautia arevensis*) - Yellow toadflax (*Linaria vulgaris*) - Musk thistle (*Carduus nutans*) - Black henbane (*Hyocyamus niger*) - Burdock (*Actium minus*) - Common mullein(*Verbascum thapsus*) - Bull thistle (*Cirsium vulgare*)

2. Current Conditions

Field surveys and mapping for noxious weeds have been ongoing since the mid 1980's on the Wise River Ranger District which includes the Seymour/Deep watersheds. Limited weed infestations have been located over the years. Inventories completed during the summer of 2011 continue to find limited noxious weed establishment. Of the thirty six Montana state noxious weed species only five were found in the analysis area. The five include spotted knapweed, oxeye daisy, musk thistle, houndstongue and Canada thistle. All infestations were relatively small with low density of invasive plants, see Table 28.

Table 28. Seymour-Deep Noxious Weed Inventory on National Forest System Lands.

Species	Acres	Number of Infestations	Minimum Size	Maximum Size
Canada thistle	2.1	12	0.01	0.9
Houndstongue	0.1	1	0.1	0.1
Musk thistle	0.1	1	0.1	0.1
Oxeye daisy	0.9	4	0.1	0.7
Spotted knapweed	0.25	7	0.01	0.1
Total	**3.45**			

Additional infestations of these weeds are found on Montana Fish, Wildlife and Parks (FWP) lands within the watershed. The inventory was by no means exhaustive and additional sites may be found in the future but it is unlikely any large, extensive infestations were missed. The private lands and bulk of the FWP lands were not inventoried with this effort. Almost all infestations are located along existing roads with a few having been able to establish some distance away from the road surface, see Figure 26.

All five known noxious weeds found in the watershed are state Priority 2B species or a county addition. All are abundant and widespread throughout the state. Management of these species is prioritized through coordination of the local weed management districts. If we were to just focus on the Seymour/Deep watershed we would adjust the ranking for the five weed species. Oxeye daisy, houndstongue and musk thistle would rank as a Priority 1B. These species are found only in a few sites in the watershed and all efforts should be made to eradicate the infestations. Spotted knapweed is on the break between a Priority 1B and 2A rank. There are still a limited number of infestations in the area but additional, larger infestations are known just outside the watershed. Efforts should be made to eradicate the known sites in the watershed and coordinated control work should be done on those infestations found to the east of the area. Canada thistle would rank as a solid priority 2A. The number and distribution of the infestations in the watershed limit management success. Containment is the logical management strategy for this species.

The limited extent of noxious weed infestations in the watershed can be attributed to two primary factors. First and foremost are the native vegetation communities that develop in the area due to the combination of geology, climate and topography, primarily closed canopy forest. The second factor relates to past and current weed management activities. The noxious weed species found in the watershed and those others that are found close by in adjacent watersheds predominantly prefer drier open plant communities. When reviewing the current weed inventory almost all known infestations are found on the lower third of

watersheds. This corresponds to lower elevations and drier conditions. Most of the infestations are found along existing roadways and within past timber harvest units.

In recent years, computer models have been completed to analyze the risk of noxious weed infestation. These risk analysis use a combination of weed plant characteristics, susceptibility of native plant communities and existing weed infestations to rate plant communities' potential for weed invasion. Two weed risk assessments were completed that cover the Seymour/Deep watersheds. The first was completed in conjunction with the 2002 Beaverhead-Deerlodge National Forest Noxious Weed Control EIS. This analysis covered all lands within the Beaverhead-Deerlodge National Forest boundary. The analysis looked at all noxious weed species and the existing plant communities found on the Forest to rank the potential for noxious weed establishment. The second analysis was on a much larger scale and covered the western two thirds of Montana and northern Idaho (Cohesive Strategy Team 2003). This analysis was similar to the first but completed the risk assessment by weed species. The modeling also looked at disturbance potential and how it affects potential weed risk.

In review of the modeling exercises both show similar trends. The Seymour/Deep watersheds generally have low risk for weed invasion. The weed risk completed by the Cohesive Strategy Team for spotted knapweed provides an average for the area, see Figure 27. Under current conditions seventy five percent of the watershed rates as "No" or "Low" weed risk for spotted knapweed. When disturbance is taken into consideration the only change in weed risk is primarily a shifting of the "No Risk" areas into a "Low Risk" scenario. The amount of "High Risk" communities does not change between the two scenarios. High risk communities in the drainage for spotted knapweed are the lower elevation open grasslands and dry Douglas fir hillsides. Current noxious weed inventories support the finding from the weed risk modeling.

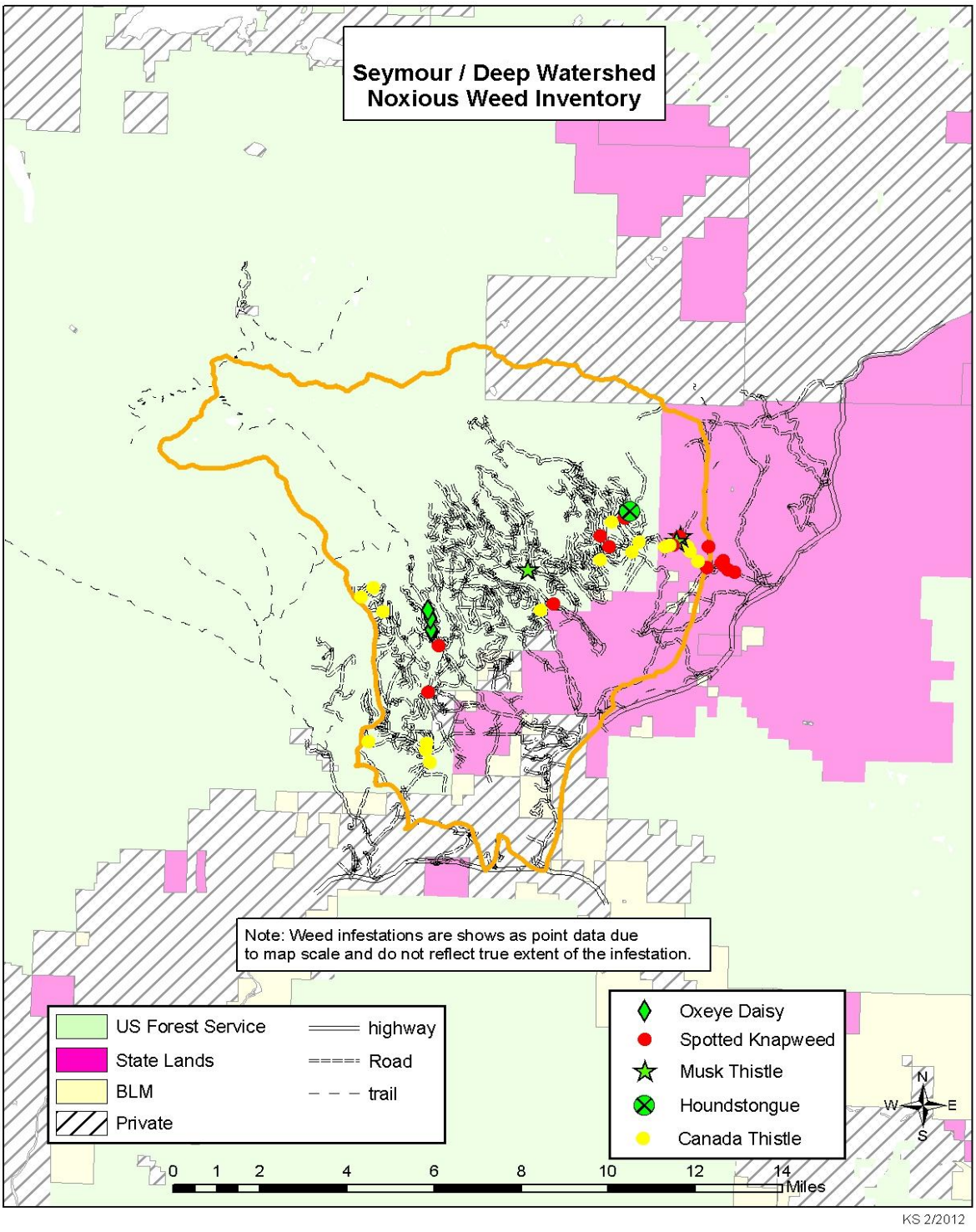

Figure 26. Map showing the noxious weed inventory within the Seymour-Deep assessment area.

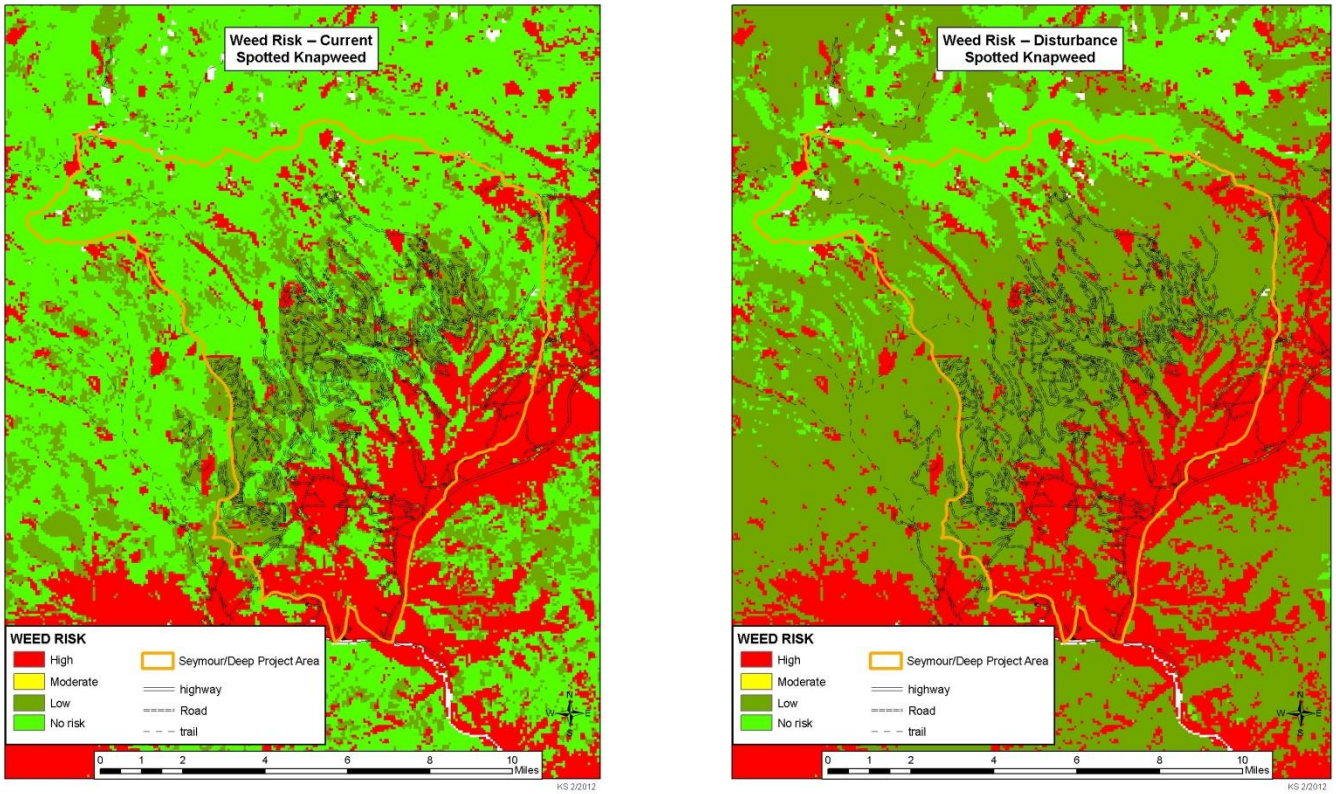

Figure 27. Comparison between Current and Disturbance Weed Risk Scenarios for Spotted Knapweed (Cohesive Strategy Team 2003).

An interesting point that stands out in these watersheds when considering noxious weed establishment and spread is the significant lack of noxious weed infestations in an area with a history of very high ground disturbance tied to road building and timber harvest. On National Forest lands in the watershed over 330 miles of road have been constructed and a little over 11,000 acres of timber harvested since the 1960's. This disturbance history and the current very low level of noxious weeds run contrary to most current weed management literature. Current research generally equates ground disturbance, i.e. open or bare ground, with providing the perfect setting for noxious weed establishment. For noxious weeds to establish and expand they must first have a seed transported into a site and then the site must provide all the needed characteristics in soil, water, light, temperature and reduced native plant competition to allow the seed to germinate and the seedling to thrive. Noxious weeds generally have a very wide range of tolerances to different site characteristics making them able to establish a foot hold and then out complete the native plants.

The higher elevation and wetter conditions found in the Seymour/Deep watersheds allow for the development of fairly dense forest communities. Even when disturbed these conditions allow vigorous growth of the native forb and shrub species thereby maintaining a plant community able to compete with introduced exotic weeds. Noxious weeds can and have found their way into the watershed but have only been able to establish in the harshest of sites, primarily road edges. There are state listed noxious weeds that may compete better

with the native plant communities of the watershed but these species have not been found in southwest Montana. Ground disturbance or manipulation of the vegetation, i.e. timber harvest and wild or management fires do not directly equate to increase in noxious weed infestations.

Future climate changes may bring about a warming and drying of the region. These changes may make current plant communities more susceptible to noxious weed invasions. In addition the increasing global trade in nursery plants continually exposes the nation to new potential invasive species (Bradley et al. 2012). Prevention is the key to keeping areas weed free. A national, state and local effort is needed to stay on top of potential new invaders.

The Wise River Ranger District has had an aggressive noxious weed control program for over 30 years. Coordination between the District, County Weed Districts, Montana Fish, Wildlife and Parks, Bureau of Land Management and many local individuals through the Big Hole Weed Management Group have successfully reduced weed infestations in the area and increased noxious weed awareness to help prevent further introduction and spread of new invaders. These efforts will need to continue into the future to maintain the area in its relatively noxious weed free state. A coordinated Early Detection Rapid Response (EDRR) program would not just benefit the Seymour/Deep watershed but the entire Wise River District and Beaverhead-Deerlodge Forest.

The Seymour/Deep watersheds can generally be categorized essentially as a newly invaded area. This is not to suggest that the current weed infestations have only just established but to highlight that with a minimal amount of effort the current infestations could easily be eradicated. Recent research looked at various weed management programs with extent and size of infestations to determine the optimal strategy for noxious weed control (Frid et.al 2011). In large landscapes with limited weed infestations, efforts should focus first on treating all small and remote sites and then move toward larger weed acres as budgets allow. These treatment strategies for existing weed infestations and along with an operational EDRR program provide the highest success in reducing current weed infestations.

All known weed infestations in the watershed are quite small and can easily be controlled. In fact four of the five weed species present in the drainage infest such small acreage that eradication is the desired weed control strategy. All Oxeye daisy, houndstongue, musk thistle and spotted knapweed infestations should be treated as a minimum twice during the growing season. This could be accomplished with minimal effort. If additional weed management funds are available then the Canada thistle infestations could be treated. No treatment of this species will in all likelihood have little effect on its overall coverage. As the past timber harvest units continue to develop many of these weed sites will become overly shaded negatively affecting the thistle vigor.

3. Recommendations

- Continue existing cooperative management of noxious weeds in these watersheds with help from other agencies, organizations, and individuals.

- Increase emphasis on weed prevention education. All district personnel should be trained in noxious weed identification. Implement an Early Detection Rapid Response plan for new invaders and new infestations of existing noxious weeds. Continue requirement of certified weeds seed free forage for all users of the National Forest Lands.
- Ensure all ground disturbing activities adequately revegetate. Rely on native soil seed bank where possible. If direct seeding is required use only native plant materials and ensure all seed mixtures are certified noxious weed seed free.
- All heavy equipment used in the area must be cleaned, including undercarriage and inspected prior to entering Forest Lands.
- Increase weed control activities in the area to move toward eradication of the oxeye daisy, houndstongue, musk thistle and spotted knapweed infestations. Canada thistle infestations should be managed under a containment strategy.

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G. WILDLIFE

1. Characterization

Wildlife is a product of the land (MDFWP 1971), reflected in part, by the habitat available on the landscape. In the largest sense, habitat consists of inorganic substrate, space, landform, water, forage and shelter; the latter three are driven by climate. Forage and cover are both characteristics reflected by vegetation and influenced by disturbance processes. Wildlife habitat is integrally tied to vegetation cover types, structural classes and condition. All vegetation management activities impact wildlife habitat.

Coarse filter analysis assumes that managing for suite of desired ecological conditions of sufficient size, composition, structure and distribution can maintain the viability of the majority of wildlife species in a particular area (USDA 2003). Coarse filter analyses generally form the basis for the development of management recommendations to maintain or restore ecological communities of sufficient size, composition, structure, and distribution such that the viability for the majority of all species will be maintained (Hunter et al. 1988 *in* USDA 2003).

The vegetation and fire resource sections of this report form the coarse filter analyses. The wildlife habitat discussion in the *Current Condition* section focuses on habitats or vegetation types of concern in this watershed which surfaced through the coarse filter look at vegetation and habitats.

There are species, however, that because of species rareness or elevated human value, warrant individual analysis. This is the "fine filter" approach. The fine filter analysis includes threatened, endangered, sensitive (TES) and management indicator species (MIS).

Table 29. Land Management within the Seymour-Deep Watershed Assessment Area.

Ownership	Seymour Creek Watershed acres	Deep Creek Watershed acres	TOTAL Acres
National Forest	16,950	19,855	36,805
BLM	550	996	1,546
Montana FWP (Mt. Haggin WMA)	1,502	8,108	9,610
Private	2,144	4,471	6,614
Water	--	23	23
TOTAL	**21,146**	**33,452**	**54,599**

The Seymour-Deep assessment area provides a wide variety of diverse habitats for a wide variety of wildlife species. The vegetation section of the wildlife analysis describes in detail the habitat types mapped throughout the assessment area. Table 30 displays a screen for current TES and MIS that are known or suspected to occur in the Seymour-Deep area.

The analysis area is known to provide or could provide year-round habitat for a number of MIS and Region 1 sensitive species. This information was compiled from Forest Service Data (NRIS Wildlife and data from the 2009 Revised Forest Plan), the Montana Natural Heritage Program Database (http://mtnhp.org/Animal/) and local knowledge. Table 30, below, displays wildlife species considered for the Seymour-Deep watershed assessment area.

Table 30. TES, MIS and other wildlife species considered for presence in the Seymour-Deep Assessment Area.

Species	2011 Status	Habitat Preference	Status Of Habitat or Species in Assessment Area	Species Carried Forward in Assessment?
Grizzly bear	Threatened	Habitat generalist. Lack of human disturbance.	This species is not known to occupy the project area. Individuals however, have been observed near the project area. These bears are dispersing from the Northern Continental Divide Ecosystem population of grizzly bears. As the number of bears in the NCDE increases and bears continue to move south, there is a relatively high potential for the Anaconda range to become occupied by resident grizzly bears within the next 10 years due to the spatial extent of available habitat and potential denning habitat in the AP Wilderness.	No, due to the current lack of confirmed occupancy in the assessment area
Peregrine Falcon	Sensitive	Prominent cliffs for nesting within 1 mile of water and 10 miles of hunting habitat including riparian areas, parklands, and mountain valleys.	The assessment area does not contain nesting habitat for this species. There is, however, potential nesting habitat to the north in the Anaconda Mtns, and the riparian areas in the area may be foraging habitat for this species. The peregrine falcon has not been documented in the assessment area.	No, due to the lack of presence and habitat in the assessment area
Gray Wolf	Sensitive	Habitat generalists. Lack of human disturbance (corresponding to low road densities and secure areas), abundant prey (primarily elk) required.	Two wolf packs are known to use the area.	No. Impacts to gray wolves are unlikely from forest management actions.

Species	2011 Status	Habitat Preference	Status Of Habitat or Species in Assessment Area	Species Carried Forward in Assessment?
Bald Eagle	Sensitive	Nesting trees/platforms near an open water body (> 80 acres) or major river system; available fish and water bird species prey near nesting habitat; forages on carrion in winter or during spring/fall migration.	Species not known or suspected in the assessment area. Nesting habitat does not occur on NFS lands in assessment area.	No, due to the lack of presence and habitat in the assessment area
Elk	MIS	Habitat generalist. Winter range in lower elevation conifer/shrub/grasslands.	Species and summer habitat known throughout the assessment area	Yes
Greater Sage-Grouse	Sensitive	Sagebrush obligate.	Species and habitat not present in assessment area.	No, due to the lack of presence in the assessment area
Mountain goat	MIS	Steep, rocky high elevation areas.	Species and habitat not present in assessment area.	No, due to the lack of presence and habitat in the assessment area
Black-backed Woodpecker	Sensitive	Burned or insect-killed forest	Species not known in the assessment area but suitable habitat (insect-caused conifer mortality) does occur in the assessment area.	Yes
Flammulated Owl	Sensitive	Mature (> 9 inches dbh) and old growth ponderosa pine/Douglas-fir with abundant moth species	Species not known in the project area and extremely limited mature Douglas fir habitat is available in assessment area.	No due to the lack of suitable habitat in the assessment area

Species	2011 Status	Habitat Preference	Status Of Habitat or Species in Assessment Area	Species Carried Forward in Assessment?
		prey.		
Harlequin Duck	sensitive	Fast moving, low gradient clear mountain streams	Species and habitat not present in assessment area.	No, due to the lack of presence and habitat in the assessment area
Fisher	Sensitive	Moist coniferous forested types (including mature and old growth spruce/fir), riparian/forest ecotones	Species not known in the project area but suitable habitat (mature fir, spruce habitat) is available in assessment area.	Yes
Great Basin Pocket Mouse	Sensitive	Dry grassland with less than 40% cover.	Species and habitat not present in assessment area.	No, due to the lack of presence and habitat in the assessment area
North American Wolverine	Candidate, Sensitive, MIS	Large areas of unroaded security habitat; alpine/subalpine talus slopes for secure denning habitat, ungulate carrion in winter.	Species has not been documented in the project area; however, the species has been recorded in the late 1950s and mid 90s north and east of the assessment area (trapping records). Denning habitat is also mapped in the southeast of the assessment area.	Yes
Northern Bog Lemming	Sensitive	Wet riparian sedge meadows, bog fens.	Species and habitat not present in assessment area.	No, due to the lack of presence and habitat in the assessment area
Pygmy Rabbit	Sensitive	Dense clumps of big	Species and habitat not present in assessment	No, due to the lack of

Species	2011 Status	Habitat Preference	Status Of Habitat or Species in Assessment Area	Species Carried Forward in Assessment?
		sagebrush or greasewood forage on grasses (wheat grass, bluegrass) in summer and sage in winter.	area.	presence and habitat in the assessment area
Townsend's Big-Eared Bat	Sensitive	Roosts in caves, mines, rocks and buildings. Forages over tree canopy, riparian areas or water.	Species and habitat not present in assessment area.	No, due to the lack of presence and habitat in the assessment area
Spotted Bat	Sensitive	Cliffs, rock faces for roosting. Forest openings, riparian areas, wet meadows for foraging	Species and habitat not present in assessment area.	No, due to the lack of presence and habitat in the assessment area
Canada Lynx	Species of interest	BDNF is currently considered unoccupied, secondary habitat. Suitable habitat includes moist forest types	Species has been documented in the western half of the in assessment area however, this habitat is considered marginal foraging habitat and most used by transient lynx, moving through to more suitable habitat.	No, due to the lack of presence and habitat in the assessment area.
Bighorn Sheep	Sensitive	Open rock and large talus slopes above grassland forage areas.	Species not known to occur in project area due to lack of suitable habitat.	No, due to the lack of presence and habitat in the assessment area.

The Recreation Allocations for NFS lands in the Seymour-Deep watershed assessment area in the Mt. Haggin Management Area are discussed further in section 2, below.

2. Current Conditions

Wildlife Habitat

Table 31, below, displays the acres of each cover type on NFS lands in the Seymour-Deep assessment area. Approximately 74 percent of the assessment area is forested, while the remaining 26 percent supports non-forested habitat, generally dry and moist grasslands, shrublands and areas that appear "sparsely vegetated". Sparsely vegetated areas appear to include open talus or scree slopes at the north end of the assessment area. These vegetation types contribute habitat elements for different species.

The Seymour-Deep assessment area is dominated by coniferous forest. Lodgepole pine is the primary coniferous species, and currently occupies about 69 percent of the forested area. Lodgepole pine generally occurs at mid elevation in the forested portion across the assessment area, below mixed conifer and whitebark pine forests, and above open grassland and shrubland. Subalpine fir and whitebark pine generally occur at higher elevations in the northern portion of the assessment area.

Table 31. Existing mapped vegetation within the Seymour-Deep Assessment Area.[1]

Cover description	Acres in Seymour-Deep Watershed on all ownerships
Aspen	79
Dry grasslands, meadow	4,199
Grass wet	736
Mesic shrublands	2,109
Xeric shrubland	778
Douglas-fir	1,123
Lodgepole pine	23,228
Mixed Conifer	3,323
Whitebark pine	5,888
Sparsely Vegetated	4,132
Total	**45,595**

[1] Source- VMAP, Vegetation Report, Seymour-Deep Watershed Assessment (2012).

The discussion of wildlife habitat below focuses on vegetation types that show the greatest change, are rare or represented to a limited extent. Data for this discussion is from several sources, primarily the VMAP based vegetation analysis prepared for the Seymour-Deep watershed assessment, the 1980 *Historic Resources Study, Mount Haggin Area, Deer Lodge County, MT* (Newell, 1980), landscape images from the National Agriculture Imagery Program (NAIP), field review and other sources.

There has been substantial timber harvest in the Seymour-Deep assessment area over the past 130 years. The explosive growth of mining in and around Butte led to the founding of the town of Anaconda in 1883 and the completion of the first ore mill in Anaconda at the Upper Works site in 1884. The voracity for heat and power at the Upper Works led to extensive harvest of fuel wood around the site that continued into the 20th century (Newell 1980). The Anaconda mill site is approximately 9 linear miles from the assessment area.

Early timber harvest for Anaconda Mill fuel wood left an environmental footprint that is still visible today. The 2009 and 2011 NAIP imagery shows striations parallel to the hill slope on many acres on the upper portion of the Deep Creek watershed. These striations are visual remnants of the yarding of fuel logs to central locations removed from the site of felling, and were used, in part, to delineate early harvest units for this assessment. Also used to delineate timber harvest from this period were aerial photographs from the 1940s. These photos show large areas with clear linear boundaries supporting even-aged stands of small diameter trees over a comparatively broad elevation range in the Deep Creek watershed. It is probable and likely that these harvest areas also originated in association with the Anaconda Mill site. Analysis of wildlife habitat specific to this watershed assessment indicates that over 2200 acres in the assessment area were harvested for fuel wood after 1884 and before the mid-1940s. It is quite likely that the complete footprint of this early harvest is masked by harvest of lodgepole pine second growth conducted from 1968 through 1993 as described below.

Included in this early harvest were substantial acres of high elevation forests, specifically forests that contain lodgepole pine, but including subalpine fir, Engelmann spruce and whitebark pine. Photographic and field reviews of these harvest sites indicate that high elevation stands harvested between 1884 and 1945 have essentially retained their dendrological species composition. Forest cover is in 3 to 6 inches diameter at breast height (DBH) and 10 to 30 feet tall trees of the above species in historic harvest stands where field review was possible. The species composition appears to shift to a higher whitebark pine component in the far northern stands. Mortality from mountain pine beetle appears low in whitebark pine on these sites, and limited field evaluation suggests that vigor is comparatively high. In general, these high elevation, mixed conifer stands appear to be green, vigorous and productive.

Other timber harvest occurred later in the 20th century on the western portion of the assessment area. A substantial portion of NFS lands in the assessment area was privately owned until 1976 by the Mount Haggin Livestock Company (Mount Haggin Ranch). In the 1960s, the Mount Haggin Livestock Company decided to convert their holdings in coniferous

forest to grazing land, and awarded a long term (25 years) logging contract to Louisiana Pacific in 1968 (USDA-FS 1995). The contract was partially implemented when the Forest Service obtained 23,000 acres of the 70,000 Mount Haggin Ranch in 1976. Apparently, the contract was completed in 1993 with limited oversight on the part of the Forest Service.

The vegetation analysis for the Seymour-Deep watershed assessment identified over 11,000 acres harvested from 1960 through 1999 using several harvest strategies, including over 9,000 acres harvested using clearcut as the primary tool. These acres now support lodgepole pine regeneration of sizes varying from 1 to 9 inches DBH. When considering the acres harvested using clearcut from 1960 through 1999 and over 2,200 acres of historic harvest in the higher elevation, mixed conifer forest, the Seymour-Deep assessment area supports 11,000 or more acres of green, vigorous young forest (Table 32). In areas not harvested as described above, lodgepole pine has been impacted by mountain pine beetle and mortality is comparatively high. In light of the degree of mortality associated with the current mountain pine beetle outbreak, the 11,000 acres of green forest ranging in age from 16 to 120 years of age is extremely beneficial to wildlife in the long term. The Seymour-Deep assessment area is and will continue to provide a diverse coniferous vegetation structure, specifically of lodgepole pine in the lower, mid and, in conjunction with whitebark pine, subalpine fir and spruce in the upper elevation forests in the assessment area.

Table 32. Percent and acres of early seral forest by species.[1]

Species	Lodgepole pine	Whitebark pine	Douglas-fir	Subalpine Fir (mixed conifer)
Percent of type 0-20 years old Forest wide (based on FIA data)*	8%	2%	3%	5.9
Percent 0-4.9 DBH on NFS lands in Seymour-Deep Area **	6080 acres (26%)	92 acres (1.6%)	48 acres (4.3%)	97 acres (3%)

[1]Source- *2008 Final Environmental Impact Statement for the 2009 Revised Forest Plan. **VMAP analysis from vegetation assessment. Percent in row three is the percent of the 0-4.9 size class from the total of all acres by species.

Douglas-fir

Douglas fir occupies about 3 percent of the forested area in the Seymour-Deep assessment area. Currently, Douglas-fir stands are scattered across the assessment area, predominately on south oriented slopes at 6300 feet along the assessment area boundary in the Deep Creek watershed. Review of VMAP indicates that the majority of acres supporting Douglas-fir are on the west side of the assessment area and are generally clustered in the canyon on either side of Seymour Creek between 6800 and about 8200 feet. The vegetation analysis describes 48 acres of early seral Douglas-fir, 93 acres of pole sized Douglas-fir and 983 acres

of late seral Douglas-fir in the Seymour Deep assessment area. The limited field review for this assessment identified a number of scattered, younger trees of varying diameter in lodgepole pine stands along the 6300 foot elevation line along the south east side of the assessment area. Wildlife field analysis did not review any Douglas fir stands that exhibited late seral characteristics.

The wildlife analysis identified four areas in the south east portion of the assessment area where large diameter, open grown Douglas fir had been key habitat components. The remnants of these trees were widely spaced in open grassland/shrubland with increasing small diameter lodgepole pine. Each of these sites are associated with low elevation grassland on the south east side of the assessment area. In the fall of 2011, we identified 78 Douglas fir trees in the south east portion of the assessment area with a minimum diameter of 24 inches, but ranging to 42 inches and possibly larger. All but 9 of these were dead, and all stands exhibited evidence of fire that had occurred at some point in the past.

Heyerdahl et al. (2006) investigated the dynamics of Douglas fir in southwest Montana, finding that open, large diameter Douglas-fir habitat was maintained by frequent fire prior to Euroamerican settlement. At their Big Hole River study site 13 miles from the Seymour-Deep assessment area, Heyerdahl et al. (2006) found an average fire return interval of 37 years during the period 1700 and 1850, a sufficiently frequent fire return interval to foster a Douglas fir savannah in which large diameter Douglas fir grew in a matrix of grassland and, to a lesser extent, sagebrush/shrub. The lack of periodic fire since 1850 resulted in a dramatic increase of small diameter Douglas fir trees on slopes above Big Hole River at the Heyerdahl et al. (2006) study site.

Seminal work by Arno and Gruell (1983) conducted about 45 miles east of the assessment area in similar habitat and elevation range illustrates the long-term impacts of fire exclusion. Arno and Gruell (1983) found that Douglas fir had and continues to invade sites that were previously maintained as grasslands by periodic fire. Early in the history of many of the large diameter Douglas fir trees in the assessment area, fires were wide spread on the landscape and the mean fire return interval was 26 years. With fire exclusion and loss of ignition sources, fire essentially was absent from the landscape from about 1850 to the present.

With high frequency, low intensity fire, wildlife habitat in the assessment area differed substantially from the current condition. Observations in the project area suggest that late seral Douglas fir was historically physically proximate to fire prone areas, specifically dry meadows at lower elevations. Individual and clumps of trees were likely wide spread and at a much lower density than observed today. Open grasslands with mountain shrubs were likely more prevalent that at present. It is likely that pre Euroamerican settlement late seral old growth included open grown, large diameter Douglas-fir associated with fire prone areas in the southeast of the assessment area.

The limited field work conducted for the Seymour-Deep watershed assessment also identified individual or small groups of Douglas fir trees 12 to 16 inches DBH scattered across lodgepole pine harvest areas. Lodgepole pine are substantially smaller in stature than these

Douglas-Fir. Removing lodgepole pine from around these Douglas-fir trees could reduce competitive resource stress and ladder fuels.

Dense young understory trees in surrounding overstory Douglas fir increase competition for moisture and are ladder fuels, providing a route for fire to elevate from a creeping fire at the ground surface to the tree canopy. Increasing levels of understory trees on drought and disturbance prone sites put large diameter trees at risk by changing fire behavior from high frequency, low intensity to stand replacing, and by increasing drought stress leading to reduced resistance to insects and disease.

The conditions noted above describe forest conditions that have and are increasing in homogeneity. Stands or patches of large diameter trees that are immersed within homogeneous forest conditions are increasingly susceptible to loss from stand replacing fire. The loss of large diameter Douglas fir trees removes a key structural habitat component used by a variety of species such as avian nesting species, the flammulated owl, coopers hawk and northern goshawk.

Old growth forest

Old forest provides large trees, snags and downed wood that provide nesting substrate, foraging habitat and cover for many species. Warren (1990) notes that about 150 wildlife species in the Northern Region are thought to use old forests for breeding, feeding or sheltering.

Green et al. (1992) reviewed historic data and determined that the bulk of the pre-settlement old growth forest in the Northern US Rocky Mountains was in the lower elevation, ground fire maintained ponderosa pine, western larch and Douglas fir forest types. In the Seymour-Deep watershed assessment area, low elevation old growth forests would have been dominated by large diameter Douglas fir. Old growth by forest type was quantified in the 2009 Revised Forest Plan. See Table 33.

Table 33. Old Growth on the BDNF, Big Hole River Landscape and Seymour-Deep assessment area.

Species	DF, PP, PF	SP, SAF	LPP	WBP
Forest-wide[1]	20.4%	36.1%	17%	28%
Big Hole Landscape[1]	20%	30%	10.4%	18%
Seymour-Deep Assessment Area[2]	983 ac.	2843 ac.	9473 ac.	5206 ac.

[1]Source- Bush et al. 2006. Detailed estimates of old growth and large snags on the Beaverhead-Deerlodge National Forest.

[2]Data is for mid to late seral structural characteristics, not necessarily old growth as described by Green et al. Source- vegetation report.

Old growth percentages presented in Table 33 are from FIA inventory data collected in the mid-1990s. It is unlikely that these data accurately represent old growth conditions in pine

species, specifically lodgepole and whitebark pine, as lodgepole pine and whitebark pine have been impacted by mountain pine beetle in the Seymour-Deep assessment area. Observations using the 2009 and 2011 NAIP imagery suggest that in those areas identified as whitebark pine by VMAP, mortality is actually comparatively low to moderate. This contrasts with lower elevation lodgepole pine 6 inches and greater DBH where on the ground observations suggest that mortality is high. It is assumed that the 9473 acres of mid to late seral lodgepole pine in Table 33 have been adversely impacted by mountain pine beetle resulting in moderate to high levels of tree mortality.

The wildlife analysis suggests that structural late seral forest is lacking in the Seymour-Deep assessment area. Thirty three percent of the forested area of the watershed was harvested in the last 120 years, and 72 percent of those acres were harvested (or entered a second time) in the 25 year period between 1968 and 1993. Cursory field work conducted for this assessment indicates that large diameter Douglas-fir occurred on south oriented exposures in conjunction with semi contiguous low elevation meadows. Assuming conditions observed by Heyerdahl et al. (2006), structural old growth with a tree density of Douglas-fir savannah would have formed low elevation old growth in these watersheds, most likely in heterogeneous patches. The limited scope of this assessment precludes a thorough analysis of the extent of the pre euro American settlement distribution of late seral, open grown Douglas-fir habitat.

Snags

Bush et al. (2006) estimated snag densities on the Forest and individual landscapes using FIA data. Snag densities for the landscape as occurred during the mid-1990 inventory period are shown in Table 34.

Table 34. Snag Density on the Big Hole Landscape

Landscape	Snags 10-19.9" dbh	Snags 20" +
Big Hole	7.8 tpa	0.6 tpa

It is likely that the current mountain pine beetle outbreak has resulted in increased levels of snags in the 10 to 19.9 inch category to some extent. Without question, snags smaller in diameter than 10 inches are abundant in the assessment area as a result of the mountain pine beetle outbreak. As 70 percent of the forested area in the assessment area is dominated by lodgepole pine which typically matures at diameters at less than 20 inches, high levels of snags larger than roughly 12 inches would not be expected.

Wildlife Secure Areas

Wildlife secure areas were a key analysis metric employed in the development of the 2009 Revised Forest Plan. Habitat within wildlife secure areas is less influenced by motorized routes, and as a consequence, wildlife/human interaction is reduced as compared to roaded

areas. Increasing access and motorized use of an area causes increasing conflicts and risks to wildlife that can be displayed in four broad categories: 1) habitat alteration, 2) disturbance and displacement, 3) increased vulnerability to mortality, and 4) increased noxious weed establishment.

Security is the protection inherent in any situation that allows wildlife to remain in a defined area despite an increase in stress or disturbance associated with human activities. Most often associated with hunted wildlife populations, security is a state of being, a condition or a functional concept most important when viewed in relation to the hunting season. In this context, wildlife secure areas reduce disturbance and displacement of hunted wildlife, and can reduce vulnerability to mortality inherent with the hunting season.

In the Seymour-Deep assessment area, land use allocation is the primary driver of the availability and configuration of wildlife secure areas. About 52 percent of the NFS lands in the Seymour-Deep assessment area has motorized use restrictions as described in Table 35.

Table 35. Recreation Allocations on NFS lands in the Seymour-Deep Assessment Area.

Allocation	Acres	Percent of assessment area
Wilderness	8,258	22
Backcountry	26	<1
Summer Non-Motorized	10,775	29
Road Based	17,453	47.5
Winter Motorized	28,694[1]	78

[1]Winter motorized derived from total NFS acres in watersheds less wilderness acres

As would be expected, the land use allocations wilderness, backcountry and summer non-motorized are higher in elevation than the road based allocation. As noted in Table 35, the Seymour-Deep assessment area contains about 8,258 acres of the Anaconda-Pintler Wilderness, and the summer non-motorized allocation abuts this portion and hence is contiguous with the larger Anaconda-Pintler Wilderness. The Anaconda- Pintler Wilderness is, by federal law and regulation non-motorized, and provides a large wildlife secure area as defined in the 2009 Revised Forest Plan.

Security is important for a range of mammals, including elk, bears, wolverine and lynx. Christensen et al. (1993), for instance, demonstrate that habitat effectiveness for elk decreases as road density increases. The State's preferred approach for both elk and grizzly bear habitat is to maintain road densities at less than 1.0 mi/mi^2 (MFWP 2005).

Under the 2009 Revised Forest Plan, wildlife secure areas and habitat connectivity are established by managing the open motorized road and trail density (OMRTD) by landscape year-round to achieve levels at or below those values in Table 36. During the fall hunting

season, the 2009 Revised Forest Plan direction is to manage OMRTD to achieve levels at or below those established for MFWP hunting districts shown below in Table 36.

Table 36. Existing and desired maximum Open Motorized Route Density

Landscape	Desired OMRTD	Existing OMRTD (Alt 1 in FEIS)
Big Hole River	1.2	1.3
Hunting District 319	0.6	0.7

Timber harvest from 1968 through 1993 resulted in numerous access routes for harvest and log haul. The 1995 Mount Haggin Watershed Restoration Project Environmental Assessment (Mount Haggin EA) identified 142 miles of combined opened and closed routes in an analysis area that appears to coincide with the Seymour-Deep assessment area. Further, the 1995 Mount Haggin EA determined there were 83 miles of open roads in the analysis area; the decision reduced that total to 57 miles of open roads and 11 miles of open motorized trail. However, it doesn't appear that the 1995 decision was fully implemented. Figure 28 illustrates the approximate secure areas for wildlife from 1995 to 2012. There are approximately 16,897 acres of wildlife secure area within the assessment area displayed in Figure 28.

The 2012 Transportation Analysis Plan (TAP) indicates that with implementation of the 3-district Travel Management Decision (anticipated 2013) there will be about 68 miles of open motorized routes in the Seymour-Deep assessment area. Figure 29 illustrates secure areas for wildlife that could occur through transportation planning under the 2012 transportation planning process. There are approximately 22,368 acres of secure habitat displayed in Figure 29. At the time of completion of this assessment, a National Environmental Policy Act decision on the TAP has not been issued. Wildlife secure areas should be revisited during project level planning.

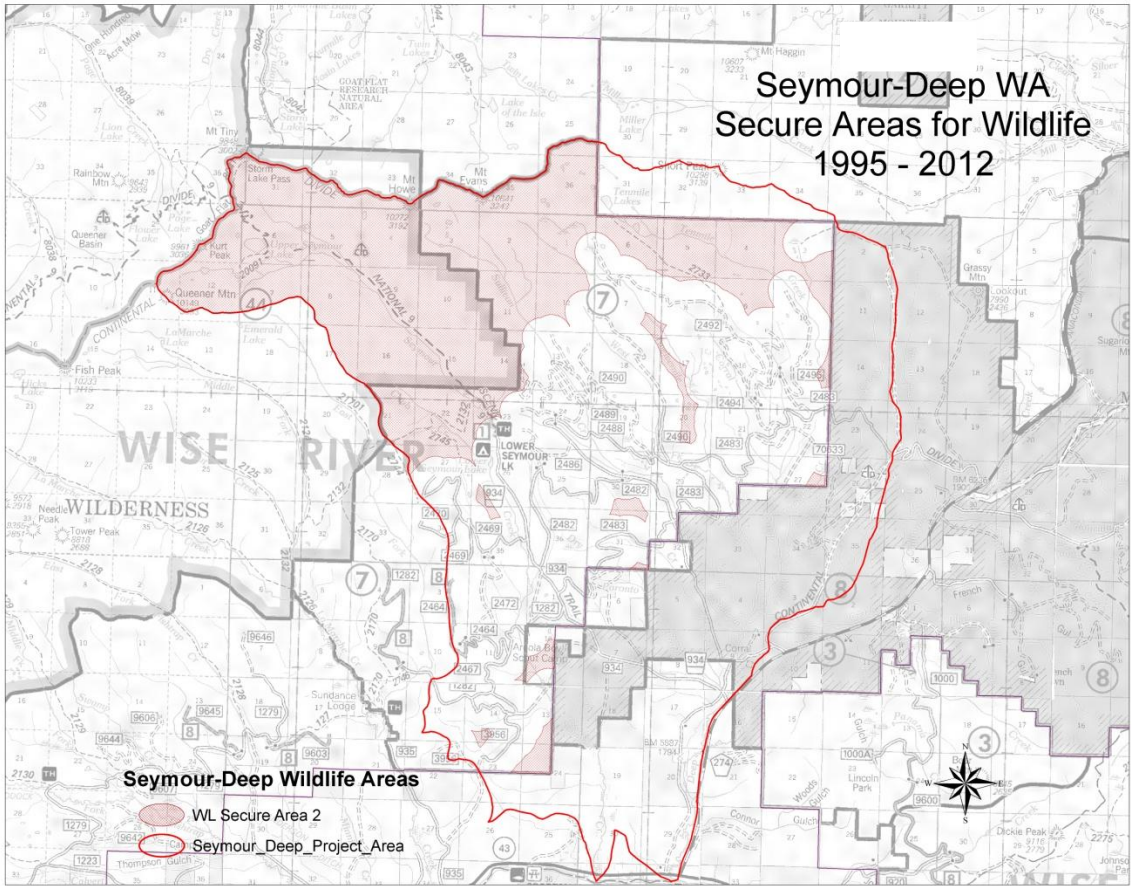

Figure 28. Secure Areas for Wildlife in the Seymour-Deep Assessment Area 1995-2012.

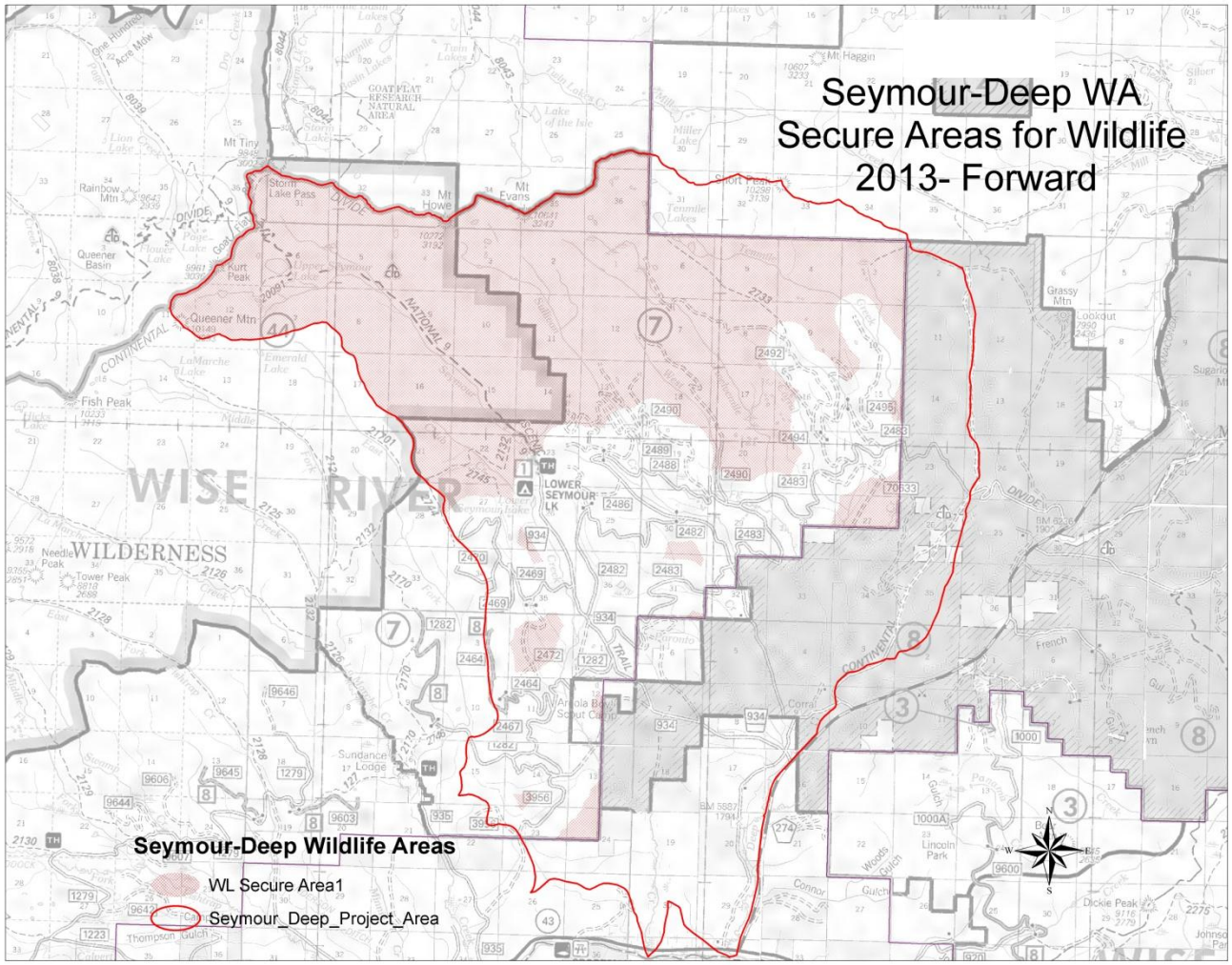

Figure 29. Potential Secure Areas for Wildlife with implementation of secure area in Seymour-Deep Assessment Area.

Connectivity

The 2009 Revised Forest Plan includes a goal that the BDNF would contribute to wildlife linkages between landscapes unless isolation is determined to be beneficial. Linkage areas are those areas identified for large carnivores, ungulates and other species at known wildlife connectivity areas and generally in cooperation with other agencies or organizations. Options to maintain and provide linkage may include, but are not limited to:

- maintaining Forest Service ownership at highway and road crossings;
- consolidating ownership at approach areas to highway and road crossings substantiated by empirical data as necessary to facilitate wildlife movement;
- developing and managing conservation easements with willing landowners, and
- providing wildlife secure areas at the landscape scale to facilitate large animal movement.

As displayed in Table 29, about 12 percent of the Seymour-Deep assessment area is privately owned; the remaining lands are public lands under management by USFS or MFWP. Private land in the assessment area is predominately in the south east portion of the assessment area along Deep Creek. Development on private land is currently residential with some agroforestry. There does not appear to be a move toward industrialization or a substantial increase in access density, nor does the landscape or residential patterns appear to lend themselves to high density residential development. Analysis for wildlife indicates that connectivity in the area should remain high.

Linkage areas for Canada lynx were identified for the Northern Rockies Planning Area (2007). This assessment area is not within an identified linkage area for Canada lynx.

Big game, elk, pronghorn and deer (and presumably many other species) are known to move through transitional ranges on their way to and from summer or winter habitats. There are no known migration or movement corridors identified in this assessment area, though there are no barriers to ungulate movement through NFS lands in the Seymour-Deep assessment area. The assessment area contains mapped (MFWP) elk and mule deer winter range. It can be assumed that animals using this winter range move through the assessment area from summer and fall habitats in and near the assessment area.

Climate change

The climate of the earth changes over time. We recognize that climate change occurs on millennial, centenary and decadal scales, and that human activities are likely contributing to current changes in climate to some extent. Current research suggests that warmer, drier conditions are likely to occur in the US Northern Rocky Mountains in the future (Ashton et al. 2010; Westerling et al. 2006). Modest increases in winter precipitation may occur in the northern US Rocky Mountains, though increases are likely to be during the winter months. Any increase in moisture during the period when it is available to forest or rangeland vegetation may be off-set by elevated water deficit from increasing temperature (Boisvenue and Running 2010). Changes in climate alter the amount, quality and distribution of broad-

scale vegetation types and impact forest structure and composition and various successional stages associated with drought, insects, disease and fire.

There is a high degree of uncertainty as to outcomes associated with climate change. Westerling et al. (2011) suggest that habitat dominated by the current suite of conifer species in the Greater Yellowstone Ecosystem (GYE- about 40 miles south of the assessment area) may shift to a dryer, lower montane woodland or grassland by the middle of the 21st century, a result of increased fire activity. Areas of uncertainty include variability in physical systems, interactions between climate and non-climate stressors and vulnerability of plant and animal species to rapid climate change stemming from variation in species life history strategies, physiological tolerance and dispersal abilities.

Species have adapted to and evolved with changing climate. The rate at which habitat may change under current climate change scenarios will likely preclude a dramatic evolutional change in species. Wildlife may respond to rapid climate change in three ways:

a) Species may respond in place through genetic, physiological or behavioral adaptations, such as shifting diet to plants or animals more favorably suited to the new climate regime.
b) Individual and species distribution may shift to more favorable locations on a temperature or moisture gradient.
c) Individual and species may be unable to do either a or b above, be unable to reproduce successfully in place and face local extirpation or extinction.

Wildlife Species of Interest

Species carried forward from Table 30 are discussed below. The big game species elk, deer, black bear, and moose occupy portions of the area in all seasons. Elk are especially important in southwest Montana due to high public interest and value for hunting. Elk use a variety of habitats during different times of the year.

ELK

The assessment area is within State Hunting District 319. Hunting District 319 and Hunting District 341 form the Fleecer Elk Management Unit (EMU). The Fleecer EMU is approximately 630 mi^2 and encompasses the southern portion of the Anaconda Range and Fleecer Mountain. Approximately 70 percent of the EMU provides hunting recreation characterized as "moderate to high levels of motorized access", about 20 percent provides minimum motorized access and about 10 percent of the Fleecer EMU is within the Anaconda-Pintler Wilderness.

The January, 2005 Montana Final Elk Management Plan (Elk Plan) identifies an elk management objective for the Fleecer EMU of 1475 (range 1250 to 1700) animals. This management objective is consistent with the number of elk counted during post season aerial trend surveys from the mid-1980s through the 2005 completion of the Elk Plan. The Elk Plan identified conflicts with elk on winter range on private land on Fleecer Mountain. The

primary Management Challenge identified for the Fleecer EMU was the high number of elk on the Fleecer winter range, and the principle management goal was to reduce the number of elk wintering on the Fleecer Face to the 800 animal management objective for this particular portion of the Fleecer EMU.

The Elk Plan noted a general increase in elk numbers with the Fleecer EMU in the decade prior to the completion of the Elk Plan, and noted the availability of "fall secure habitat" as one of the factors contributing to the increase. Habitat management strategies put forward by the plan include:

- Improve elk security throughout the transition range use by the Fleecer elk herd, especially in the Fishtrap, Mudd Creek, Seymour, Twelve Mile and Bear Gulch drainages where elk security has been substantially reduced through logging.
- Identify areas where either road closures or openings are necessary to enhance elk security or facilitate harvest and recommend appropriate changes to the (travel plan).
- Provide technical assistance and information in revisions and updating of grazing allotment management plans.
- Cooperate with the Beaverhead-Deerlodge National Forest and BLM to improve elk habitat through projects designed to improve vegetative diversity and maintain or increase carrying capacity on winter range. Emphasize the importance of sagebrush/grassland communities through the use of current memorandums of understanding. Reduce conifer establishment on important shrub and grassland habitats on the Mt Haggin and Fleecer WMAs.
- Represent wildlife habitat needs and hunting recreation issues on National Fire Plan projects.

As described above, substantial regrowth of lower elevation coniferous vegetation has occurred following the extensive timber harvest of the 19th and 20th centuries. *Security* as used in the habitat management strategies from the 2005 Elk Plan is forested cover sufficient to conceal and elk or to deflect a round from a firearm, and is primarily a concept applied during the fall hunting season. The substantial regrowth of those acres harvested between 1884 and 1995 now provide *cover* for elk and other ungulates. Cover is a component of security.

Post season aerial trend surveys counted 1300 elk during the winter of 2012 in the Fleecer EMU (V. Boccadori, pers com w/J. Frederick on 03-01-2012). This is within the management objective of 1480 (range 1250-1700) for the Fleecer EMU.

State wide, elk are substantially above management objectives established in the 2005 plan. At the close of 2011, we note that there were 112,490 elk observed in post season counts for an estimated total of 140,613 elk in Montana. The state-wide objective is 90,910 counted elk.

The elk population in the Seymour-Deep Assessment Area is with population objectives established by the State and the State-wide population objective is currently and has been consistently above population objectives.

WOLVERINE

Wolverine are generally solitary, wide-ranging species and are usually associated with areas with minimal human disturbance and areas that hold snow through the late spring. When inactive, wolverines occupy dens in caves, rock crevices, under fallen trees, in thickets or similar sites. Natal dens are found in deep snow areas in the late winter/early spring. Dispersing individuals may be found far outside of usual habitats.

In the assessment area, approximately 17,000 acres (17%) is mapped as winter non-motorized. There are approximately 89 acres of modeled wolverine habitat in the assessment area.

The Wildlife Conservation Society (WCS) has identified west central Montana as the "Central Linkage Ecosystem" or CLE (Inman et al. 2008). The CLE contains a significant amount of primary wolverine habitat that is in public ownership, and it does support reproductive females. None of these are within the assessment area.

The CLE is critically important because successful reproduction in this area is the most likely means of achieving successful dispersal among the larger Regional Population Centers (Yellowstone, Northern Continental Divide, Bitterroot and Salmon). The CLE is broken down into potential metapopulation units – this assessment area is part of the Anaconda deme (Inman et al. 2008).

Following the B-Bar Ranch Wolverine Summit in 2007, MFWP changed wolverine trapping regulations in 2008. To achieve dispersal and gene flow among the core population centers, wolverines are now protected from harvest in a large portion of Montana, specifically Wolverine Management Unit 4, the Central Insular Mountains. The assessment area is in Wolverine management Unit 2, Central Core area, in which the legal quota was 1 wolverine in 2011. The Anaconda deme is in the Central Core area (Inman et al. 2008). Limited trapping of wolverines is permitted in the Assessment Area, which helps prevent the removal of dispersing wolverines from the population.

BLACK-BACKED WOODPECKER

In Montana, black-backed woodpeckers are primarily associated with fire-killed trees. There is little recent fire activity in the assessment area, though in other portions of the Anaconda Range and in the Pioneer Mountains to the south, there have been large fire in forested areas recently.

Black-backed woodpecker secondary habitat has been increasing forest-wide due to insect caused tree mortality in conifers. While insect killed trees do not offer the immediate pulse of preferred habitat provided by fire killed trees, this mortality does provide habitat for wood boring beetles that follow mortality caused by the mountain pine beetle. According to

the Montana Natural Heritage program, this species has been observed near the project area in adjacent burned areas.

In 2006 black-backed woodpecker surveys were done across Region 1 in beetle outbreak areas. Only a few were detected in the beetle outbreak areas, and all were on the Nez Perce NF.

Aerial insect and disease flights have found that beetle infestations started at lower elevations on the south and east sides of the mountain range in the early 2000s. Yearly, the beetle infestation has moved higher in elevation. Mapping in 2008 shows infestations across the mountain range, at all elevations (BDNF Insect and Disease progression map, 10/29/2008). Beetle populations and dead trees remain widespread across the assessment area (see vegetation report for more details).

FISHER

Within the historic past, the range of the fisher included the coniferous forests of Canada and the north and western United States, extended into the hardwood forests of southern Ohio, Indiana, Illinois Virginia and West Virginia. The historic distribution of the fisher in the western United States is not as clearly understood but is thought to include the Cascade/Coast Ranges in Oregon into the southern Sierra Nevada along the Pacific Coast and the northern Rocky Mountains extending southward into central Idaho and possibly into northeastern Wyoming. Today, the fisher occupies much of its historic habitat in the western United States, but individual populations may be more isolated than prior to Euroamerican settlement.

Over exploitation, habitat loss through settlement and logging, predator poisoning and possibly extensive fires of the early 20th century led to severe contractions in the range of the fisher and extirpation of the fisher in some areas. The species was considered extinct in Montana when trapping was closed in 1930. A number of fisher from Canada and the midwestern United States were introduced into Montana from 1959 to 1991, including 12 at Moose Lake in the Pintler Mountains, about 20 miles to the west. With a possible limited exception, fishers have not been detected in surveys for fisher on the BDNF to date. Fishers prefer continuous canopy, dense mature to old moist forest.

3. Reference Conditions

Natural vegetation, the key element of wildlife habitat, is a product of the natural disturbances processes fire, insects, disease, weather events, herbivory and natural succession. Prior to Euroamerican settlement in the1860s, these disturbance processes were the primary influence on both the pattern (patch size, juxtaposition, distribution) of vegetation patches on the foothills and mountains of the assessment area. Insects, disease, herbivory and weather events are and have been active in the assessment area. Lacking, however, is broad-scale fire.

Before settlement, southwest Montana's valley bottom and mountains were occupied by a great number of wildlife species year round or seasonally. It is assumed that present animal communities, distribution, assemblages, densities and interactions (predation, competition and parasitism) are somewhat different now than presettlement. A shrinking base of native grassland/shrubland and riparian vegetation, historical and recent developments which convert vegetation or land use, highways, market hunting, and the interruption of natural processes like fire contribute to these differences. In addition, one key wildlife species that likely occurred in the foothills of the assessment area is not represented- the American bison.

Among many factors, changes in land use in the valleys, introduction of non-native species and public interest in hunting and game management preclude using the historic distribution of wildlife species as a reference point. The desired condition is described in the 2009 Revised Forest Plan. This condition is a diversity of forest, shrub land, grassland, riparian and aquatic communities formed and maintained by ecological disturbance processes. The resulting plant communities provide conditions for self-sustaining, viable populations of native and desired non-native plant and wildlife species within the natural capability of the ecosystem.

4. Synthesis and Interpretation

Land management direction relevant to wildlife

Management indicator species (MIS) are identified under the premise that changes in the distribution or size of the population reflect impacts of management activities. The 2009 Revised Forest Plan identifies wolverine and mountain goats as indicators of disturbance in high elevation winter habitat, and elk as an indicator of fall security at mid and lower elevations. Table 37 summarizes the plan goals and objectives for MIS. The 2009 Revised Forest Plan objective for MIS is to maintain habitat conditions for elk security and winter habitat integrity for wolverine and mountain goat as reflected by changes in abundance of these MIS. Specific objectives that apply to this watershed and landscape are included in Table 37 below. Additional desired conditions, goals and objectives related to wildlife are listed below Table 37.

Table 37. MIS Objectives in the 2009 Revised Forest Plan.

Species	Representative Habitat	Plan Goals or Objectives
Elk	Fall habitat security	Road densities by hunting unit – from October 15 – December 1, reduce the open motorized road and trail densities in HU 319 to 0.6 mi/mi^2 or less (Forest Plan p. 46). Road densities by Landscape – year round – Manage density of open motorized roads and

Species	Representative Habitat	Plan Goals or Objectives
		trails by landscape year-round, except fall rifle season, to achieve levels at or below the following: Big Hole Landscape – 1.2 mi/mi^2 (Forest Plan p. 45).
Wolverine	High-elevation winter security	No specific objectives however, see road densities by landscape goal above.
Mountain goat	High-elevation winter security	No specific objectives – no habitat within the assessment area.

Desired Conditions, Goals and Objectives for Wildlife in the Revised 2009 Forest Plan.

Desired Condition – ecological processes, which affect the chemical, physical, and biological components of the aquatic and terrestrial ecosystems and fully support designated beneficial uses, are present and functioning to provide the diversity of the forest, shrub land, grassland, riparian and aquatic communities.

Desired Condition – Conditions for self-sustaining or viable populations of native and desired non-native plant and animal species are supported within the natural capability of the ecosystem.

Desired Condition – Issues involving species with needs that go beyond forest boundaries and authority are identified and resolved in conjunction with other federal agencies, state, county, tribal and city governments.

Goal – Habitat: Cover and forage for animals is provided by a mosaic of species and age classes of native trees, shrubs, grasses and forbs.

Goal – Connectivity: Forest management contributes to wildlife linkages between landscapes, unless landscape isolation is determined to be beneficial. Linkage areas are those areas identified for large carnivores and ungulates through multi-agency coordination.

Goal – sage grouse: Sagebrush habitat supports sage grouse and pygmy rabbit populations by providing suitable sage grouse brood-rearing habitat on at least 40% of the sagebrush habitat within 18 km of documented active or inactive sage grouse leks and the area mapped as potential pygmy rabbit habitat.

Goal - Wildlife Security: Secure areas and connectivity for ungulates and large carnivores are provided, while recognizing the variety of recreational opportunities.

Goal – Wildlife Secure Areas and Connectivity: Manage density of open motorized roads and trails by landscape year-round, except fall rifle big game season, to achieve levels at or below the following (Scale – landscape) Big Hole River – 1.2 mi/mi^2

Goal – Elk Security: Elk security is managed to provide quality elk habitat, provide a variety of recreational hunting opportunities, and provide support for Montana's fair chase emphasis. Manage open motorized road and trail density by MTFWP hunting units as of 2006 – on National Forest lands during the fall rifle big game season, to achieve levels at or below the following (Scale – Hunting Unit): HU 319 = 0.6 mi/mi^2 or less

Objective – MIS - Maintain habitat conditions for elk security and winter habitat integrity for wolverine and mountain goat as reflected by changes in abundance of these MIS.

Objective – sage grouse: maintain or improve sagebrush height, and canopy and grass-forb canopy of sagebrush habitat, emphasizing habitat within 18 km of documented active or inactive sage grouse leks and the area mapped as potential pygmy rabbit habitat.

Objective – Snags – Snags and woody debris are well distributed by vegetation category and size class over time.

Objective – Sensitive and Federally Listed Species – Information in the following sources should be considered when designating projects

The Seymour-Deep assessment area is in two Management Areas as established in the 2009 Revised Forest Plan. The 2009 Revised Forest Plan describes no objectives or standards unique to the Fishtrap/Mt. Haggin Management Area or the Anaconda Pintler Wilderness Management Area.

Habitats of concern are directly linked to those cover types showing the greatest change. The wildlife analysis indicates that mountain big sagebrush, upland aspen, riparian aspen and other riparian vegetation (willow, alder, cottonwood) have changed from the historic past. Conifers have encroached into grasslands/big sagebrush sites and aspen groves at various locations across the assessment area. Conifer encroachment results in competition for water, sunlight and space. Extensive timber harvest in the latter part of the 20th century altered stream flow regimes and impacted riparian vegetation to some extent, though robust riparian vegetation occupies lower elevation sites in the assessment area.

Whitebark pine in areas harvested prior to 1940 are small in stature and appear robust in the few areas visited during wildlife field work. Large diameter Douglas fir in the foothill areas appears to be limited in distribution, and this appears to deviate from the recent past.

Open motorized road and trail densities exceed 2009 Revised Forest Plan direction for Big Hole River Landscape and Hunting Unit 319 as shown in Table 36. The south west portion of the BDNF is currently conducting transportation analysis as directed under the 2005 Travel Management Rule. There is an opportunity to move toward the travel management goals established in the 2009 Revised Forest Plan through implementation of route closures.

5. Recommendations

Improve wildlife habitat by reducing conifer encroachment into mountain big sagebrush and sagebrush/grassland parks and aspen stands. Priorities for sagebrush and grassland treatments would be on big game winter ranges.

Killing coniferous trees in aspen groves increases insolation, reduces shade, reduces coniferous seed source and increases available soil moisture for aspen, - all of which lead to increased plant vigor. There is no evidence that removal of conifer trees results in increased herbivory. Remove conifers from within and around aspen groves whenever possible.

Mature Douglas-fir stands and potential flammulated owl habitat. Conduct surveys in larger contiguous stands of potential habitat and evaluate stand conditions for potential thinning of Douglas-fir.

Whitebark Pine – inventory is needed to determine current condition of stands; assess blister rust infection, mountain pine beetle infestation and other stand conditions.

Route densities in Hunting Unit 319 exceed 2009 Revised Forest Plan objectives. Work collaboratively with stakeholders to strategically reduce route densities and increase wildlife secure areas in the assessment area.

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H. RECREATION RESOURCES

1. Characterization

As identified in the Beaverhead-Deerlodge National Forest, Land and Resource Management Plan, (Forest Plan), the watershed analysis area is located in the Fish Trap – Mount Haggin Management Area and the Anaconda-Pintler Wilderness Management Area of the Big Hole Landscape.

Forest Plan direction pertinent for Recreation and Travel Management for the watershed assessment includes the following goals, objectives, and standards.

Goals

Recreation Settings: Offer a choice of recreation settings ranging from remote backcountry to more developed front country areas. Recreation allocations use Recreation Opportunity Spectrum (ROS) concepts and definitions.

Summer Non-Motorized Allocations: Provide semi-primitive non-motorized recreation settings, and offer opportunities for mountain biking, horse and stock travel, hiking, dispersed camping, and other activities.

Summer Motorized Backcountry Allocations: Provide semi-primitive motorized recreation settings, and offer opportunities for varied types of travel and recreational activities.

Summer Roaded Allocation: Provide roaded natural and rural recreation settings, and offer a wide variety of opportunities for dispersed and developed recreational activities.

Winter Non-Motorized Allocations: Provide primitive and semi-primitive non-motorized recreation settings in these areas, and offer opportunities for ski touring, snowshoeing, and hiking, and other non-motorized activities.

Winter Motorized Allocations: Provide roaded and semi-primitive motorized recreation settings in these areas, and offer opportunities for a variety of motorized and non-motorized travel and activities. The majority of these allocations provide opportunities for travel by snowmobile.

Recreation Opportunities: High quality diverse outdoor recreation opportunities are provided, including but not limited to:

- Day use activities within a 30 minute drive of communities for motorized and nonmotorized trails, picnicking and interpretive sites,
- Winter use areas near communities for ski touring, snowshoeing and snowmobiling,

- Trails and routes for autos, four-wheel-drive vehicles, ATVs, motorcycles, mountain bikes, horses, and hikers to high mountain lakes and other features,
- Developed and dispersed camping.

Road and Trail Use: A system of routes and areas designated for non-motorized and motorized use are identified and available for public use. A Roaded or Backcountry recreation allocation does not determine the motorized status of any route, including the CDNST, within those allocations. A non-motorized recreation allocation (Summer Non-Motorized, Recommended Wilderness, or designated Wilderness) does close all routes within the area to motorized use.

Resources are protected and user conflicts are minimized by allowing motorized wheeled travel only on designated routes and areas. Established routes to dispersed campsites are recognized as part of the Forest transportation system.

A system of trails designated for nonmotorized uses are also identified and available for public use.

Developed Sites: High quality developed recreation facilities are strategically located to concentrate use, provide access to backcountry settings, and protect natural resources. Sites are clean, well maintained, and designed for universal accessibility.

Objectives

Non-motorized winter activities: Increase opportunities for non-motorized winter activities, such as ski touring and snowshoeing, where highway access points and parking are available.

Dispersed Sites: Identify dispersed campsites causing adverse resource impacts. Develop mitigation or relocate the site to protect the resource. Actions may include but are not limited to installing toilets for public health, bulletin boards, or hardening sites where necessary.

Close campsites where unacceptable resource damage cannot be mitigated.

Developed Recreation Sites: Complete mineral withdrawals for all developed recreation sites.

Trails – Maintain motorized and non-motorized trails to standard. Reconstruct trails that do not meet standards based on the following Region One priorities:

a. Safety hazards to users

b. Actual or potential resource damage, especially in key watersheds,

c. Level of use

Standards

Standard 1: Permanent road construction is not allowed in summer non-motorized allocations or in areas evaluated for wilderness potential.

Standard 2: Motorized vehicles are not allowed in summer or winter non-motorized allocations except for permitted or administrative use.

Standard 3: Restrict year-round, wheeled motorized travel to designated routes or areas. Where routes have not been designated through site specific travel planning, restrict motorized vehicles to open motorized routes identified on the Forest Plan Interim Roads and Trails Inventory GIS Layer displayed on page 53. Motorized wheeled travel on routes leading to identified dispersed campsites is allowed. Exceptions may be authorized for:

- Motorized wheeled cross-country travel for any military, fire, search and rescue, or law enforcement vehicle used for emergency purposes,
- Authorized motorized wheeled cross-country travel is limited to official administrative duties or emergency services such as, fire suppression, prescribed fire, noxious weed control, vegetation restoration, surveying, and law enforcement,
- Motorized wheeled cross-country travel for other government entities on official administrative business as authorized through the normal permit processes or a memorandum of understanding,
- Motorized wheeled cross-country travel for lessees and permittees limited to terms described in the federal lease or permit.

Standard 4: Extreme sport courses such as motocross trails, technical mountain bike courses, and motor vehicle challenge routes will not be constructed.

Standard 5: New outfitter and guide permits or increases in existing permits, will be only be made based on need, administrative capability, and a suitable mix of guided and non-guided public capacity determined by a Forestwide capacity study. This mix may vary by type of activity and/or season of use. Capacity validation will be made on an area-specific basis when the general Forestwide capacity determination does not adequately address the management situation. Heli-skiing operations will not be permitted.

Standard 6: New recreation resorts or residence tracts will not be permitted, nor will permits be issued for unoccupied tracts or lots.

Standard 7: Manage summer non-motorized allocations for either a primitive or semiprimitive non-motorized setting from May 16 thru December 1, (page 54).

Standard 8: Manage winter non-motorized allocations for a primitive or semi-primitive nonmotorized setting from December 2 thru May 15 (page 55).

Standard: 9: Manage summer backcountry allocations for a semi-primitive motorized setting from May 16 thru December 1 (page 54).

Standard 10: Manage recommended Wilderness for primitive or semi-primitive nonmotorized settings and protect Wilderness character.

Standard 11: Commercial timber harvest is prohibited in recommended Wilderness.

Standard 12: Road construction is not permitted in recommended Wilderness.

Standard 13: Wheeled or motorized vehicles designed for the primary purpose of transporting people, except for wheel chairs, are prohibited in recommended Wilderness except for permitted or administrative uses.

As described in the Forest Plan, the watershed assessment includes the Fishtrap-Mount Haggin and Anaconda-Pintler Wilderness Management Areas within the Big Hole Landscape. The following table summarizes the Recreation Management decisions from the Forest Plan.

Table 38. Summary of recreation management decisions from the Forest Plan.

Allocation	Fishtrap-Mount Haggin Management Area	Anaconda-Pintler Management Area
Travel Restrictions		
Summer Motorized Travel Not Allowed	**40%**	**100%**
Winter Motorized Travel Not Allowed	**0%**	**100%**
Recreation Allocations		
Wilderness	**0%**	**100%**
Recommended Wilderness	**0%**	**0%**
Summer		
Summer non-motorized	**40%**	**0%**
Backcountry Recreation	**2%**	**0%**
Road-based	**55%**	**0%**
Wilderness Study Area	**0%**	**0%**

Allocation	Fishtrap-Mount Haggin Management Area	Anaconda-Pintler Management Area
Winter		
Winter non-motorized	**0%**	**0%**
Winter motorized	**97%**	**0%**
Wilderness Study Area Winter non-motorized	**0%**	**0%**
Wilderness Study Area	**0%**	**0%**
Fish Key Watersheds	**11%**	**41%**
Restoration Key Watersheds	**34%**	**7%**

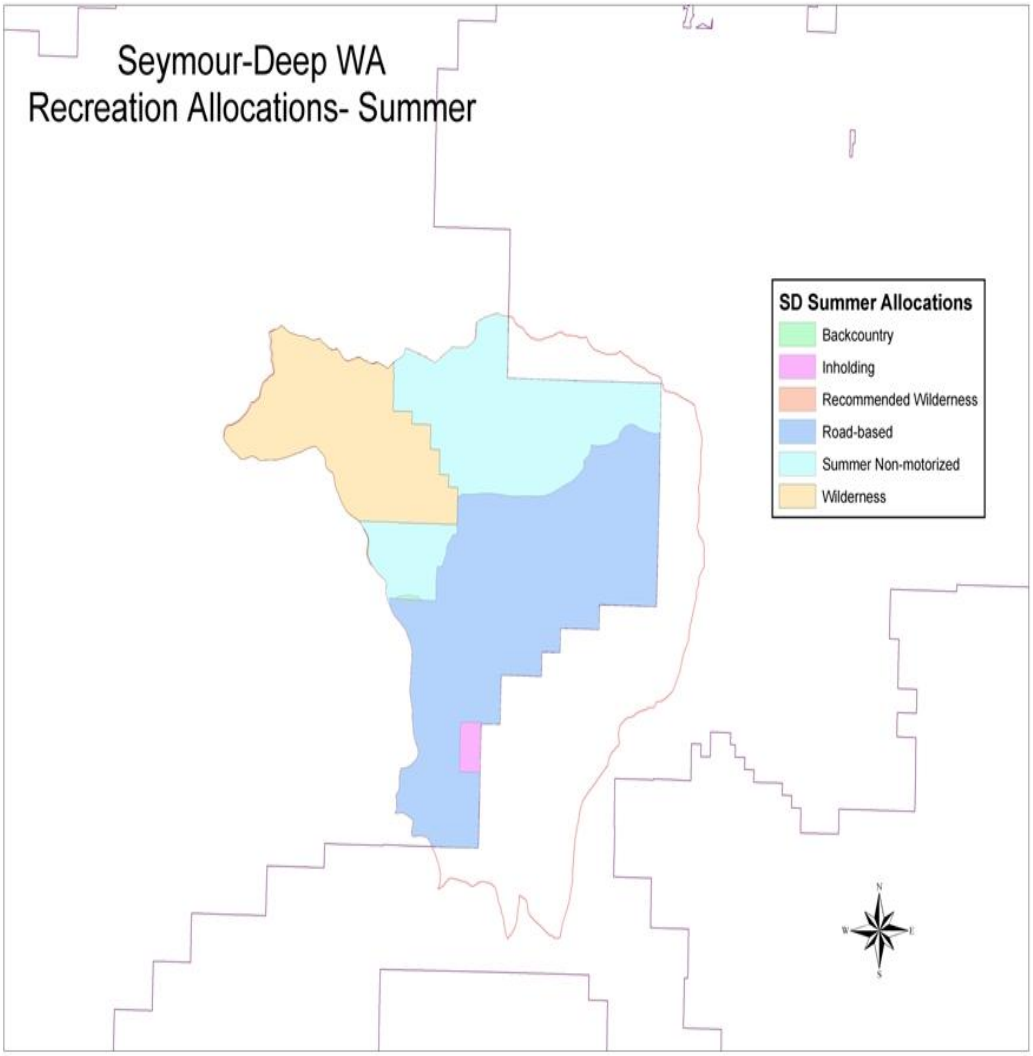

Figure 30. Seymour-Deep Watershed Assessment summer recreation allocations. Note that this map is a generalized depiction of the recreation allocations. There is additional wilderness that is mapped as summer non-motorized.

Descriptions of each Management Area (MA) are as follows:

BIG HOLE LANDSCAPE –

Anaconda-Pintler Management Area

This area is managed to protect wilderness characteristics and values and provide primitive recreation with high levels of challenge and solitude.

The Anaconda-Pintler Wilderness, including lands on the Bitterroot National Forest, was designated in 1964 by Congress as part of the National Wilderness Preservation System. The area provides primitive and semi-primitive non-motorized recreation settings. Local residents and destination tourists use stock or hiking to travel into or through the areas. Opportunities to camp, hunt and fish at alpine lakes are available. Guided trips are available from local outfitters.

Vegetation is managed primarily through prescribed and natural fire. Most active watershed restoration takes place in the lower reaches of Sullivan Creek key restoration watershed. See the 2002 A-P Wilderness Plan or subsequent revisions for additional direction.

Visitors may encounter:

- Native vegetation changed only by fire and other natural events
- Quiet natural landscapes and few other visitors
- Pack Stock

Objectives in addition to Forestwide Objectives

- None

Standards in addition to Forestwide Standards

- Minimum Scenic Integrity Objective – Very High
- Motorized vehicles are prohibited
- Mountain bikes are prohibited
- Timber harvest is not allowed
- The Anaconda-Pintler Wilderness Plan provides additional standards

BIG HOLE LANDSCAPE –

Fishtrap-Mount Haggin Management Area

This area is managed as a transition between the level of activity in the Big Hole Valley and the relative solitude of the Anaconda-Pintler Wilderness. Developed and dispersed recreation sites compliment wilderness recreation opportunities.

Two fairly distinct areas of recreation settings are included. Summer non-motorized and undeveloped lands parallel the boundary of the Anaconda-Pintler Wilderness, and provide wildlife habitat and quiet recreation. The area between the non–motorized area and private lands offer a roaded setting with developed and dispersed campsites, roads, and trails. Hunting, camping, ATV riding, bicycling, and hose riding are common activities. Snowmobile opportunities are available across the lower area though limited in some areas by terrain and

vegetation. A winter non-motorized area adds to wildlife security provided by the adjacent wilderness.

Timber harvest and production may take place in the area, as well as livestock grazing. Deep Creek watershed is managed to conserve native fish populations. Sullivan and Seymour Creek are managed to restore desirable watershed conditions. Active restoration is likely in the roaded parts of these two key watersheds.

Visitors may encounter:

- Vegetation changes as a result of timber harvest or fire
- Motor vehicle and mountain bike riders on roads and trails in the foothills
- Campers near roads and at developed campgrounds
- Developed trailheads for access to the Anaconda-Pinter Wilderness
- Snowmobiles
- Livestock

Objectives in addition to Forestwide Objectives

- None

Standards in addition to Forestwide Standards

- None

Through the Recreation Facility Analysis (RFA) process completed by the Beaverhead-Deerlodge National Forest (Forest) in 2008, recreation sites, experiences and opportunities on the Forest occur in four types of areas:

1. **Frontcountry areas** –

   Visitors are more likely to experience higher concentrations of use, particularly near communities. Daily backyard access for trails, driving for pleasure, OHV and snowmobile riding are common, as are opportunities to visit developed campgrounds, resorts and interpretive sites.

2. **Roaded backcountry areas –**

   Use concentrations thin out, allowing visitors on foot or by vehicle to experience more wild-feeling landscapes and observations of wildlife. Driving for pleasure, OHV and snowmobile riding are common, but are more dispersed, along with activities such as mountain biking, hiking, skiing, and dispersed camping.

3. **Backcountry areas –**

Take visitors to more remote landscapes, where, other than by snowmobiles, access is non-motorized. Greater opportunities for solitude are found here. Activities include hiking, stock use, mountain biking, dispersed camping, snowmobiling and skiing.

4. **Wilderness and proposed wilderness areas –**

   Are the most wild and rugged landscapes, where visitors experience remoteness, solitude, challenge and self-reliance. Hiking and stock use occur mostly as day-trips, but multi-day treks and primitive camps occur here, as well.

2. Current Conditions

The primary recreation uses in the analysis area occur during the summer and fall. In the non-wilderness portion of the analysis area, summer activities are primarily motorized, specifically driving for pleasure on 4X4 vehicles and ATVs. Dispersed camping is popular, especially with local, "backyard" recreationists. Most of this summer activity occurs along Seymour Creek. There are several well used sites along spur roads where family units and groups of friends gather to enjoy camping in small trailers and RVs, as they have done for years, even generations. Days are spent lolling around camp, driving 4X4s or ATVs for pleasure, or fishing for Brook and Cutthroat trout in Lower Seymour Lake and in the area's numerous creeks. There is one developed site, Lower Seymour Lake Campground which has 17 camping units. The campground operates near capacity during holiday weekends, but is generally uncrowded outside of these peak periods.

In the wilderness, recreation use consists mostly of hiking, packing in with stock for day trips or primitive camping along the Continental Divide National Scenic Trail (CDNST). A six mile section of the CDNST passes through the analysis area and attracts visitors from throughout the country and abroad who come to hike this famous trail. There has been an increase in the number of CDNST long-distance hikers over the past several years. Many wilderness visitors enjoy fishing at Upper Seymour Lake where the Montana Fish Wildlife and Parks maintains this 40 acre lake as a recreation fishery. The lake, only a five mile hike from the trailhead, receives considerable day and overnight use.

Fall hunting season sees increased use throughout the area, especially in the roaded portions of the watershed. Hunting camps are common along all open roads, especially the first two weeks of the general rifle season. Archery hunters, both local and out-of-staters, quietly roam the area in search of elk. Several routes open in summer close on October 15 through December 1 to provide wildlife security, but most roads remain open all year.

Winter use is generally moderate to light, depending on snow conditions, and is limited to snowmobile activity.

In spring, some bear hunting occurs, but overall use is light until summer.

Three outfitter-guide operations are permitted in the area. There is a base camp in Tenmile, used for fall hunting. Another outfitter has a permit for day use hunting in the area, including within the wilderness. And a third outfitter leads backpacking trips into the Anaconda-Pintler

Wilderness, often from the Seymour Lake Trailhead.

Trails

There is a paucity of trails in the area, totaling less than 16 miles in total. Opportunities are scarce for both motorized and non-motorized trail based recreation. Some trails are remnants of old two-track roads that have devolved to motorized trails. Some sections of these routes are steep and eroding. These reaches need to be reconstructed to meet standards. Few trails in the analysis area provide loop opportunities. The few loops that are available are not of sufficient length to deliver a high quality motorized experience. Pending completion of the Motorized Vehicle Use Map (MVUM) there are no non-motorized trails in the analysis area except for a one mile section of the CDNST already discussed.

Table 39. Trails in the Seymour-Deep Watershed analysis area, including trail number, motorized/non-motorized designation, and length.

Trail Name	Trail Number	Designation	Length
CDNST	2009	Non-Motorized	6
Tenmile Lakes	2733	Motorized[1]	2.51
Unnamed	2745	Motorized	1.22
East Fork Ridge	2744	Motorized[1]	1.2
Chub Creek	2132	Motorized[1]	3.78
Queener Pond	20091	Non-motorized	1.08
	3956	Admin Only	
Total Miles			15.80
Total non-motorized miles			7

[1]Non-motorized in travel analysis recommendations.

The existing CDNST route is identified as CDNST Trail #2009. It begins at the Lower Seymour Lake Trailhead and crosses out of the analysis area on the Continental Divide north of Upper Seymour Lake. All but the first mile of this six mile trail is within designated wilderness. The short section of the trail outside of wilderness is also closed to motorized use, but open for mountain bikes. This one mile mountain bike allowance by itself does not provide an adequate riding opportunity. However, mountain bikers can connect with the Chub Creek Trail #2132 before reaching the wilderness boundary and loop back to the trailhead via the East Fork Ridge Trail #2744, or Trail #2745 (Unnamed), for a shorter loop. Mixing mountain bikes with other trail uses can lead to safety concerns but is generally manageable with

signing asking mountain bikers to maintain prudent speeds and be watchful and courteous of stock users. The likelihood of mountain bikers trespassing into wilderness is low, in part because heavy use along the trail to Upper Seymour Lake would lead to quick detection.

There are plans to construct about 10 miles of new CDNST within the area from the Mount Haggin State Wildlife Management Area to the Lower Seymour trailhead. This non-motorized single track route would head around Tenmile, Twelvemile, and Sullivan Creeks along the northern edge of the analysis area. The project is on the Capital Investment Program with an anticipated completion date of 2014.

Roads

The non-wilderness area has an extensive road presence. In 1995 an inventory showed 142 miles of road. In the transportation analysis process (TAP) completed in February of 2012, 112 miles of road were identified (see Table 40, below).

Table 40. Transportation analysis process recommendations by road name, road number. The recommended designation and route length are listed.

Road Name	Road Number	Designation Info is from TAP	Length
Seymour Creek	934	Open system road	6.95
Seymour Campground	934A	Open system road	0.34
East Fork Lamarche	1282	Open system road	5.28
Seymour Creek Spur	2444	Open system road & OML-1	3.41
Townsend's Solitaire	2466	Open system road	1.91
Toadstool	2467	Open system road	0.79
Western Bluebird	2468	Decommission	0.98
Tree Sparrow	2468A	Decommission	0.53
Fox Sparrow	2468B	Decommission	0.29
Twin Flower	2469	Open system road and A6	3.13
Woodtick	2470	Open system road and A6	1.2
Mountain Vole	2471	Open system road	0.57
Indian Paintbrush	2472	Decommission	0.81

Road Name	Road Number	Designation Info is from TAP	Length
Labrador Tea	2472A	Decommission	0.65
Gray Cat Bird	2472B	Decommission	0.54
Hermit Thrush	2472C	Decommission	0.86
Middle Dry Creek	2481	A6	1.91
Upper Dry Creek	2482	Open system road	5.75
Lower Dry Creek	2483	Open system road	11.39
Bear Trap	2484	Open system road & A6	3.23
Dry Bear	2485	A6	1.31
Bear Grass	2486	A6	1.00
Lower Sullivan Creek	2487	Decommission	0.73
Sullivan Creek	2488	Open system road	2.18
Upper Sullivan Creek	2489	Open system road, A6 and Decommission	3.83
West Fork Twelvemile	2490	Decommission	7.71
Twelvemile Ridge	2490A	Decommission	0.41
Lincoln's Sparrow	2491A	Decommission	1.32
Sage Sparrow	2497A	Decommission	0.24
Western Jumping Moose	2498A	Decommission	0.07
Meadow Vole	2498B	Decommission	0.18
Lower Twelvemile	2491	Decommission	1.87
Upper Corral Creek	2492	Decommission	6.22
Lower Corral Creek	2493	Decommission	2.38
Cut Across	2494	Open system road	1.64
Slaughter House Creek	2495	Open system road &	2.63

Road Name	Road Number	Designation Info is from TAP	Length
		Decommission	
Upper Slaughter House Creek	2496	A6	1.36
Sullivan Ridge	3938	Decommission	2.07
Chub Creek	3939	Open system road	2.02
Bacon Ditch	3956	Open system road & A6	3.04
Twelvemile Creek	3957	Open system road, A6 & OML-1	1.56
Lower Slaughter House	3958	Open system road & A6	1.70
Short Cut	3964	A6	0.32
	70620	Decommission	0.69
	70621	Decommission(OML-1)	1.11
	70622	Decommission	0.78
	70623	Decommission	2.56
	70624	Decommission	0.48
	70625	Decommission	0.42
	70626	Decommission	0.18
	70627	Decommission	0.36
	70628	Decommission	0.88
	70629	Decommission	1.47
	70630	A6	1.00
	70631	Decommission	0.14
	70632	A6	0.62
	70633	Open system road?	0.94
	70634	Open system road?	2.50

Road Name	Road Number	Designation Info is from TAP	Length
	70635	A17?	0.63
	3938	Decommission	
	70820	Decommission	
Total Miles			**111.8**
Total Open			68.35
OML1			6.08
Decommission			36.65

Under the TAP recommendations, open road mileage would be reduced by about 38%.

Developed and Dispersed Sites

There are two developed sites in the analysis area as shown below:

Table 41. Developed and dispersed recreation sites in the analysis area.

Site	Type	Development
Lower Seymour Creek	Campground	Developed
Seymour Lake	Trailhead	Developed

DEVELOPED:

Lower Seymour Creek Campground is the only campground in the area. It has 17 sites and an occupancy rate typically of 30 to 80 percent, depending on the weekend, throughout the summer.

Seymour Lake Trailhead provides parking, hitchrails, toilets and bulletin board information. This site is a major portal into the Anaconda-Pintler Wilderness.

DISPERSED:

Dispersed use is extant throughout the area but with the greatest concentration in the Seymour Creek drainage, at least during summer. There are several established, well used campsites along side roads proximate to the Seymour Creek drainage. These sites are typified by bare ground, rustic parking pads, stumps, remnant fire wood piles, trees with

broken branches, rock fire rings, and minor structures such as food hang poles and primitive benches. During hunting season dispersed use expands throughout the Seymour/Deep watershed as hunters flock to the area. Sites lacking compelling attractions, such as proximity to water or scenic vistas, serve as campsites in fall simply because they can accommodate a vehicle, trailer or wall tent.

SPECIAL USE AUTHORIZATIONS

There are the three outfitter-guide permits issued for the area, already discussed. There are no recreation residences or rental cabins or administrative sites.

RECREATION OPPORTUNITY SPECTRUM

The Recreation Opportunity Spectrum (ROS) provides a framework for defining the types of outdoor recreation opportunities the public might desire, and identifies that portion of the spectrum that any given area might be able to provide. Recreation Opportunity Settings are the combination of physical, biological, social, and managerial conditions that give the value to a place. The Forest Service strives to provide and maintain a range of settings from roaded natural through primitive to meet the expectations and desires of visitors. ROS classifications help determine acceptable development for specific sites and areas. A combination of the following factors determines the ROS class for an area: remoteness (including distance from roads and settlements), degree of naturalness (level of human modification to the landscape), social setting (number of encounters with other people within a typical day), and managerial setting (degree of visitor controls).

ROS is divided into two opportunity categories: summer and winter. The area has two main ROS classes:

1. Roaded modified,
2. Primitive.

There are other areas managed for Semi-primitive motorized and Semi-primitive non-motorized, but they are quite small and do not contribute substantially to the recreation setting.

Forest Service Manual Direction (2330.3) describes each of the ROS classes found within the project area (Table 42).

Table 42. Recreation opportunity spectrum class for the Seymour-Deep assessment area taken from the Forest Service Manual (2330.3).

Recreation Opportunity Spectrum Class	Development Scale	Level of site modification

Recreation Opportunity Spectrum Class	Development Scale	Level of site modification
Primitive - (P)	1	**Minimum site modification.** Rustic or rudimentary improvements designed for protection of the site rather than comfort of the users. Use of synthetic materials excluded. Minimum controls are subtle. No obvious regimentation. Spacing informal and extended to minimize contacts between users. Motorized access not provided or permitted.
Semi-Primitive - Motorized: (SPM) Non-Motorized: (SPNM)	2	**Little site modification.** Rustic or rudimentary improvements designed primarily for protection of the site rather than the comfort of the users. Use of synthetic materials avoided. Minimum controls are subtle. Little obvious regimentation. Spacing informal and extended to minimize contacts between users. Motorized access provided or permitted. Primary access over primitive roads. Interpretive services informal.
Roaded Natural - (RN)	3	**Site modification moderate.** Facilities about equal for protection of natural site and comfort of users. Contemporary/rustic design of improvements is usually based on use of native materials. Inconspicuous vehicular traffic controls usually provided. Roads may be hard surfaced and trails formalized. Development density about 3 family units per acre. Primary access may be over high standard roads. Interpretive services informal, but generally direct.
Roaded Modified - (RM)	3	**Same as Roaded Natural,** except that the surrounding landscapes are generally within ½ mile of roads and substantially modified by timber harvest and other activities and do not appear natural.
Rural - (R)	4	**Site heavily modified.** Some facilities designed strictly for comfort and convenience of users. Luxury facilities not provided. Facility design may incorporate synthetic materials. Extensive use of artificial surfacing of roads and trails. Vehicular traffic control usually obvious. Primary access usually over paved roads. Development density 3-5 family units per acre. Plant materials usually native. Interpretive services often formal or structured

Recreation Opportunity Spectrum Class	Development Scale	Level of site modification
Urban - (U)	5	**High degree of site modification.** Facilities mostly designed for comfort and convenience of users and usually include flush toilets; may include showers, bathhouses, laundry facilities, and electrical hookups. Synthetic materials commonly used. Formal walks or surfaced trails. Regimentation of users is obvious. Access usually by high-speed highways. Development density 5 or more family units per acre. Plant materials may be foreign to the environment. Formal interpretive services usually available. Designs formalized and architecture may be contemporary. Mowed lawns and clipped shrubs not unusual.

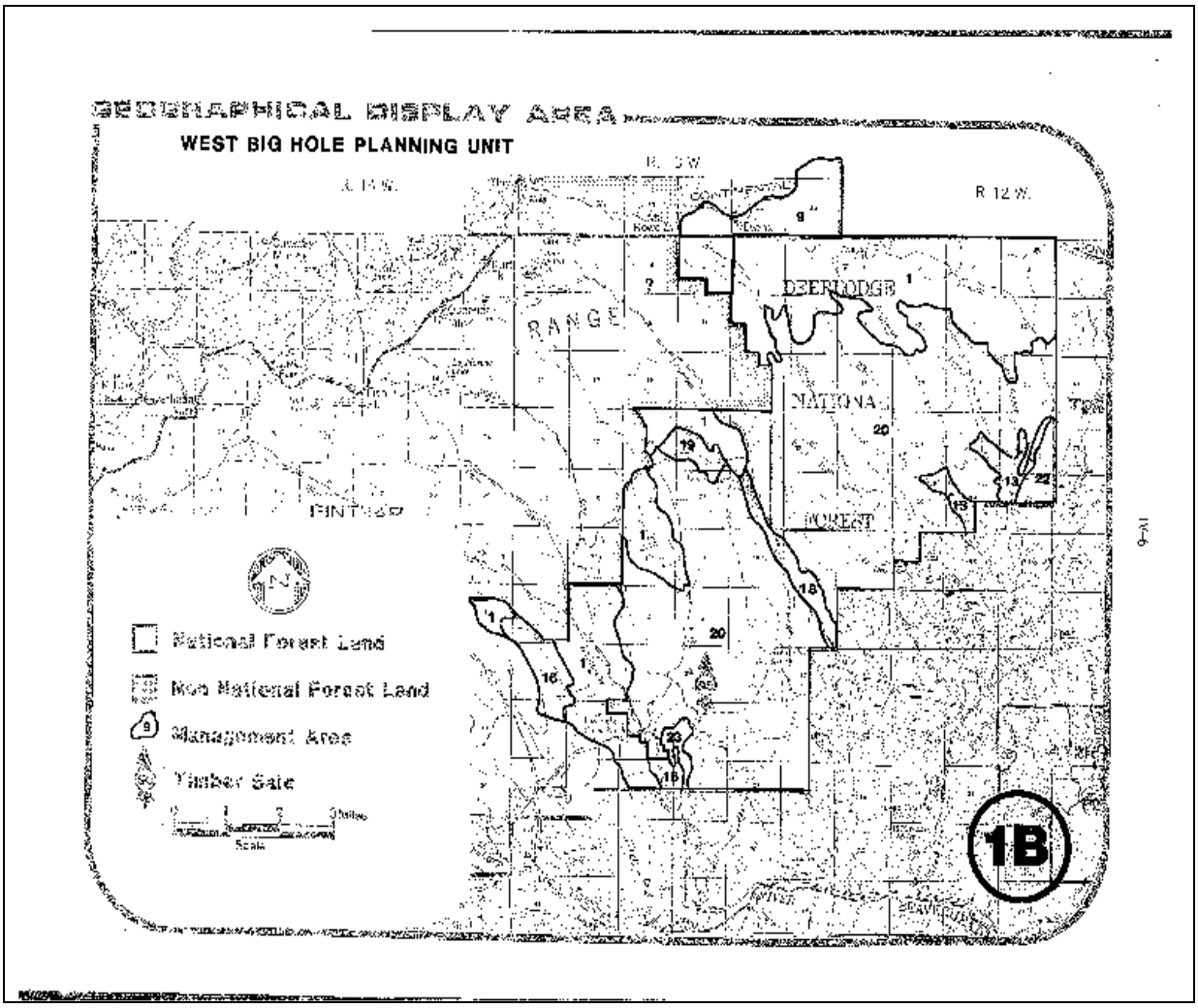

Figure 31. ROS Map from the 1986 Beaverhead Forest Plan.

Roaded Modified (RM) – Management Areas (MA) 20, 19 & 18.

The vast majority of the area is located in this ROS class. This ROS class is managed to maintain high quality wildlife habitat and to provide for dispersed recreation opportunities in a roaded, modified environment.

Semi-primitive Motorized (SPM) – MA 22.

The only portion of the area within this ROS is the extreme southeast corner including slivers of Sections 27 and 22. The TAP recommends decommissioning the few routes found here.

Primitive and Semi-Primitive Non-Motorized – MA 9 & 1.

This ROS classification is for areas within the Anaconda-Pinter Wilderness and portions of areas adjacent to the wilderness. Motorized use is prohibited in wilderness. Areas adjacent to the wilderness are managed for a semi-primitive, non-motorized ROS.

3. Reference Conditions

Recreation Use Potential

Data collected for the Forest Plan show projections for maximum visitor use potential are similar to previous projections. The 1986 Beaverhead Forest Plan projections were compared with current use and no adjustments to the previous benchmarks were necessary. Projections in 1986 show the capability to supply three times more recreation use than the Beaverhead-Deerlodge National Forest did at the time of this analysis (expect for the wilderness which is managed to provide opportunities for solitude or a primitive and unconfined type of recreation). Updated projections agree the Forest can supply three times more use than shown in the 2005 National Visitor Use Monitoring (NVUM) survey. However, the distribution of use between developed camping and hunting does not fit the distribution of current use or future predictions. Hunting was underestimated in the 1986 document and developed recreation was overestimated (Table 43).

Table 43. Distribution of recreation activities compared to the present. The Maximum is taken from the 1986 Beaverhead Forest Plan.

Recreation Type	Maximum Visitor Use Potential	Actual Recreation Use Based on 2005 NVUM *	Maximum Benchmark based on Updated Percentages
Developed	30%	5%	279,600
Dispersed	66%	69%	3,858,480
Wilderness	2%	2%	111,840
Hunting and Fishing	3%	24%	167,760
Total Recreation Visitor Days	5,592,000	1,750,000	5,592,000

***** *Visits were converted to Recreation Visitor Days (RVDs) using a factor of 1 visit = 1,259 RVDs or 1 RVD= .795 visits.*

The Beaverhead-Deerlodge National Forest completed its Recreation Facility Analysis in April of 2007. The following statement summarizes the Forests' Recreation Niche:

> "On the surface, the vast, expansive landscapes of the Beaverhead-Deerlodge National Forest teem with elk, and a variety of other species. Nested beneath the surface other riches - copper, gems, silver and gold are found. Over time, these treasures have both attracted and supported people, from Native Americans, to early ranchers, to miners. Today, these building blocks form the foundation for local livelihoods and lifestyles. Hunting, fishing, rock hounding, or simply roaming the Forest to enjoy scenery, explore history, and appreciate wildlife year round are traditions that continue to span generations."

4. Synthesis and Interpretation

Recreation use in the roaded part of analysis area continues to be centered on motorized activities, while the wilderness portion attracts primitive recreation. Proximity to local population centers (Butte & Anaconda) and continuing increases in registration of off-highway vehicles (ATVs, Snowmobiles) has put increased demand on existing roads and trails in the area, but opportunities for road based recreation remain limited. There is only one developed campground in the analysis area (Lower Seymour Lake) and one developed trailhead (Seymour Trailhead). Most recreation activities are concentrated in this area. The highest levels of recreation activities are seen in summer for dispersed camping and for hunting and camping during the fall big game hunting season. Low levels of snowmobiling occur in winter. Light levels of activity are seen during the spring for bear hunting.

Activities – Sites – Trails

Recreational use in the analysis area continues to rise. Off-highway motorized registrations are increasing with a corresponding increase in use on roads and trails. Dispersed camping and recreation activities are concentrated in the Seymour Creek drainage (Table 43.) Proximity to riparian areas and season of use (Spring thaw, Winter snow) has increased the damage to trail and road surfaces.

Recent outbreaks of beetle-killed trees in the analysis area have also led to increased firewood gathering. Subsequently, more vehicles are going off of designated roads and trails to collect firewood. However, due to terrain and vegetation features, off road/trail vehicle use is confined and limited to areas immediately adjacent to open routes. Significant resource damage does not appear to result from firewood gathering.

Preliminary travel planning activities for sections of the analysis area (Fishtrap-Mount Haggin MA) were begun in 2008. Using the Forest Plan Interim Roads and Trails Map as a baseline, roads and trails in the MA were reviewed. District and Forest staffs identified resource concerns and made recommendations on how they might be alleviated. A Draft Transportation Access Plan (TAP) was completed in February of 2012. Proposals on future management of roads and trails in the analysis area will be made available to the public for comment and feedback during the summer of 2012. Site-specific NEPA analysis will be needed to identify and analyze alternatives, using the recommendations from forest specialists and comments received from interested publics.

5. Recommendations

Trails and Roads

The Seymour/Deep watershed analysis area features an extensive road system developed mostly in support of logging operations which dominated use of the area from 1883 through 1993. The Transportation Access Plan (TAP), completed in draft form in February 2012, shows 111 miles of existing road and 16 miles of trail. The TAP is an inventory of existing routes and used in developing a Motorized Vehicle Use Map (MVUM), which, when completed, will

restrict wheeled motorized vehicles to designated roads and trails. A MVUM is presently being worked up for this area. Many of routes shown on the TAP are no longer physically available to vehicles because they have "haired" in, meaning trees have germinated and become reestablished within the road prism and are now large enough to preclude vehicle use. Other routes were low standard skid roads that have weathered to an unsafe condition and are not suitable for public use. Additional routes shown in the TAP are recommended for decommissioning to improve water quality or because they do not provide a practical recreation opportunity. The proximity of routes to streams and riparian areas, steep grades, and poor drainage controls are a concern, especially along Deep Creek, a fish key watershed, managed to conserve natural fish populations, and Sullivan and Seymour Creeks, restoration key watersheds, managed to restore desirable watershed conditions. Other routes need to be relocated, maintained or closed to address safety concerns for motorized users and protection of forest resources. There are also several redundant or parallel routes to the same destination that may not be of particular utility. The cost of performing annual maintenance, clearing routes, installing and cleaning drainage control structures, and keeping up with signing needs is a real concern in times of shrinking budgets. Open routes increase the potential for establishment of noxious weeds, the control of which is expensive monetarily, but exorbitant environmentally if left unchecked. A limited and logical transportation system that meets user needs for access and recreation, while maintaining environmental and fiscal affordability will be considered in the MVUM. Overall the TAP recommends about 70 miles of road (62% of the inventory) be maintained in the MVUM, and 1.22 miles of motorized trail (Trail #2745).

The area does not lend itself to challenging 4X4, ATV or motorcycle opportunities. The motorized routes are more suitable for poking around than for high thrill adventure. There are no single track trails available for motorcycles, and motorized loop opportunities are limited in number and scope. The potential to develop additional loops is low due to reasons described above.

The roaded portion of the analysis area is also not endowed with great non-motorized trail opportunities. There are only 10 miles of trail outside of wilderness.

As previously stated, recreational use for the roaded portion of the project area is primarily for dispersed camping in summer and fall. Summer use is focused on lolling around campsites, fishing and driving for pleasure. Fall use is mostly associated with hunting. Maintaining opportunities for dispersed camping is central for public use and enjoyment.

Specific recommendations:

- Maintain the Chub Creek Road #3939 only to the junction with East Fork Ridge Trail #2744. The 1/3rd mile of trail that heads NE above this junction should be decommissioned as it serves no administrative or recreational purpose.

- Complete the planned tie-in to connect the Chub Creek Road #3939 to the East Ridge Trail #2477 (southwest corner of section 27).

- Maintain the East Fork Ridge Trail #2744 as a non-motorized route (as presently shown on the TAP). As such, a short day hike, horse ride or mountain bike ride could be realized on a 3.5 mile loop utilizing this trail, a portion of the Chub Creek Trail #2132, Trail #2745 (no name), and Road #3939.

- Maintain Trail #2745 as a non-motorized trail (TAP presently shows it as motorized). This route connects Road #3939 to the Chub Creek Trail #2132. The trail does not afford a practical motorized opportunity. It is only 1.22 mile long, generally too narrow for ATVs (having become brushed in), and is overly steep in places where rutting and erosion are likely to worsen with increased use. There is scant evidence of recent motorized use. This recommendation enhances non-motorized recreation by creating additional loop options incorporating Trails #2132, 2744, and Road #3939 to allow for a 3.5 mile loop, or utilizing Trails #2132 and CDNST Trail #2009 (portion outside of wilderness) to access the Seymour Lake Trailhead and Roads #934 (Seymour), 2469 (Twin Flower) and 3939 to complete an 8 mile loop.

- Close Roads #2485, Dry Bear and #2486, Bear Grass (both show as A6 on TAP). On the TAP map these show as connecting to Road #2484, Bear Trap Loop, but 2485 ends in a clear cut 1 mile above Upper Dry Fork Creek #2482 and 2486 ends at a Kelly Hump 0.4 mile up from its' junction with 2485.

- Bear Trap Loop is open on the TAP (A1 and A6). Consider leaving this loop open year-long or implement a hunting season closure beginning 10/15. It is 4.6 miles long, includes Bear Trap Road #2484 and a portion of Sullivan Creek Road #2488. The first 0.5 miles of 2484 is Alder choked and too closed in for full sized vehicles. It needs to be brushed out to accommodate full sized vehicles. Road 2488 is in excellent condition and suitable for even low clearance vehicles.

- Road #2489, Upper Sullivan Creek (TAP shows this route as converted to a trail open to full sized vehicles). Surface of this route is rocky but not washing badly and suitable for vehicles with at least moderate ground clearance. This TAP map shows 2489 reconnecting back to the Bear Trap Loop but this connection is either gone or not readily apparent and should be reinvestigated. Road #2489 junctions with Road #3938, the Sullivan Ridge Road, in the SW corner of section 18. 3938 is slated for decommissioning on the TAP. The Visitor Map (B-D Central) shows an open route along Road 3938 to the middle of Section 13. I recommend that this route be maintained as open as shown on the Visitor Map (and the number changed to 2489 unless a loop tie-in back to the Bear Trap Loop can be established). This route is in good condition and ends at a Kelly Hump (UTM 0332807E 5097174N), beyond which, about 330 yards, is an old bridge crossing. There are fire rings in the area indicating past use (probably hunting season). (Note. A Goshawk was observed near the old bridge crossing).

- In Section 29, between where the west and east reaches of the West Fork Twelvemile Road #2990 rejoins Road #2488 (Sullivan Creek), the TAP indicates a motorized trail instead of a system road. This seems incongruous and may be in error.

- Road #2490, West Fork Twelve Mile, 7.71 miles long, is recommended for decommissioning on the TAP. The west side of this road has been partially obliterated and is unsuitable for full size vehicles or even ATVs. The east side of 2490 is in fair condition. The map shows these two reaches of road connecting to make a loop. However, about 200 yards of the road have been obliterated at the top end where the road crosses the creek. This route should be decommissioned as a road but it could be maintained as a non-motorized trail for hikers, horseman, mountain bikers and hunters. The area provides excellent habitat. Both elk and bear sign were observed during a September survey.

- Road #2492, Upper Corral Creek and Upper Slaughterhouse Road #2496. There is some minor washing along these routes but overall road surfaces are in good condition. The TAP shows 2492 decommissioned about 200 yards before the junction with the Tenmile Lakes Trail #2733. At 3.2 miles up from Road #2483 (Lower Dry Creek) there is a turnaround which is a logical place to end this route. Ideally the open route would continue at least to the junction with the Tenmile Lakes Trail and a small trailhead facility developed consisting of a turnaround, adequate for a truck with horse trailer, a hitch rail, and parking for five vehicles).

  Upper Corral Creek Road #2492 continues up the drainage. This is a former logging road that has reverted to a two-track that is slated for decommissioning under the TAP. This route may prove a recreation benefit if maintained as a non-motorized trail. As such it could connect with the new CDNST route that will skirt the northern boundary of the watershed from the Mount Haggin Management Area to Tenmile Lakes and beyond. This route, coupled with Trail #2733 and a mile of the new CDNST, would create a loop opportunity for non-motorized visitors (bikes, horses, hikers) of about seven miles in length.

- Road #2494 (**2495**), Cut Across (**Slaughterhouse**). Note that the Mount Haggin topographic map shows road numbers that are not consistent with the TAP. Road #2494 on the TAP is labeled 2495 (Slaughterhouse Creek) on the topo. The topo appears correct and therefore this route on the east side of Slaughterhouse Creek in Sections 22 and 15, is referred to as 2495 in this report. In Section 15, this road junctions with Road #70634 which continues north to a dead-end in Section 10. The road (2495) crosses Slaughterhouse Creek and junctions with Road #2494 (labled as such on the topo) in the SE corner of Section 16. At this point the TAP recommends decommissioning 2494. I recommend that this short section of road remain open for an additional 7/10th mile to complete a loop with the Corral Creek Road 2492.

Preliminary travel planning and recommendations in the Fishtrap-Mount Haggin MA has been completed through the TAP but adjustments and changes are likely following field

inspections during the summer of 2012. A MVUM is underway to implement travel planning for the area but is not yet finalized. TAP recommendations, which reduce open motorized roads by 38%, will certainly improve watershed function, especially if decommissioned roads are stabilized. Some decommissioned roads could be converted to single track trails and serve a recreation need, especially in providing loop routes for mountain bikes and maintaining trail access for hunters.

As recommended by the TAP most system roads will be A1 routes, meaning open all year. Only a few roads will be closed seasonal to provide for wildlife security during the hunting season. In order to reduce impacts and expense of gate management, it may be best to reduce the number of routes closed seasonally, especially in consideration of the 38% reduction of open routes proposed in the TAP. Seasonal closures currently in place for wildlife security need to be reviewed for current validity. Some closures may no longer be needed, thereby making some existing roads and trails available for more loop trails.

Dispersed Recreation Opportunities

Designated campsites and the access routes to them off of designated roads should be added to the transportation system through the MVUM to secure these opportunities.

Most dispersed sites are located along the major forest development roads and do not pose resource concerns.

Developed Recreation

Consider upgrades for the Seymour lake Trailhead. The site gets considerable use and visitors would benefit by replacing the existing outhouse with a modern SST (double), replacing hitchrails, and removing the old loading ramp and feed bunk that have fallen into disuse.

6. References

United States Department of Agriculture, Beaverhead-Deerlodge National Forest, Land and Resource Management Plan, Forest Plan, January, 2009.

United States Department of Agriculture, Beaverhead National Forest Plan, Forest Plan, 1986.

United States Department of Agriculture, Beaverhead-Deerlodge National Forest, Recreation Facility Analysis, April, 2008.

Beaverhead-Deerlodge National Forest, National Visitor Use Monitoring Surveys, 2005.

I. HERITAGE RESOURCES

1. Characterization

Prehistoric Context

Prehistoric peoples have occupied southwestern Montana for at least the last 12,000 years. Evidence for this occupation is based on material recovered from archaeological and historic sites. A wide variety of stone tools (but especially projectile point types) provide clues about when, where and how humans adapted to the environmental challenges presented by this areas high mountains and rigorous climatic extremes.

Although previous research regarding prehistoric utilization of higher elevation USFS managed forested slopes within the project area are limited, some research has been conducted on nearby parcels of land belonging to the Montana Department of Fish (Mount Haggin Wildlife Area), Wildlife, and Parks (see Smith 1981, Newel 1980). Smith (1981:73) notes that prehistoric site distribution in the Deep Creek- French Creek basin is centered at lower elevations on the relatively level surfaces provided by glacial outwash and alluvial terraces. Through an intensive multi-year survey project, several prehistoric sites were identified throughout the Deep Creek- French Creek basin that represented many types of prehistoric utilization. These sites included habitations, occupations, workshops, and drivelines. Through projectile point typology, research has shown that human activity in the Deep Creek – French Creek basin began about 10,500 years ago and persisted fairly continuously into the present (Smith 1981). Prehistoric inhabitants likely utilized this area seasonally in a hunter / gatherer lifeway exploiting the numerous resources such as wild game and procurement of raw materials needed for manufacturing stone tools. A noted lack of vegetal processing implements indicates that early inhabitants of this area focused mainly on hunting (Smith 1980).

Ehtnographic evidence suggests that the Big Hole Valley as well as the French and Deep Creek basin was seasonally visited by multiple Native American tribes. This includes use by early Salish/Kootenai, Nez Perce, Shoshone-Bannock, and Blackfeet cultures. It is likely that several tribes utilized the greater valley as a travel corridor in search of bison on the Great Plains to the east. It is likely that the territory including the Seymour-Deep Creek Watersheds was disputed lands and possibly communal hunting grounds.

Historic Mining Context

Fur traders passed through the greater Big Hole valley, but mining was the main attraction that drew white settlers into the Mount Haggin area. The first likely discovery of gold in Montana was made on Gold Creek on the Clark Fork River between the Deer Lodge Valley and the Flint Creek Valley. The discovery was reputedly made by a French-Indian fur trader named Francois Findlay ("Bentese") in 1852. Gold was located in the glacial gravel deposits of French and Oregon Creeks (within and near the project area) in the 1860's.

The era of placer gold in southwestern Montana soon gave way to the dominance of lode mining. Lode mining called for a more complex level of industrial development. It gave rise to all of the larger cities and towns in and near the Analysis Area. Most of the smaller towns and mining camps also developed as a result of lode mining although some early placer camps like Butte persisted to become regional commercial and supply centers.

Mining efforts in the Seymour and Deep Creek watersheds focused primarily on gold mainly obtained through placering in the French Creek Mining District. French Creek is a tributary of the Big Hole River and drains the north end of the Pioneer Mountain Range and the eastern portion of the Anaconda-Pintler Wilderness Area. The French Creek district abuts the Continental Divide on the east and the Deer Lodge/Silver Bow County line on the north. A synopsis of mining activity is provided by the Montana DEQ Historical Narratives (2011) as follows:

> *The first placers were worked in the two and a half miles of French Gulch in 1864 and the 20 claims yielded as much as $300 per ten-hour run. The best paying claims were located above the discovery and were only seven to eight feet above bedrock. Mountaineer City was well established in the Gulch when it was described in 1865 as 20 to 30 homes, two or three shops, two blacksmiths and a shoemaker shop. It had the usual assortment of saloons, a faro bank, and was proudly awaiting its first hurdy-gurdy outfit. By the end of the first four years, the district was said to have produced between $1 and $5 million (Lyden 1948; Wolle 1963; Big Medicine 1865).*
>
> *The next period of placer gold production occurred at the turn of the century. In 1900 a connected bucket dredge was installed on the the creek. Although this dredge, the Mildred, was rated at 2,500 tons per day, a production of only 1,000 tons was actually achieved. In 1902 W. R. Allen secured the best remaining ground and formed the Allen Gold Mining Company. Because many of the early operations were limited by lack of water, Allen had 15 miles of ditches dug to bring a large volume of water to his placer claims. The ditches were engineered to deliver sufficient head pressure to work several hydraulic giants and an Evans hydraulic elevator. Water for the two 3-inch nozzles was brought from American Gulch via a 2.5 mile ditch which was constructed at a cost of $10,000. Gravels from the hillsides, pulled down by the hydraulic operation, were washed downstream to be worked in the Evans hydraulic elevator. Built by the Risdon Iron Works, the elevator was rated at 1,000 cubic yards per day, but in reality only worked 300 to 500 cubic yards per day. Tailings from the elevator were carried away by several three foot wide flumes. In the upper gulch a steam hoist and derrick were employed raising and moving boulders out of the way. The placer operation proved to be a success and produced coarse gold dust and $10 to $50 nuggets. Although a sawmill and a 100-ton cyanide mill were planned, Allen's activities in the gulch ended in 1904 (Mining World 1904; Lyden 1948).*
>
> *Allen also employed 30 miners in 1902 and began working lode deposits from which three carloads were sent to the smelter. These averaged $15 to $19 per ton.*

Ultimately 4,500 feet of shafts and tunnels were driven (Mining World 1904; Lyden 1948).

Around 1910 interest in the district's lode mines returned. Several mines working true fissure veins were opened up, but there is no report of production (Walsh 1910).

The last period of production was sparked by higher gold prices during the Great Depression. In 1932 one placer operation was reported to have recovered $41 in gold. In 1940, $945 in gold was taken from California Creek, a tributary of French Creek (Lyden 1948).

BOUNDARIES OF THE DISTRICTS

Sahinen (1935) describes French Creek as a south-flowing tributary entering the Big Hole River about 20 miles northwest of Divide. The district is about 12 miles south of Anaconda on the south flank of the Anaconda range and over the divide from the German Gulch district.

Lyden (1948) discusses the French Gulch district in terms of placer mining on French Creek and its tributary California Creek. He also cites evidence of mining on Oregon Creek which flows into California Creek. Big Medicine (1865), who wrote from Mountaineer City, describes the district additionally as: First Chance, Moose Creek, Lincoln, Oregon, California and American Gulches.

HISTORIES OF SELECTED MINES

Allen & Co. Placer

The Allen & Co. Placer is initially listed in 1871 and also in 1905 and 1906 (WPA 1941). At the turn of the century W. R. Allen worked the upper gulch with two hydraulic nozzles, and an Evans hydraulic elevator. This operation worked the gulch successfully until 1904. During this period Allen also had 30 men employed in lode mining. This operation sent several carloads to the smelter, returning $15 to $19 per ton. The underground workings for the lode mining operation ultimately reached an aggregate of 4,500 feet

Historic Logging

During the period 1883-1917, several hundred million boardfeet of timber were removed from the Mount Haggin area, which included a portion of the project area. The total area involved in this past harvest included forested lands on either side of highway 274, along both sides of the continental divide. In 1883, A.W. McCune received a contract from the Anaconda Mining Company for 300,000 cords of wood that was selectively cut from the Mill Creek Canyon area without much regard for the ownership of the land (Newel 1980). The creation of the Hellgate and Bighole Forest Reserves in 1905 and 1906 respectively, ensured that future harvests would at least have some level of regulation and prescriptions. The first large scale timber sale in Region 1, was administered by the USFS in 1906. The Anaconda

Smelter and French Gulch mines were the recipients of this first massive harvest contracted to William R. Allen. The contract secured an astonishing 100 million board feet of timber and Allen quickly went to work constructing the necessary infrastructure needed to extract the timber. This infrastructure included several tramways, water diversion ditches, chutes, sleds, and expansion of a water flume earlier constructed by the McCune operations. Most of the wood was cut either into 8-foot mining stulls or cordwood to fire the smelter, with the remainder processed into building materials. Probably the most important accomplishment of the operation was an eighteen mile wooden flume that was able to transport logs from French Gulch to the railroad near Anaconda. This flume included 29 trestles, a 685 foot tunnel, and over 100,000 board feet of lumber (Newel 1980).

The harvest ended in 1916, when the mills directed their logging efforts in the Georgetown Lake area. Even today, 100 years after this past harvest, reforestation has yet to establish well west of the divide, where toxins from the smelter destroyed, and continues to inhibit, much of the vegetation. East of the divide, natural regeneration was successful, as stands harvested from the contract that ran 1968-1993 were also harvested before the turn of the century. Along the shores of Tenmile Lakes, in the upper reaches of the analysis area, hundreds of cords of stacked wood remain today, from this initial harvest of 100 years ago. These early timber sales played a vital role in the development of sustainable timber harvest guidelines still in use today.

Historic Ranching and Livestock Activity

Historic ranching throughout the greater Big Hole valley was fairly slow to occur given the harsh and remote nature of the land. Known for its lush natural grass, early intruders associated with mining and logging utilized the range land seasonally to support animals used for labor. It wasn't until the conclusion of the Nez Perce pursuit through the Big Hole Valley in 1877 that permanent settlers filtered into the Seymour-Deep Creek area. Homesteading and ranching began to take shape throughout the Big Hole Valley around the mid 1880's, however most was focused on taking advantage of low relief areas along the valley floor that offered an abundance of natural forage. One prominent local resident was a miner-turned-farmer, Johnny Seymour, whom Seymour Canyon is associated with the French Gulch region of the project area. One known ranching site located within the watershed project area is the Home Ranch. This property dates back to the original purchase in 1889 by John B. Lindsay, and subsequent resale to George Welcome in 1903 (Newel 1980). In 1891, Jacob Barnowsky purchased a quarter section of bottomland along Pronto Creek within the watershed project area. It is reported that little remains of the "Barnowsky Place" with most buildings being removed in the 1950's. Historic ranches are not known to exist within the USFS administered lands in the project area, although it is likely that portions were utilized for seasonal grazing activities. Adjacent areas near Mount Haggin, were also utilized for sheep herding, a lifestyle heavily steeped in Montana historic culture from the 1880's to present. The nearby Mount Haggin Land and Livestock Company operated from 1926 into the 1970's headquartered at the Mule Ranch near the project area. The company was noted for innovative breeding techniques and producing prize-winning breeds of

Hampshire sheep (Newel 1980). The potential for undiscovered historic period sites associated with ranching and grazing in the project area is considerable.

2. Current Conditions

An examination of existing records on file with the Heritage Program of the B-D Forest has provided information on the number and type of known cultural resources and level of previous cultural resource inventory conducted on forest lands within the Seymour-Deep Watershed analysis area. Within the study area, only three surveys covering 42 acres of forest land was intensively inventoried for cultural resources. This amounts to approximately <1% of the total land managed by the Forest Service (36,805 acres) and <1% of the 54,599 acres within the entire watershed analysis area. This level of cultural resources inventory is less than that completed elsewhere on the forest due to various reasons. All inventories have been primarily project compliance related in advance of a number of proposed federal undertakings including: spring development, thinning, roadside tree harvesting, and potential gravel source locations. The inventory projects vary from as little as 6 acres, to as much as 20 acres in extent.

As a result of past cultural resources inventory within the Seymour - Deep analysis area, no cultural properties have been formally recorded. Several site leads were noted as a result of one previous inventory 1987-BE-2-4. These site leads relate to historic period occupations including the remains of several living structures and a wood lined ditch. It is possible that the site is affiliated with historic logging activities or possibly mining operations. These resources fall in line with site types that would be expected throughout the project area given its history of use.

Recorded prehistoric site types in adjacent areas are primarily lithic scatters. Although no prehistoric resources have been identified on lands managed by the USFS, is fairly safe to say that there is some potential for this type of resource being present given previous work on adjacent lands. This potential would be regarded as "low probability" based on the topography of the USFS lands. Given the amount of historic activity that took place across this landscape, the existence of heritage resources associated with either mining or logging is highly likely. Although no resources are formally recorded at this time, their presence would seem imminent. Typical features associated with these types of sites include ditch lines, logging camps, sawmills, tramways, flumes, roads, trails, cabins, adits, shafts, tailings, and prospects. Such resources would be expected to be recorded as future work takes place.

3. Synthesis and Interpretation

Cultural resource inventories within the analysis area have been strictly "compliance" oriented in support of other forest programs over the past 25 years. Cultural resources that were encountered during these investigations were noted and avoided.

As noted above, a good share of the known cultural resources are of historic origins that contain wooden cabins, buildings, and/or structures are in various stages of collapse, decay

and neglect. As a result, there is a high probability that much of the original historical integrity of many of these sites may have been lost, resulting in Forest Plan objectives or desired conditions for Heritage Resources not being met.

4. Recommendations

The Seymour – Deep Creek watersheds are proportionally underrepresented in terms of previous cultural resources inventory. Additional inventory in this area would be desirable. It is recommended that a sample inventory be undertaken in areas considered to have high potential for cultural resources.

When cultural properties are located, they need to be recorded and formally evaluated for significance and eligibility to the National Register of Historic Places in consultation with the Montana State Historic Preservation Office. A formal recordation of the complex of sites associated with report 1987-BE-2-4 is recommended.

Sites formally determined to be significant and eligible for the National Register of Historic Places would then be managed to standards and monitored at least every five years to insure that no impacts occur that adversely affect site integrity or eligibility.

Similarly, the current recreational use of the area also affords the opportunity to provide historical interpretation of the French Gulch historic mining area and timber production significant on both a local and regional scale. It is recommended that historical interpretation be included as part of providing future recreational opportunities in accordance with the recently developed Beaverhead-Deerlodge "recreational niche" concept.

5. References

Montana Department of Environmental Quality. http://deq.mt.gov/abandonedmines/linkdocs/default.mcpx

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Newel, Alan S. 1980. Historic Resources Study: Mount Haggin Area, Deerlodge County, MT. Prepared for the Montana Department of Fish, Wildlife, and Parks, Bozeman, MT.

Smith, Mark B. 1981. Archaeological Investigations in the Deep Creek-French Creek Locality, Deer Lodge County, MT. Archaeology in Montana Vol. 22, Number 2. Bozeman, MT.

J. RANGE MANAGEMENT

1. Characterization

Livestock grazing has occurred in the Seymour/Deep watershed since the late 1800's. The watershed contains only one grazing allotment, Seymour C&H that encompasses the lower half of the drainage. With the drainage dominated by dense conifer forest grazing is limited to the smaller open meadows found on mid elevation slopes and the lower valley grasslands that extend across the Forest boundary. Large willow dominated riparian area are common on the lower reaches of the many streams that make up the watershed. Much of the drainage has seen extensive timber harvest since the early 1900's. The removal of forest cover allowed increased forage production for livestock if only for a transient period. Most past timber harvest units have recovered and tree cover is again limiting the amount of forage produced in the drainage.

2. Current Conditions

The livestock grazing within the Seymour/Deep watershed is coordinated with Montana Fish, Wildlife and Parks in conjunction with the Mount Haggin Wildlife Management Area, see Map 1. A small parcel of BLM land is located in the drainage and is managed as part of the allotment. A portion of the Seymour allotment lies outside the Seymour/Deep watershed. Approximately 1850 acres are within the La Marche Creek drainage on the west side of the analysis area. The vegetation in this portion of the allotment is primarily lodgepole forest and provides little livestock forage. Due to the small amount of the allotment outside of the watershed all further discussions will pertain to the entire allotment to have a complete review of the allotment and any potential needs.

The Seymour allotment is scheduled along with ten other allotments in the Big Hole drainage for allotment management plan review and update. The environmental analysis is scheduled for completion in early 2014. Current livestock management is guided by the 1985 Seymour Allotment Management Plan, the 2009 Beaverhead-Deerlodge National Forest Land and Resource Management Plan and the 2011 Cooperative Livestock Grazing Management Agreement between the Forest Service and Montana Department of Fish, Wildlife & Parks.

The Seymour C&H allotment is managed under a three pasture rest rotation grazing system. Just over three hundred head of livestock owned by three ranches graze on the allotment. Due to the high elevations forage resources are not ready for grazing until mid-June. Forage production along with early season snows and recreational demands of the area limit livestock grazing through early October. Currently the allotment is grazed in coordination with Mount Haggin Wildlife Management Area (WMA). The WMA comprises of six pastures that are managed under a three pasture rest rotation protocol. The boundary between National Forest systems lands and the WMA is completely fenced while the interior pasture divisions have a limited amount of fence. The dense forest that dominates the watershed along with topography provide for a natural barrier for livestock. The large numbers of

streams in the watershed along with abundant natural potholes provide the livestock easy access to water. With all the natural water within the drainage only one stock trough has been installed on the allotment. Tables 44 and 45 list specific information pertaining to the Seymour C&H allotment.

Table 44. Seymour C&H Allotment Grazing Permit Information, including permitted numbers, type of livestock, season of use, and number of permittees.

Allotment Number	Permitted Numbers	Class/Type of Livestock	Season of Use	Number of Permittees
20050	323	Cattle Cow/Calf	6/16 to 10/5	3

Table 45. Seymour C&H Allotment Information, including total acres, suitable acres, grazing system, miles of fence, and number of water developments.

Total Acres	Acres Suitable Livestock Range	Grazing System	Pastures	Miles of Fence	Number of Water Developments
17,699	7045	Rest Rotation	Tenmile (North) Sullivan (Middle) Seymour (South)	1 mile – Interior Division/ Drift Fences 15.3 miles – Boundary Fences	1 Trough

Forage use parameters for uplands and riparian areas are set to ensure both the vegetation and streambank/riparian areas maintain or improve in condition (see Table 46). Past annual monitoring and recent field reviews show current grazing standards are being met and no resource concerns have developed due to livestock grazing. The current coordinated grazing plan between the Forest and WMA plan graze the Forest pastures in conjunction with the adjacent WMA pasture. Gates remain open between the pastures and livestock are permitted to move back and forth as they please. Due to the abundant forage on the WMA livestock tend to prefer to graze here more often and limit their use on the Forest side of the fence. This provides for very low forage use in the uplands and very limited use along streams and other riparian areas on National Forest system lands.

Table 46. Seymour C&H Allotment Forage Utilization and Riparian Use Standards.

Key Areas	Utilization and Stream Bank Disturbance Standards
Uplands: Sagebrush/grasslands	**55%** of forage utilized on suitable range on 85% of the area. **65%** utilization on remaining 15%.
Riparian: Riparian sites that **do not** contain Westslope cutthroat trout.	Stubble Height: Green line **4"** measured by reach; flood plain **3"** measured by reach; OR, **30%** streambank disturbance measured by reach.
Riparian: Riparian sites on streams that contain Westslope cutthroat trout or listed species, which includes Twelvemile Creek.	**45%** of forage utilized on suitable range on 85% of the area. Allow no more than **65%** utilization on remaining 15%.; OR, **30%** streambank disturbance measured by reach.

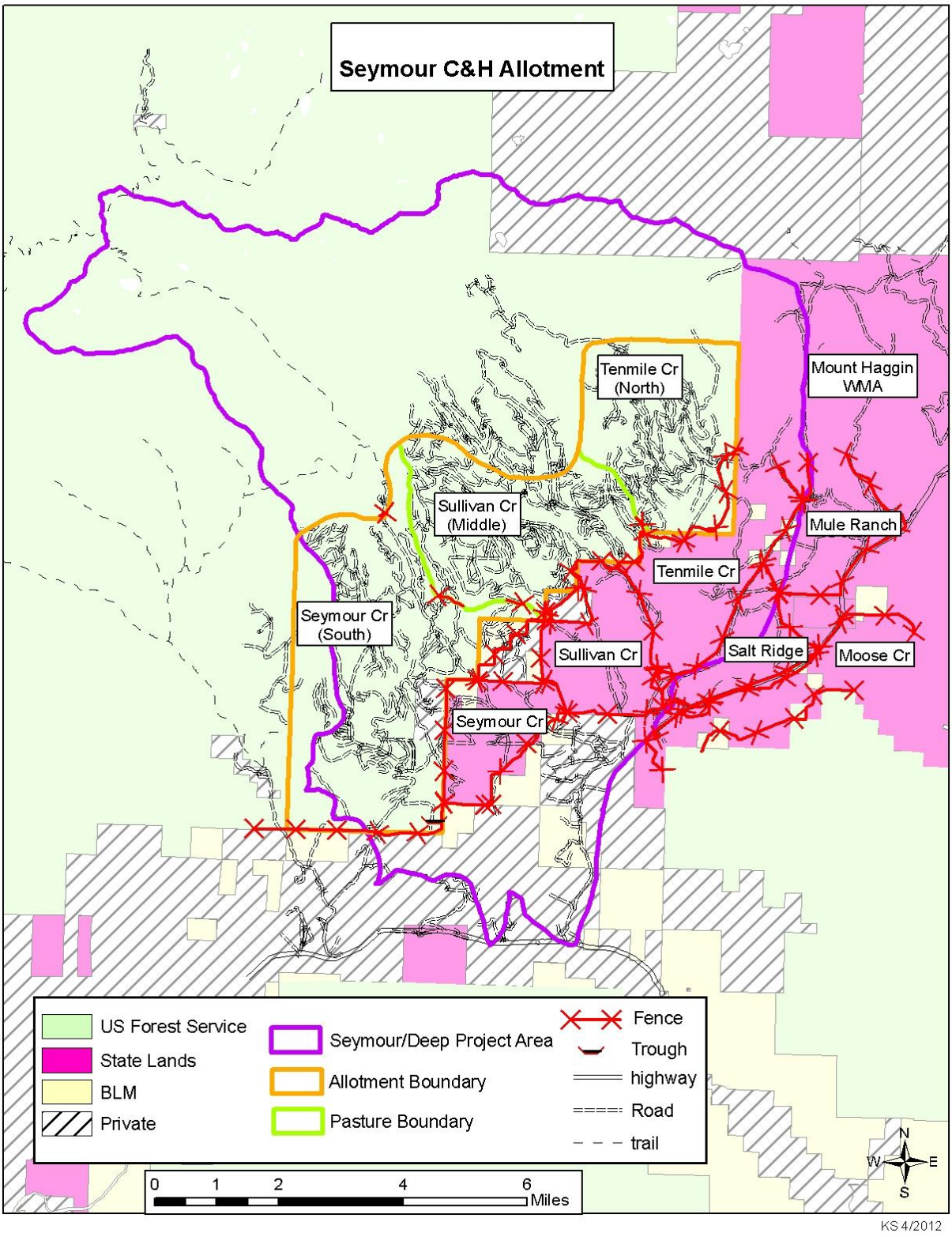

Figure 32. Seymour-Deep Assessment area showing the Seymour C&H Allotment boundary, land ownership, pasture boundaries, and locations of troughs and fences.

The Seymour/Deep watershed had just over 11,000 acres of timber harvest since the 1960s. Most of this harvest was through clearcutting or similar regeneration cuts. The removal of tree canopy released the ground vegetation and allowed a significant increase in forage production. These sorts of vegetation treatment are classed as "transitory range" in context with livestock grazing analysis. The transitory classification comes from the fact that increases in forage availability only lasts until the forests re-establish and again shade out the ground vegetation.

There has been no timber harvest in the watershed since the 1990's. Most harvest units have successfully regenerated and tree canopy cover is filling in. Loss of forage in old timber harvest units continues. As the trees shade the ground vegetation production of high quality livestock forage declines. Livestock numbers were never increased to take advantage of the new forage created from the timber harvest. The open nature of the watershed created from the timber harvest allowed livestock to fan out wider in the watershed thereby reducing there impacts. The current loss of this "transitory range" will not affect the overall livestock management on the allotment. As mentioned above annual monitoring and field reviews show minimal livestock use on Forest System lands.

Livestock grazing has been ongoing in the Seymour-Deep watershed for many decades. The forage use in the area has varied over the years but for the most part has been incidental to the large timber management activities in the drainage. Current grazing management has allowed for maintenance and improvement of the various plant communities established here. Livestock use is light on the Seymour C&H allotment and current management plans work well for the permittees, Forest Service and Montana Fish, Wildlife and Parks. If we look at the Seymour allotment in a strict livestock production eye a more intensive management plan could be developed. This plan would still protect upland and riparian resources but would require an additional workload and commitment on the permittees to more actively manage the livestock when on the allotment. Until all cooperating partners see a need for a change in the livestock management in the area there is no reason to change the current grazing strategy.

3. Recommendations

- Continue Cooperative Livestock Grazing Management Agreement between the Forest Service and Montana Department of Fish, Wildlife & Parks.
- Authorized reconstruction on its current location approximately 4 miles of the Tenmile boundary fence between the Forest and Mount Haggin Wildlife Management area.

4. References

USDA Forest Service. 1985. Seymour Stewardship Area - Allotment Management Plan. Beaverhead-Deerlodge National Forest, Wise River Ranger District, Wise River, MT.

USDA Forest Service. 2009. Beaverhead-Deerlodge National Forest Land and Resource Management Plan. January 2009. Beaverhead-Deerlodge National Forest, Dillon, MT.

VI. FINDINGS and RECOMMENDATIONS by RESOURCE

This section summarizes the findings from individual resource write-ups and the subsequent recommendations for closing the gap between current conditions and desired conditions. These actions include restoration needs, maintenance of conditions, or protection of ecosystem components in order to sustain the health and productivity of natural resources. Data gaps and monitoring needs are included as part of the recommendations.

Any actions or projects which utilize the information presented in this Watershed Assessment will be analyzed on a site-specific basis by an interdisciplinary team and will include both public involvement and disclosure of the decision as prescribed by the National Environmental Policy Act (NEPA).

See Section VII for INTEGRATED RECOMMENDATIONS.

SOILS

Finding:

The maintenance of soil productivity is the desired condition for the soil resource (USDA Forest Service, 2009). While extensive management activity has occurred in the assessment area, managed areas appear to be recovering well and lingering effects were observed to occur primarily on old skid trails and landings. Other impacted sites occur primarily in localized areas of dedicated use, such as roads and campgrounds, which are provided for with Forest Plan direction and the Regional Soil Quality Standards (USDA Forest Service, 1999).

Areas where we have opportunities to improve soil productivity include poorly located/unneeded road segments, unauthorized roads and trails, and also small areas of residual compaction on old roads/skid trails in previously managed timber stands.

Recommendations:

- *Implement current travel management recommendations.* Travel management efforts are currently underway for the Wise River Ranger District. Implementation of the current recommendations would increase productivity over time on about 63 miles of road. Assuming a 14-foot wide footprint, this translates into approximately 106 acres that would slowly regain productivity over time.
- *Verify landtype mapping on the ground for proposed activities involving heavy equipment*. While there is general agreement between the landtype mapping and the geology maps available for the area, there are areas that do not match up. Additionally, the assessment area is complex and the landtype map (1:24,000) is not meant to delineate small inclusions of sensitive soils. For these reasons, it will be especially important for a soil scientist to review any proposed activities involving heavy equipment (e.g. timber sale units) on the ground to verify the mapping and

assure that appropriate project design features are prescribed to protect soil productivity.

WATERSHED and HYDROLOGY

Finding:

Much of the lower part of the Seymour Creek watershed has been heavily harvested as part of the Mt. Haggin timber sale, and some stream channels (especially intermittent streams) in these areas have been impacted by logging practices and increases in water yield. During and before the timber harvests of the 1980s, only a small portion of the main stem of Seymour Creek had been harvested, and it is in generally good condition throughout.

The majority of land in the lower elevations of Deep Creek subwatershed has been altered by past timber harvest, resulting in some degradation in stream function, especially of intermittent streams.

The recommendations below specify actions which will help achieve proper functioning streams and healthy riparian vegetation throughout the Seymour-Deep assessment area. These recommendations will help address the 303(d) stream concerns and should improve conditions that could allow those streams to be recovered and taken off the 303(d) list, and meet goals of the Forest Plan.

Recommendations:

Reverse past management's negative effects to the watershed with a focus to:

- maintain healthy and vigorous riparian vegetation to continue bank stabilization and provide shade;
- ensure existing roads and trails function properly to keep sediment out of streams;
- improve road and trail crossings at streams; and
- continue to monitor and reclaim past mining sites.

Under the 2009 Beaverhead-Deerlodge Forest Plan, the Deep Creek subwatershed was identified as a Fish and Restoration Key Watershed and Seymour Creek subwatershed was identified as a Restoration Key Watershed. These watersheds should be given priority for any management actions. Implementing strategies to achieve aquatic goals set in the Forest Plan (Appendix A) will contribute to attaining desired stream functions within the watershed.

Recommendations include efforts to reverse some of the past management's negative effects to the watershed. This includes improving road and trail crossings to decrease the amount of sediment reaching streams, ensuring that existing roads and trails are functioning properly with adequate drainage features to keep sediment out of streams,

repairing/replacing culverts that are known to not be functioning properly, and maintaining healthy and vigorous riparian vegetation which will continue to stabilize banks and provide shade.

The TAP has recommended that a number of roads be decommissioned or closed. For roads that will remain on the system, a Road Condition Survey needs to be completed within the project area to determine specific roads and stream crossings that need to be modified to reduce sediment input to streams and improve crossings. Although some streams have appropriate sized bridges or culverts, many roads and trails within the watersheds need properly functioning drainage features and stable crossings to decrease levels of sediment affecting streams. There are 23.8 miles of roads within 300 feet of perennial streams and 15.0 miles of roads within 150 feet of intermittent streams within this watershed (Table 10). A portion of these routes are preventing some stream reaches from achieving properly functioning condition. A combination of surfacing, additional drainage features within the road prism, reclamation, and/or prism re-routes should be completed to effectively promote stream function. On roads that will be decommissioned or closed, any connection between the road prisms or any crossings that may be delivering sediment to streams should be properly decommissioned so to remove any potential sediment delivery in the future.

Maintaining healthy riparian vegetation is important for proper stream function. Currently healthy riparian vegetation exists throughout the watersheds. However, riparian willow and aspen stands are being threatened by conifer encroachment. This encroachment is relatively recent and could be treated to reduce the impacts of colonization and ensure that the willows and aspen communities maintain vigor. Individual tree removal, girdling conifers to act as future large woody debris recruitment, and cutting trees and leaving them within the riparian area are all possible management activities. By maintaining a healthy willow and aspen community, stable stream banks, appropriate stream temperatures, and healthy insect communities can be maintained. In addition, the presence of these riparian species could protect stream corridors from high intensity fire more effectively than a conifer over story (Dwire, Kauffman 2003). Some projects are already being planned and executed within the project area, but mainly in aspen colonies.

Grazing has been shown to have had negative impacts within the Seymour-Deep assessment area in the past. Proper implementation of grazing standards and monitoring of allotments are critical to ensure that stream systems are allowed to move toward proper functioning condition and that no increased resource damage will occur. An updated Allotment Management Plan is being drafted currently for the North West Big Hole, including Seymour-Deep Creek subwatersheds.

Table 47. Watershed and Hydrology recommendations.

Action	*Purpose* and Rationale	Sideboards	Priority
Complete Road Condition Surveys (RCSs)	*Locate any potential sediment delivery sites from the road system:* Once problem areas are identified, suggestions for fixing road segments can move forward and be		Number one hydro priority for roads

Action	*Purpose* and Rationale	Sideboards	Priority
	prioritized		
Maintain and improve design of selected roads and trails; especially stream crossings and culvert replacements with bridges or appropriate sized culverts	*Reduce sediment delivery from roads and trails to streams:* by improving the design of stream crossings and placing appropriately spaced and designed drainage features on roads, sediment input to streams from travel ways can be greatly reduced.	Any instream work will require a 124 permit.	
Decommission and/or restore roads and trails identified through route analysis	*Reduce sediment delivery from road and trails to streams in locations or with designs that cannot be brought up to a desired condition:* by removing roads from riparian areas and removing unnecessary stream crossings on roads, sediment input to streams from travel ways can be greatly reduced.	Travel planning and MVUM Any instream work will require a 124 permit.	
Fix irrigations ditches that are currently be utilized, but are in disrepair (or have water right owner fix); reclaim ditches or remove water from ditches that are no longer being maintained or utilized	*Improve stream function and decrease impacts to roads:* some irrigation ditches have lacked maintenance and are running along or down roads increasing sediment delivery to some streams	These actions will likely require cooperation form water rights' holders.	Ditch that parallels FR 2482 needs maintenance -- does diversion need maintenance work (or is even still operational?) and at the very least the ditch needs to be fixed to remove active flow over and down FR 2482
Reduce conifer colonization in aspen stands	*Improve riparian habitat and stream function:* Healthy aspen and willow stands contribute to stable stream banks, appropriate stream temperatures and protect stream corridors from high intensity fire more effectively than a conifer over story.	TMDL status and Forest Plan Standards may affect location of treatment in riparian areas.	
Improve recreation facilities like campgrounds and trailheads	*Reduce sediment delivery from recreation sites to streams:* by hardening sites, controlling traffic, and improved signing and compliance in recreation sites within RCAs, sediment delivery can be greatly reduced.		Lower Seymour Lake trailhead had stream overflow running down the trail during high flow summer of 2011

AQUATIC SPECIES and HABITAT

Finding

Past and current management activities have had negative effects on streams, stream function, bank stability, riparian vegetation and native aquatic species.

Sedimentation due to naturally unstable soil types was potentially an issue historically but management activities have significantly increased this problem. Roads and trials, past timber harvest, livestock, water diversions and past mining activities have all significantly increased sediment levels within streams. These same activities have also affected stream function. Bank stability, width to depth ratios, and other stream function parameters have been negatively affected by these management activities.

The streams within the headwater portion of this watershed are generally stable and functioning properly. Apart from some nonmotorized trail systems, management activities have generally not affected the Wilderness portion of the watershed. Most management activity has occurred in the mid to lower elevations of the analysis area.

The presence and persistence of non-native salmonid species within most of the SDWA area is likely to remain the existing condition. Non-native species do have significant recreational fishing value for recreationist and are a good indicator of aquatic health. However, nonnative expansion has occurred throughout several of the major drainages in the SDWA in the last 10 years. Westslope cutthroat trout restoration and population maintenance opportunities exist in the Seymour, Tenmile and Twelvemile Creek drainages. These native species restoration opportunities should be considered high priority aquatics projects and pursued as interagency partnership projects between the USDA Forest Service and the Montana Department of Fish, Wildlife and Parks.

Recommendations

Recommendations for the SDWA should include efforts to reverse some of the past management's negative effects to the watershed. This includes improving road and trail crossings to decrease the amount of sediment reaching streams, ensuring that existing roads and trails are functioning properly with adequate drainage features to keep sediment out of streams, repairing/replacing culverts that are not functioning properly, and maintaining healthy and vigorous riparian vegetation which will continue to stabilize banks and provide shade.

Roads and trails are contributing to increases in sedimentation for several streams within the SDWA. A significant portion of the travel routes in the SDWA are preventing streams from achieving properly functioning condition. A combination of surfacing, additional drainage features within the road prism, reclamation, and culvert replacement should be completed to effectively promote stream function.

Table 48 displays all aquatics opportunities identified in the SDWA by 6th field HUC.

Table 48. Aquatics Opportunities and Data Gaps for the SDWA.

6th Field HUC	Stream Name	FS Route	Recommendation	Remarks
Seymour and Deep	NA	All	Incorporate All Road and Trail Related Improvement Recommendations for the SDWA Hydrology Report	Reduce erosion/sediment
Seymour	Seymour Creek	2469	Incorporate a Fish passage Barrier into the Bridge Design on Seymour FS Route 2496, Stream Mile 12 Figure 8.	WCT restoration/population maintenance: 13.5 miles of stream habitat for WCT (including Chub Creek and Upper and Lower Seymour lakes).
Deep	Corral Creek		Conduct Upstream Electrofishing and Habitat Surveys and WCT Assess Genetics.	WCT restoration/population maintenance
Deep	Slaughterhouse Creek	2483	Replace 5 Culverts, Obliterate and Restore Undeveloped Ford, Road Maintenance,	Replace plugged and undersized culverts, reduce erosion/sediment
Deep	Slaughterhouse Creek	2495, 2496	Resurface and Incorporate Road BMPs or Obliterate Roads (Figure 21)	Reduce erosion/sediment
Deep	Tenmile Creek	2483	Replace the Double Culvert on FS Route 2483 with a Fish Passage Barrier/Box Culvert Design. Restore Upper Drainage to Genetically Unaltered WCT.	WCT restoration/population maintenance: 7.5 miles of stream habitat for WCT (including the Tenmile chain of lakes).
Deep	Twelvemile Creek		Eastern Brook Trout Removals in Twelvemile Creek Where Sympatric with WCT.	WCT restoration/population maintenance

6th Field HUC	Stream Name	FS Route	Recommendation	Remarks
Deep	WF Twelvemile Creek	2483	Replace the Culvert on FS Route 2483 with a Fish Passage Barrier/Box Culvert Design. Restore Upper Drainage to Genetically Unaltered WCT.	WCT restoration/population maintenance: 7.5 miles of stream habitat for WCT

VEGETATION

Finding

The Beaverhead-Deerlodge Forest Plan (2009a) has several objectives for vegetation. These are presented here. The recommendations section (below) describes activities that would bring current conditions closer to the desired conditions (objectives) in the Forest Plan.

The Beaverhead-Deerlodge Forest Plan (2009a) has an objective of increasing aspen on 67,000 acres Forest-wide in a 10 year period. Surveys conducted in the eastern side of the Seymour - Deep Creek assessment area indicate relatively few aspen stands in upland areas contained within conifer stands.

As discussed previously, fire management practices in the last century have had a dramatic influence on Douglas-fir stand size class as well as allowing colonization of Douglas-fir in unique habitats that historically were free of conifers (dry grassland parks).

Without fire or commercial removal, and with the high levels of insects, substantial acres of FM 8 are converting to FM 10 over the next 15 years.

Recommendations

Aspen

The most recent monitoring report for the Beaverhead-Deerlodge National Forest found that non-stand replacement treatments such as conifer clearing adjacent to and within aspen stands are effective in stimulating long term sprouting even if browsing continues to limit growth (USDA 2009). Treatment areas can continue to exhibit dense sprouting after 25 years (USDA 2009): an effective approach is to treat many acres of aspen thereby distributing the effects of browsing over a larger number of acres. This approach allows some of the sprouting to successfully grow above browse height, effectively recruiting young growth to older aspen stands.

Site specific field reviews of aspen stands will need to be done to determine suitable stands for treatment. In general, all aspen stands in the Seymour - Deep Creek assessment area are at high risk due to either singularly or cumulatively: conifer encroachment and overtopping; browsing; and age. The overriding objective with aspen would be to treat as many acres as possible in conducive stands to ensure full vigor can be achieved.

Aspen stand vigor can be increased by removing existing conifers from around the aspen clone in upland stand sites. All aspen stand acreage in upland and riparian associated stands where access is feasible should have the conifers removed around the clones.

Big Sagebrush Steppe and Grassland

Use fire to create the mosaic of big sagebrush and grassland communities that historically occurred within the Seymour - Deep Creek assessment area. Where possible, remove the conifer succession into sagebrush steppe vegetation; this may be through a combination of mechanical means and the use of fire. Caution with treatments adjacent to major travel routes is recommended; these locations typically support noxious weeds that have a high risk of spread into disturbed natural vegetation (Sheley et al. 2002). An assurance of adequate recovery by native vegetation prior to potential exposure to non-native plants is the best alternative.

Cool, Dry Douglas-fir Habitats

The management recommendation is to push back colonization of Douglas-fir and other conifers out of sites that historically lacked the conifer. The additional management recommendation is to reduce stand densities on as many acres of Douglas-fir stands as possible. Where allowed, use timber harvesting systems on operable (ground-based to allow thinning) acres, whereby the largest trees are retained.

Achieving the objective of sustaining most of the larger, older Douglas-fir trees in a stand may only be possible if as many stands of Douglas-fir are thinned as possible. Large trees are lacking in the assessment area, and Douglas-fir offers the best opportunity to develop this needed structure. When an increase of Douglas-fir bark beetle populations develop, stands of larger trees are attacked and become the foci for development of an outbreak. However, mortality from DFB is less in stands with lower basal areas or in thinned stands.

Cool Habitats Dominated By Lodgepole Pine

There is a need to salvage mortality in lodgepole pine created from the MPB epidemic. There is an opportunity to salvage harvest off of predominately the existing road system (some temporary road may be needed) using ground-based equipment capturing product value prior to deterioration, creating additional opportunities for land stewardship projects. Although overtime, the lodgepole pine stands killed by MBP will regenerate, the downfall will create heavy fuel loading. There is an opportunity to strategically harvest in areas to break up fuel continuity and create elk and other wildlife movement corridors.

There is also an opportunity to create a strategic fuels treatment plan that would allow for fire starts to burn in portions of the Seymour - Deep Creek Watershed Assessment area to create early successional conditions. Given that a large percentage of the assessment area is roadless, the advantage of fire use management would enhance opportunities for resource benefits (i.e. to facilitate landscape heterogeneity).

Dry, Lower Subalpine Habitats

Where lodgepole pine dominates the overstory and has been attacked by MPB, there is an opportunity to salvage harvest the lodgepole pine creating stands that are early successional without heavy fuel loading. These stands would maintain a mixed conifer component with other species maintained.

There is a need to increase landscape heterogeneity by creating a patch mosaic of varying successional stands. The objective is to create early-seral conditions for the early seral species lodgepole and whitebark pine. Where commercial harvest is not available, this objective would be met through the use of fire.

Cold Moist Upper Subalpine & Timberline

A concerted effort to ensure the regeneration of whitebark pine needs to be accomplished; this is either through affirmation that natural regeneration has occurred, openings in mixed conifer stands take place to allow for natural regeneration, or planting of rust resistant stock occurs. Monitoring of whitebark pine across the BDNF indicates that natural regeneration with the ongoing overstory tree mortality associated with the MPB epidemic and existing blister rust infection-induced mortality is occurring. The most effective means for regenerating whitebark pine is to allow fire to burn in these timberline habitats when ignitions are natural. Management ignition may need to occur in strategic locations when conditions exist to promote regeneration. There is a need to conduct additional site specific inventory, mapping and analysis to implement these recommendations.

The following table summarizes the recommendations of each vegetation type within the Seymour - Deep Creek Watershed Assessment area.

Table 49. Recommendtions by vegetation type.

Vegetation Type: Action	Purpose and Rationale	Acres	Sideboards	Priority
<u>Aspen:</u> *remove conifer competition within and adjacent to aspen clones, to improve clonal vigor.*	*Restore a declining, unique component of forest vegetation to a condition more reflective of past conditions.* Aspen stands are at risk of loss due to encroachment, overtopping, browse and age. (All acres.)	79	None.	All acres with conifer competition.
<u>Sagebrush Steppe and Grassland:</u> *reduce conifer colonization; create age diversity, to improve dry shrubland and grassland*	*Restore sagebrush/grasslands to a more resilient condition reflective of natural disturbances*: Fire exclusion may have increased shrub densities and average age of sagebrush steppe communities. Conifers have colonized both grassland and	5,000	Ensure weed spread is minimized.	All acres with conifer encroachment.

Vegetation Type: Action	Purpose and Rationale	Acres	Sideboards	Priority
conditions.	sagebrush steppe communities. (All acres.)			
Willow: remove conifer competition within willow stands, to improve willow component.	*Improve willow conditions; remove conifer colonization and overtopping*. Fire exclusion has allowed conifers to occupy willow habitats. (All acres.)	2,000	None.	All acres with conifer competition.
Douglas-fir: reduce stand density and promote large tree development	*Increase landscape vegetative heterogeneity, species diversity and resilience:* Lack of fire has resulted in a change from open-grown stands of large diameter trees and a mosaic of different age classes and tree densities to a more continuous cover of mature trees and reduced landscape diversity. (2/3 of mid- to late-seral acres.)	600	None.	Treat as many acres as possible to enhance large tree recruitment and increase resiliency.
Lodgepole Pine: salvage mortality caused by mountain pine beetle; reduce stand densities in early to mid- seral stands	*Capture product value prior to deterioration; create opportunities for stewardship projects. Reduce stand density in early to mid-seral lodgepole pine stands to increase resilience to natural disturbances.* (1/4 of mid- to late-seral acres.)	4,000	None.	Stands that have good economic value. Stands with acceptable access, including consideration of temporary road construction.
Mixed Conifer type: increase landscape heterogeneity by creating a patch mosaic of varying successional stands	*Create early-seral conditions for early seral lodgepole and whitebark pine establishment primarily through the use of fire; forest vegetation structure provides the basis for maintaining forested ecological communities of sufficient diversity.* (2/3 of mid- to late-seral acres.)	2,000	Fuel model 10 stands.	All acres where WBP regeneration can be encouraged.
Whitebark Pine: remove other conifer species that are competing with whitebark pine; ensure regeneration of whitebark pine is occurring post-beetle and blister rust mortality.	*Ensure continued presence of this keystone species in this landscape; create new opportunities for regeneration where needed (focusing on mixed conifer and/or stands where other conifers are colonizing whitebark pine stands), or plant rust-resistant wbp where naturals are not occurring. Use prescribed or natural fire where possible.* (All acres.)	5,800	Increase opportunity for WBP regeneration, or growing space for existing WBP regeneration.	All acres where WBP can and needs to be enhanced or opportunity for increasing WBP regeneration occurs.

THREATENED, ENDANGERED, and SENSITIVE PLANTS

Finding

Of the thirty nine listed sensitive plants for the Beaverhead-Deerlodge four are known within the Seymour-Deep watershed and seven species are known in close proximity to the watershed but have not been found within. There are eleven other plant species found

within and adjacent to the watershed that the Montana Natural Heritage Program tracks as Species of Concern(SOC) but do not currently meet the criteria for inclusion on the Forest sensitive list.

Recommendations

- Initiate or increase field surveys for sensitive and SOC plant species across the watershed. Efforts should be made to compile full species lists for all vascular and non-vascular plant species in the drainage and across the Forest.
- Focus field surveys toward *Botrichium* species and riparian habitats.
- Where possible develop cooperative agreements with local and regional universities/colleges to assist in field surveys and research to better understand the flora of the Forest.
- Ensure field crews, especially noxious weed and trail crews have training covering sensitive plant identification. Training should provide them understanding as to the reasons for using alternative control methods or project design changes to avoid damaging these unique species.
- Ensure all ground disturbing activities adequately revegetate. Rely on native soil seed bank where possible. If direct seeding is required use only native plant materials and ensure all seed mixtures are certified noxious weed seed free.

INVASIVE SPECIES

Finding

The Seymour/Deep watershed can generally be categorized essentially as a newly invaded area. This is not to suggest that the current weed infestations have only just established but to highlight that with a minimal amount of effort the current infestations could easily be eradicated. Recent research looked at various weed management programs with extent and size of infestations to determine the optimal strategy for noxious weed control (Frid et.al, 2011). In large landscapes with limited weed infestations, efforts should focus first on treating all small and remote sites and then move toward larger weed acres as budgets allow. These treatment strategies for existing weed infestations and along with an operational EDRR program provide the highest success in reducing current weed infestations.

All known weed infestations in the watershed are quite small and can easily be controlled. In fact four of the five weed species present in the drainage infest such small acreage that eradication is the desired weed control strategy. All Oxeye daisy, houndstongue, musk thistle and spotted knapweed infestations should be treated as a minimum twice during the growing season. This could be accomplished with minimal effort. If additional weed management funds are available then the Canada thistle infestations could be treated. No treatment of this species will in all likelihood have any affect its overall coverage. As the past

timber harvest units continue to develop many of these weed sites will become overly shaded negatively affecting the thistle vigor.

Recommendations

- Continue existing cooperative management of noxious weeds in these watersheds with help from other agencies, organizations, and individuals.
- Increase emphasis on weed prevention education. All district personnel should be trained in noxious weed identification. Implement an Early Detection Rapid Response plan for new invaders and new infestations of existing noxious weeds. Continue requirement of certified weeds seed free forage for all users of the National Forest Lands.
- Ensure all ground disturbing activities adequately revegetate. Rely on native soil seed bank where possible. If direct seeding is required use only native plant materials and ensure all seed mixtures are certified noxious weed seed free.
- All heavy equipment used in the area must be cleaned, including undercarriage and inspected prior to entering Forest Lands.
- Increase weed control activities in the area to move toward eradication of the oxeye daisy, houndstongue, musk thistle and spotted knapweed infestations. Canada thistle infestations should be managed under a containment strategy.

WILDLIFE

Finding

Habitats of concern are directly linked to those cover types showing the greatest change. The wildlife analysis indicates that mountain big sagebrush, upland aspen, riparian aspen and other riparian vegetation (willow, alder, cottonwood) have changed from the historic past. Conifers have encroached into grasslands/big sagebrush sites and aspen groves at various locations across the assessment area. Conifer encroachment results in competition for water, sunlight and space. Extensive timber harvest in the latter part of the 20th century altered stream flow regimes and impacted riparian vegetation to some extent, though robust riparian vegetation occupies lower elevation sites in the assessment area.

Whitebark pine in areas harvested prior to 1940 are small in stature and appear robust in the few areas visited during wildlife field work. Large diameter Douglas fir in the foothill areas appears to be limited in distribution, and this appears to deviate from the recent past.

Open motorized road and trail densities exceed 2009 Revised Forest Plan direction for Big Hole River Landscape and Hunting Unit 319 as shown in Table 36. The south west portion of the BDNF is currently conducting transportation analysis as directed under the 2005 Travel Management Rule. There is an opportunity to move toward the travel management goals established in the 2009 Revised Forest Plan through implementation of route closures.

Recommendations

Improve wildlife habitat by reducing conifer encroachment into mountain big sagebrush and sagebrush/grassland parks and aspen stands. Priorities for sagebrush and grassland treatments would be on big game winter ranges.

Killing coniferous trees in aspen groves increases insolation, reduces shade, reduces coniferous seed source and increases available soil moisture for aspen, - all of which lead to increased plant vigor. There is no evidence that removal of conifer trees results in increased herbivory. Remove conifers from within and around aspen groves whenever possible.

Mature Douglas-fir stands and potential flammulated owl habitat. Conduct surveys in larger contiguous stands of potential habitat and evaluate stand conditions for potential thinning of Douglas-fir.

Whitebark Pine – inventory is needed to determine current condition of stands; assess blister rust infection, mountain pine beetle infestation and other stand conditions.

Route densities in Hunting Unit 319 exceed 2009 Revised Forest Plan objectives. Work collaboratively with stakeholders to strategically reduce route densities and increase wildlife secure areas in the assessment area.

RECREATION RESOURCES

Finding

Recreation use in the roaded part of analysis area continues to be centered on motorized activities, while the wilderness portion attracts primitive recreation. Proximity to local population centers (Butte & Anaconda) and continuing increases in registration of off-highway vehicles (ATVs, Snowmobiles) has put increased demand on existing roads and trails in the area, but opportunities for road based recreation remain limited. There is only one developed campground in the analysis area (Lower Seymour Lake) and one developed trailhead (Seymour Trailhead). Most recreation activities are concentrated in this area. The highest levels of recreation activities are seen in summer for dispersed camping and for hunting and camping during the fall big game hunting season. Low levels of snowmobiling occur in winter. Light levels of activity are seen during the spring for bear hunting.

Activities – Sites – Trails

Recreational use in the analysis area continues to rise. Off-highway motorized registrations are increasing with a corresponding increase in use on roads and trails. Dispersed camping and recreation activities are concentrated in the Seymour Creek drainage (Table 43.) Proximity to riparian areas and season of use (Spring thaw, Winter snow) has increased the damage to trail and road surfaces.

Recent outbreaks of beetle-killed trees in the analysis area have also led to increased firewood gathering. Subsequently, more vehicles are going off of designated roads and

trails to collect firewood. However, due to terrain and vegetation features, off road/trail vehicle use is confined and limited to areas immediately adjacent to open routes. Significant resource damage does not appear to result from firewood gathering.

Preliminary travel planning activities for sections of the analysis area (Fishtrap-Mount Haggin MA) were begun in 2008. Using the Forest Plan Interim Roads and Trails Map as a baseline, roads and trails in the MA were reviewed. District and Forest staffs identified resource concerns and made recommendations on how they might be alleviated. A Draft Transportation Access Plan (TAP) was completed in February of 2012. Proposals on future management of roads and trails in the analysis area will be made available to the public for comment and feedback during the summer of 2012. Site-specific NEPA analysis will be needed to identify and analyze alternatives, using the recommendations from forest specialists and comments received from interested publics.

Recommendations

Trails and Roads

The Seymour/Deep watershed analysis area features an extensive road system developed mostly in support of logging operations which dominated use of the area from 1883 through 1993. The Transportation Access Plan (TAP), completed in draft form in February 2012, shows 111 miles of existing road and 16 miles of trail. The TAP is an inventory of existing routes and used in developing a Motorized Vehicle Use Map (MVUM), which, when completed, will restrict wheeled motorized vehicles to designated roads and trails. A MVUM is presently being worked up for this area. Many of routes shown on the TAP are no longer physically available to vehicles because they have "haired" in, meaning trees have germinated and become reestablished within the road prism and are now large enough to preclude vehicle use. Other routes were low standard skid roads that have weathered to an unsafe condition and are not suitable for public use. Additional routes shown in the TAP are recommended for decommissioning to improve water quality or because they do not provide a practical recreation opportunity. The proximity of routes to streams and riparian areas, steep grades, and poor drainage controls are a concern, especially along Deep Creek, a fish key watershed, managed to conserve natural fish populations, and Sullivan and Seymour Creeks, restoration key watersheds, managed to restore desirable watershed conditions. Other routes need to be relocated, maintained or closed to address safety concerns for motorized users and protection of forest resources. There are also several redundant or parallel routes to the same destination that may not be of particular utility. The cost of performing annual maintenance, clearing routes, installing and cleaning drainage control structures, and keeping up with signing needs is a real concern in times of shrinking budgets. Open routes increase the potential for establishment of noxious weeds, the control of which is expensive monetarily, but exorbitant environmentally if left unchecked. A limited and logical transportation system that meets user needs for access and recreation, while maintaining environmental and fiscal affordability will be considered in the MVUM. Overall the TAP recommends about 70 miles of road (62% of the inventory) be maintained in the MVUM, and 1.22 miles of motorized trail (Trail #2745).

The area does not lend itself to challenging 4X4, ATV or motorcycle opportunities. The motorized routes are more suitable for poking around than for high thrill adventure. There are no single track trails available for motorcycles, and motorized loop opportunities are limited in number and scope. The potential to develop additional loops is low due to reasons described above.

The roaded portion of the analysis area is also not endowed with great non-motorized trail opportunities. There are only 10 miles of trail outside of wilderness.

As previously stated, recreational use for the roaded portion of the project area is primarily for dispersed camping in summer and fall. Summer use is focused on lolling around campsites, fishing and driving for pleasure. Fall use is mostly associated with hunting. Maintaining opportunities for dispersed camping is central for public use and enjoyment.

Specific recommendations:

- Maintain the Chub Creek Road #3939 only to the junction with East Fork Ridge Trail #2744. The 1/3rd mile of trail that heads NE above this junction should be decommissioned as it serves no administrative or recreational purpose.

- Complete the planned tie-in to connect the Chub Creek Road #3939 to the East Ridge Trail #2477 (southwest corner of section 27).

- Maintain the East Fork Ridge Trail #2744 as a non-motorized route (as presently shown on the TAP). As such, a short day hike, horse ride or mountain bike ride could be realized on a 3.5 mile loop utilizing this trail, a portion of the Chub Creek Trail #2132, Trail #2745 (no name), and Road #3939.

- Maintain Trail #2745 as a non-motorized trail (TAP presently shows it as motorized). This route connects Road #3939 to the Chub Creek Trail #2132. The trail does not afford a practical motorized opportunity. It is only 1.22 mile long, generally too narrow for ATVs (having become brushed in), and is overly steep in places where rutting and erosion are likely to worsen with increased use. There is scant evidence of recent motorized use. This recommendation enhances non-motorized recreation by creating additional loop options incorporating Trails #2132, 2744, and Road #3939 to allow for a 3.5 mile loop, or utilizing Trails #2132 and CDNST Trail #2009 (portion outside of wilderness) to access the Seymour Lake Trailhead and Roads #934 (Seymour), 2469 (Twin Flower) and 3939 to complete an 8 mile loop.

- Close Roads #2485, Dry Bear and #2486, Bear Grass (both show as A6 on TAP). On the TAP map these show as connecting to Road #2484, Bear Trap Loop, but 2485 ends in a clear cut 1 mile above Upper Dry Fork Creek #2482 and 2486 ends at a Kelly Hump 0.4 mile up from its' junction with 2485.

- Bear Trap Loop is open on the TAP (A1 and A6). Consider leaving this loop open year-long or implement a hunting season closure beginning 10/15. It is 4.6 miles long,

includes Bear Trap Road #2484 and a portion of Sullivan Creek Road #2488. The first 0.5 miles of 2484 is Alder choked and too closed in for full sized vehicles. It needs to be brushed out to accommodate full sized vehicles. Road 2488 is in excellent condition and suitable for even low clearance vehicles.

- Road #2489, Upper Sullivan Creek (TAP shows this route as converted to a trail open to full sized vehicles). Surface of this route is rocky but not washing badly and suitable for vehicles with at least moderate ground clearance. This TAP map shows 2489 reconnecting back to the Bear Trap Loop but this connection is either gone or not readily apparent and should be reinvestigated. Road #2489 junctions with Road #3938, the Sullivan Ridge Road, in the SW corner of section 18. 3938 is slated for decommissioning on the TAP. The Visitor Map (B-D Central) shows an open route along Road 3938 to the middle of Section 13. I recommend that this route be maintained as open as shown on the Visitor Map (and the number changed to 2489 unless a loop tie-in back to the Bear Trap Loop can be established). This route is in good condition and ends at a Kelly Hump (UTM 0332807E 5097174N), beyond which, about 330 yards, is an old bridge crossing. There are fire rings in the area indicating past use (probably hunting season). (Note. A Goshawk was observed near the old bridge crossing).

- In Section 29, between where the west and east reaches of the West Fork Twelvemile Road #2990 rejoins Road #2488 (Sullivan Creek), the TAP indicates a motorized trail instead of a system road. This seems incongruous and may be in error.

- Road #2490, West Fork Twelve Mile, 7.71 miles long, is recommended for decommissioning on the TAP. The west side of this road has been partially obliterated and is unsuitable for full size vehicles or even ATVs. The east side of 2490 is in fair condition. The map shows these two reaches of road connecting to make a loop. However, about 200 yards of the road have been obliterated at the top end where the road crosses the creek. This route should be decommissioned as a road but it could be maintained as a non-motorized trail for hikers, horseman, mountain bikers and hunters. The area provides excellent habitat. Both elk and bear sign were observed during a September survey.

- Road #2492, Upper Corral Creek and Upper Slaughterhouse Road #2496. There is some minor washing along these routes but overall road surfaces are in good condition. The TAP shows 2492 decommissioned about 200 yards before the junction with the Tenmile Lakes Trail #2733. At 3.2 miles up from Road #2483 (Lower Dry Creek) there is a turnaround which is a logical place to end this route. Ideally the open route would continue at least to the junction with the Tenmile Lakes Trail and a small trailhead facility developed consisting of a turnaround, adequate for a truck with horse trailer, a hitch rail, and parking for five vehicles).

  Upper Corral Creek Road #2492 continues up the drainage. This is a former logging road that has reverted to a two-track that is slated for decommissioning under the

TAP. This route may prove a recreation benefit if maintained as a non-motorized trail. As such it could connect with the new CDNST route that will skirt the northern boundary of the watershed from the Mount Haggin Management Area to Tenmile Lakes and beyond. This route, coupled with Trail #2733 and a mile of the new CDNST, would create a loop opportunity for non-motorized visitors (bikes, horses, hikers) of about seven miles in length.

- Road #2494 (**2495)**, Cut Across (**Slaughterhouse**). Note that the Mount Haggin topographic map shows road numbers that are not consistent with the TAP. Road #2494 on the TAP is labeled 2495 (Slaughterhouse Creek) on the topo. The topo appears correct and therefore this route on the east side of Slaughterhouse Creek in Sections 22 and 15, is referred to as 2495 in this report. In Section 15, this road junctions with Road #70634 which continues north to a dead-end in Section 10. The road (2495) crosses Slaughterhouse Creek and junctions with Road #2494 (labled as such on the topo) in the SE corner of Section 16. At this point the TAP recommends decommissioning 2494. I recommend that this short section of road remain open for an additional 7/10th mile to complete a loop with the Corral Creek Road 2492.

Preliminary travel planning and recommendations in the Fishtrap-Mount Haggin MA has been completed through the TAP but adjustments and changes are likely following field inspections during the summer of 2012. A MVUM is underway to implement travel planning for the area but is not yet finalized. TAP recommendations, which reduce open motorized roads by 38%, will certainly improve watershed function, especially if decommissioned roads are stabilized. Some decommissioned roads could be converted to single track trails and serve a recreation need, especially in providing loop routes for mountain bikes and maintaining trail access for hunters.

As recommended by the TAP most system roads will be A1 routes, meaning open all year. Only a few roads will be closed seasonal to provide for wildlife security during the hunting season. In order to reduce impacts and expense of gate management, it may be best to reduce the number of routes closed seasonally, especially in consideration of the 38% reduction of open routes proposed in the TAP. Seasonal closures currently in place for wildlife security need to be reviewed for current validity. Some closures may no longer be needed, thereby making some existing roads and trails available for more loop trails.

Dispersed Recreation Opportunities

Designated campsites and the access routes to them off of designated roads should be added to the transportation system through the MVUM to secure these opportunities.

Most dispersed sites are located along the major forest development roads and do not pose resource concerns.

Developed Recreation

Consider upgrades for the Seymour lake Trailhead. The site gets considerable use and visitors would benefit by replacing the existing outhouse with a modern SST (double), replacing hitchrails, and removing the old loading ramp and feed bunk that have fallen into disuse.

HERITAGE RESOURCES

Finding

Cultural resource inventories within the analysis area have been strictly "compliance" oriented in support of other forest programs over the past 25 years. Cultural resources that were encountered during these investigations were noted and avoided.

As noted above, a good share of the known cultural resources are of historic origins that contain wooden cabins, buildings, and/or structures are in various stages of collapse, decay and neglect. As a result, there is a high probability that much of the original historical integrity of many of these sites may have been lost, resulting in Forest Plan objectives or desired conditions for Heritage Resources not being met.

Recommendations

The Seymour – Deep Creek watersheds are proportionally underrepresented in terms of previous cultural resources inventory. Additional inventory in this area would be desirable. It is recommended that a sample inventory be undertaken in areas considered to have high potential for cultural resources.

When cultural properties are located, they need to be recorded and formally evaluated for significance and eligibility to the National Register of Historic Places in consultation with the Montana State Historic Preservation Office. A formal recordation of the complex of sites associated with report 1987-BE-2-4 is recommended.

Sites formally determined to be significant and eligible for the National Register of Historic Places would then be managed to standards and monitored at least every five years to insure that no impacts occur that adversely affect site integrity or eligibility.

Similarly, the current recreational use of the area also affords the opportunity to provide historical interpretation of the French Gulch historic mining area and timber production significant on both a local and regional scale. It is recommended that historical interpretation be included as part of providing future recreational opportunities in accordance with the recently developed Beaverhead-Deerlodge "recreational niche" concept.

RANGE MANAGEMENT

Finding

Livestock grazing has been ongoing in the Seymour-Deep watershed for many decades. The forage use in the area has varied over the years but for the most part has been incidental to the large timber management activities in the drainage. Current grazing management has allowed for maintenance and improvement of the various plant communities established here. Livestock use is light on the Seymour C&H allotment and current management plans work well for the permittees, Forest Service and Montana Fish, Wildlife and Parks. If we look at the Seymour allotment in a strict livestock production eye a more intensive management plan could be developed. This plan would still protect upland and riparian resources but would require an additional workload and commitment on the permittees to more actively manage the livestock when on the allotment. Until all cooperating partners see a need for a change in the livestock management in the area there is no reason to change the current grazing strategy.

Recommendations

- Continue Cooperative Livestock Grazing Management Agreement between the Forest Service and Montana Department of Fish, Wildlife & Parks.
- Authorized reconstruction on its current location approximately 4 miles of the Tenmile boundary fence between the Forest and Mount Haggin Wildlife Management area.

VII. INTEGRATED RECOMMENDATIONS

The Interdisciplinary Team identified several common themes appearing in individual resource recommendations. The following summarized actions will benefit numerous resources. Note that this table does not display all detailed recommendations; rather, it displays a summary. For detailed recommendations by resource, refer to VI. FINDINGS and RECOMMENDATIONS by RESOURCE on page 172, above.

Table 50. Integrated recommendations, including recommended action, the purpose and rationale behind the recommendation, and any sideboards and/or priorities to consider.

Action	*Purpose* and Rationale	Sideboards	Priority
ASPEN **Remove conifer competition** within and adjacent to aspen clones, to improve clonal vigor.	***Restore a declining, unique component of forest vegetation to a condition more reflective of past conditions.*** Aspen stands are at risk of loss due to encroachment, overtopping, browse and age. Loss of aspen stands impacts a number of wildlife species. Healthy aspen and willow stands contribute to stable stream banks, appropriate stream temperatures and protect stream corridors from high intensity fire more effectively than a conifer overstory.	TMDL status and Forest Plan Standards may affect location of treatment in riparian areas.	All acres with conifer competition (79 acres).
SAGEBRUSH STEPPE AND GRASSLAND **Reduce conifer colonization**; create age diversity to improve dry shrubland and grassland conditions.	***Restore sagebrush/grasslands to a more resilient condition reflective of natural disturbances:*** Fire exclusion may have increased shrub densities and average age of sagebrush steppe communities. Conifers have colonized both grassland and sagebrush steppe communities. Sagebrush/grasslands are important forage and cover for everything from elk to small mammals and birds.	Ensure weed spread is avoided or mitigated.	All acres with conifer encroachment (5,000 acres).
WILLOW **Remove conifer competition** within willow stands, to	***Improve willow conditions; remove conifer colonization and overtopping.*** Fire exclusion has allowed conifers to occupy willow habitats. Willow are important forage species,	TMDL status and Forest Plan Standards may affect location of treatment in riparian	All acres with conifer competition (2,000 acres).

Action	*Purpose* and Rationale	Sideboards	Priority
improve willow component.	especially for wintering big game. Healthy and vigorous riparian vegetation contributes to stream bank stabilization and provides shade to help regulate stream temperature.	areas.	
DOUGLAS-FIR **Reduce stand density** and promote large tree development.	***Increase landscape vegetative heterogeneity, species diversity and resilience.*** Lack of fire has resulted in a change from open-grown stands of large diameter trees and a mosaic of different age classes and tree densities to a more continuous cover of mature trees and reduced landscape diversity.	None.	Treat as many acres as possible to enhance large tree recruitment and increase resiliency (2/3 of mid- to late-seral acres—600 acres).
LODGEPOLE PINE **Salvage mortality caused by mountain pine beetle;** reduce stand densities in early to mid-seral stands	***Capture product value prior to deterioration; create opportunities for stewardship projects.*** Reduce stand density in early to mid-seral lodgepole pine stands to increase resilience to natural disturbances. Over time, the lodgepole pine stands killed by MBP will regenerate, and the downfall will accumulate blocking wildlife movement and create heavy fuel loading.	None.	Stands that have good economic value. Stands with acceptable access, including consideration of temporary road construction (1/4 of mid- to late-seral acres—4,000 acres).
MIXED CONIFER TYPE **Increase landscape heterogeneity** by creating a patch mosaic of varying successional stands.	***Create early-seral conditions for early seral lodgepole and whitebark pine establishment primarily through the use of fire.*** Forest vegetation structure provides the basis for maintaining forested ecological communities of sufficient diversity.	Fuel model 10 stands.	All acres where WBP regeneration can be encouraged (2/3 of mid- to late-seral acres—2,000 acres).
WHITEBARK PINE **Remove other conifer species that are competing** with whitebark pine; ensure regeneration of whitebark	***Ensure continued presence of this keystone species in this landscape.*** Create new opportunities for regeneration where needed (focusing on mixed conifer and/or stands where other conifers are colonizing whitebark pine	Increase opportunity for WBP regeneration, or growing space for existing WBP regeneration.	All acres where WBP can and needs to be enhanced or opportunity for increasing WBP regeneration occurs.

Action	*Purpose* and Rationale	Sideboards	Priority
pine is occurring post- beetle and blister rust mortality. **Conduct inventory to determine current condition of stands;** assess blister rust infection, mountain pine beetle infestation and other stand conditions.	stands), or plant rust-resistant whitebark pine where naturals are not occurring. Use prescribed or natural fire where possible. (5,800 acres.) Whitebark pine is an important forage species for birds, small mammals and bears. It is a difficult species to regenerate and at high risk of change or loss. It is important to retain what stands are present.		
FUEL MODEL 10 Reduction -	***Improve age class distribution of Douglas-fir and lodgepole stands (Forest Plan objective).*** Large patches of Fuel Model 10 create a risk for severe wildfire. Without fire or treatment, and with the high levels of insects, substantial acres of FM 8 are converting to FM 10, adding to the risk.		See recommendations for Douglas Fir and Lodgepole above.
SENSITIVE PLANT POPULATIONS **Initiate or increase surveys** for sensitive and species of concern in the Seymour-Deep watershed assessment area. Where possible, develop cooperative agreements with local and regional academic institutions to assist in field surveys and research to add to the knowledge base of the forest's flora.	***Protect sensitive plants and species of concern from eradication.*** More complete inventories will aid in protection of these species. Four species are documented in assessment area, with an additional 7 species known in close proximity to the assessment area that have not been found within. Efforts should be made to compile full species lists for all vascular and non-vascular plant species in the drainage and across the forest.		Focus field surveys toward *Botrichium* species and riparian habitats.
NOXIOUS WEEDS **Continue existing cooperative management of noxious weeds**	***Prevent establishment and/or spread of invasive plants and noxious weeds. Protect sensitive plant populations from eradication by competing noxious weeds.***	-Follow the direction put forth in the 2002 Beaverhead-Deerlodge National Forest Noxious Weed Control Program Final Environmental	Move toward eradication of the oxeye daisy, houndstongue, musk thistle and spotted knapweed infestations. Canada thistle infestations should be managed

Action	*Purpose* and Rationale	Sideboards	Priority
		Impact Statement.	under a containment strategy.
Increase emphasis on weed prevention and education.	Prevention, along with early detection and rapid response, are the most biologically effective and economic strategies for controlling invasive plants and noxious weeds. Training all district personnel to identify weeds is an important step in developing an early detection and rapid response program.	- For education, keep apprised of new invaders. For vehicle cleaning, make sure vehicle cleaning language is in contract specifications.	
NOXIOUS WEEDS **Ensure all ground disturbing activities adequately revegetate**. Rely on native soil seed bank where possible. If direct seeding is required use only native plant materials and ensure all seed mixtures are certified noxious weed seed free.	***Prevent establishment and/or spread of invasive plants and noxious weeds. Protect sensitive plant populations from eradication by competing noxious weeds.*** Invasive plants and noxious weeds can substantially alter the composition of native plant communities resulting in decreases in habitat quality for wildlife, reduced forage for livestock, increased erosion and increased sediment levels in streams, and decreases in aesthetic/recreational quality of wild lands.	- Rely on native soil seed bank where possible. If direct seeding is required, use only native plant materials and ensure all seed mixtures are certified noxious weed seed free. - Consult Forest Botanist or Forest Soil Scientist for seed mix when needed.	All projects in the watershed where ground disturbance will occur.
LIVESTOCK **Authorize reconstruction of approximately 4 miles of the Tenmile boundary fence** between the Forest and Mount Haggin Wildlife Management area, on its current location.	***To manage livestock between the Forest and Mount Haggin Wildlife Management area.***		
FISH BARRIER CONSTRUCTION	***To provide for westslope cutthroat trout restoration/population maintenance***		See Aquatic Species and Habitat section (Table 48) for details. Locations include Seymour Creek, Tenmile Creek, Twelvemile Creek,

Action	*Purpose* and Rationale	Sideboards	Priority
			and West Fork Twelvemile Creek.
AQUATIC SPECIES **Conduct upstream electrofishing and habitat surveys and westslope cutthroat genetics assessment.** **Conduct Eastern Brook Trout Removals in Twelvemile Creek** where sympatric with WCT.	***Westslope cutthroat trout restoration/population maintenance.***		Corral Creek for electrofishing and habitat surveys including WCT genetics assessment. Twelvemile Creek for EBT removal.
WATER RESOURCES **Fix irrigation ditches that are currently utilized,** but are in disrepair (or have water right owner fix); reclaim ditches or remove water from ditches that are no longer being maintained or utilized.	***Improve stream function and decrease impacts to roads:*** some irrigation ditches have not been maintained and are running along or down roads increasing sediment delivery to some streams.	These actions will likely require cooperation form water rights' holders.	Ditch that parallels FR 2482 needs maintenance to remove active flow over and down FR 2482.
TRAVEL ROUTES **Complete Road Condition Surveys.**	***Locate any potential sediment delivery sites from the road system:*** Once problem areas are identified, suggestions for fixing road segments can move forward and be prioritized.		Routes 2483, 2495, and 2496 (see Aquatic Species and Habitat recommendations (Table 48)).
TRAVEL ROUTES **Travel route Maintenance or relocation** (see Route analysis for route recommendations.)	***Reduce sediments moving off roads and trails, especially in riparian areas and near streams.*** Some old existing access roads are continual maintenance problems. Improvements have reduced impacts but location and grade are essentially poor. In	Consider ramifications of non-native impacts on WCT when changing culverts/crossings. Complete road condition surveys to	Routes 2483, 2495, and 2496 are priorities for aquatic species and habitat. Keep 2492 open to the junction with the Tenmile Lakes Trail.

Action	*Purpose* and Rationale	Sideboards	Priority
	some cases the sediment travels overland, impacting soil productivity offsite, in other cases it makes it to streams. ***Improve recreational experience and public safety.***	identify and prioritize locations needing maintenance/relocation. Any in-stream work will require a 124 permit.	For more specific information, see Aquatics Species and Habitat (Table 48), and also Recreation recommendations.
TRAVEL ROUTES **Decommission travel routes** to reduce route density and sedimentation issues .	***Reduce sediment and erosion from routes.*** ***Improve wildlife security.*** Meet or move towards Forest Plan road density objectives by working collaboratively with stakeholders to reduce route densities. ***Improve soil productivity over time as decommissioned routes recover and revegetate.*** ***Reduce weed spread.***	Heritage review needed in case of historic routes. Any in-stream work will require a 124 permit.	-Routes that add best to wildlife security in Hunting Unit 319. -Review seasonal closures currently in place for wildlife security in light of the 38% reduction in open routes proposed in the TAP. -Routes close together serving same destinations. -Routes in stream bottoms. -Routes with fish passage concerns or sediment at crossings. -See Recreation section for specific recommendations.
TRAVEL ROUTES **Route Conversions (roads to trails or trails to roads)**-- see Route analysis	*Improve recreational system, recreation experience and public safety* *Reduce sediment and erosion* *Adequate road system to facilitate future management opportunities*		-2492 past Tenmile lakes trailhead should be maintained as a non-motorized trail. This route, coupled with trail 2733 and a mile of the new CDNST would create a non-motorized loop opportunity.
TRAVEL ROUTES **Route additions—improve quality of recreation experience** by creating or connecting segments.	*Improve recreation system and experience.*	New routes cannot add to hunting season road density concerns.	-Keep 2494 open for an additional 7/10th of a mile to complete a loop with the Corral Creek Road 2492. -Complete planned tie-in to connect 3939 to the East Ridge Trail 2477. -Keep 3938 open to the middle of

Action	*Purpose* and Rationale	Sideboards	Priority
			section 13 (as shown on the visitor map) and change the number to 2489 unless a loop tie-in back to the Bear Trap Loop can be established.
HERITAGE RESOURCES **Inventory** in areas considered to have high potential for cultural resources.	***To identify cultural resources that are significant.*** Significant cultural properties would be managed to standards and monitored at least every five years to insure that no impacts occur that adversely affect site integrity or eligibility.	When cultural properties are located, they need to be recorded and formally evaluated for significance and eligibility to the National Register of Historic Places in consultation with the Montana State Historic Preservation Office.	Sample inventory should be undertaken in areas considered to have high potential for cultural resources.
HERITAGE RESOURCES **Historical interpretation of the French Gulch** historic mining and timber production area.	***To educate the public about the historic mining and timber production that is significant at both a local and regional scale. Improve recreation experience and education. Preserve historical significance.*** This education would be a part of providing future recreational opportunities in accordance with the recently developed Beaverhead-Deerlodge NF "recreational niche" concept.	Design input by both Heritage and Recreation specialists.	
RECREATION **Improve recreation facilities** (campgrounds and trailheads).	***Reduce sediment delivery from recreation sites to streams:*** by hardening sites, controlling traffic, and improved signing and compliance in recreation sites within RCAs, sediment delivery can be greatly reduced. ***Improve recreation opportunities.***		Lower Seymour Lake trailhead had stream overflow running down the trail during high flow summer of 2011. This site gets considerable use. Develop a small trailhead facility at the junction of the Tenmile Lakes trail, consisting of a turnaround, a hitch rail, and parking for five vehicles.

VIII. PARTICIPANTS

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