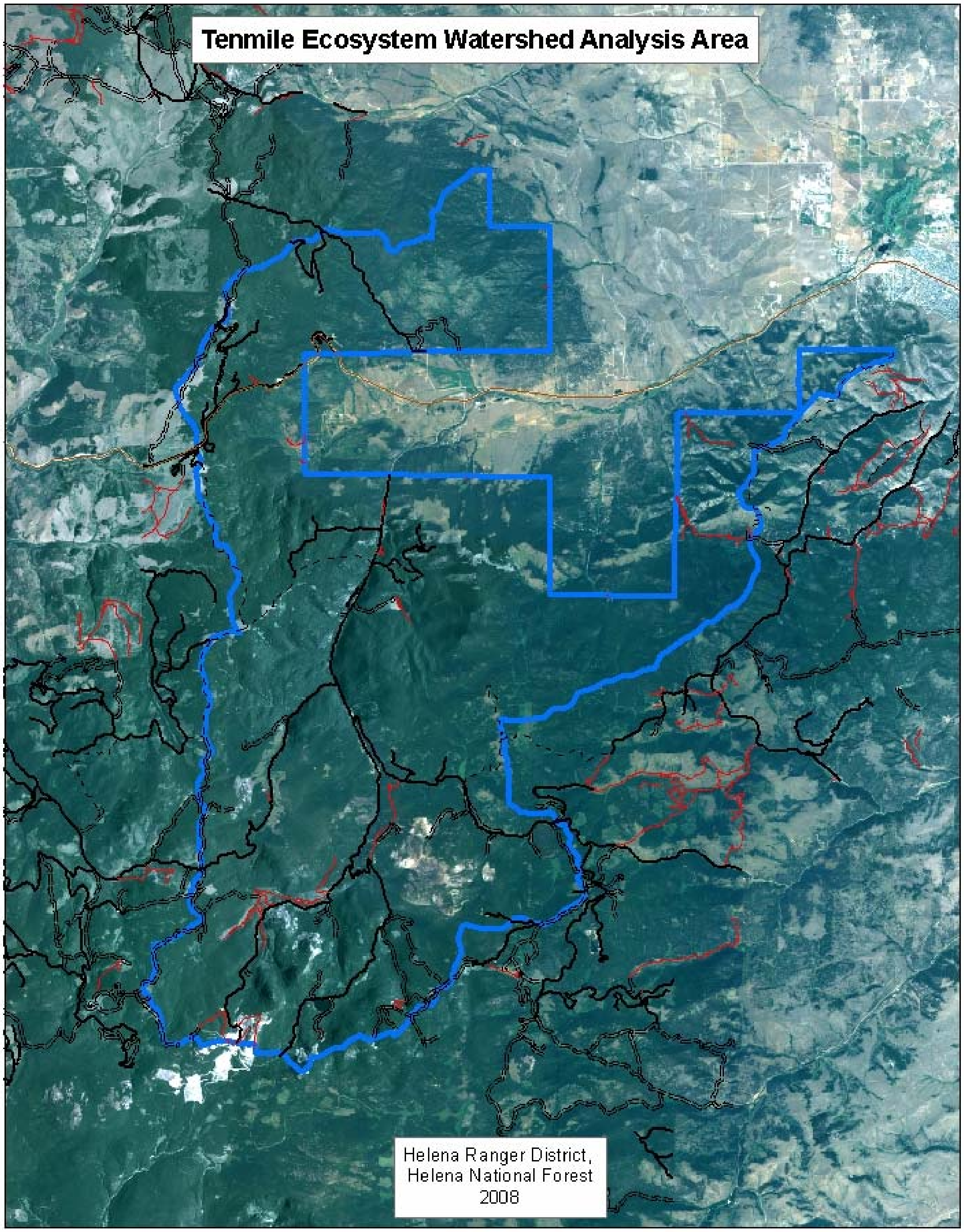
Tenmile Ecosystem Watershed Analysis Area
Helena Ranger District,
Helena National Forest
2008

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CHAPTER ONE: Introduction

In 1992 the Helena National Forest adopted an ecological land management approach to managing ecosystems on the Forest. In keeping with national changes in forest management priorities, policies and practices, this approach provides a holistic and integrated way to manage Forest resources and provides commodities and services for Forest users. Increasing emphasis on hazardous fuel management, protection of threatened and endangered species, and global climate change has amplified the need to implement a broad ecosystem perspective. Addressing other resource needs at the landscape scale and improving workload efficiency, integration, accountability and decision-making are also reasons to use this approach.

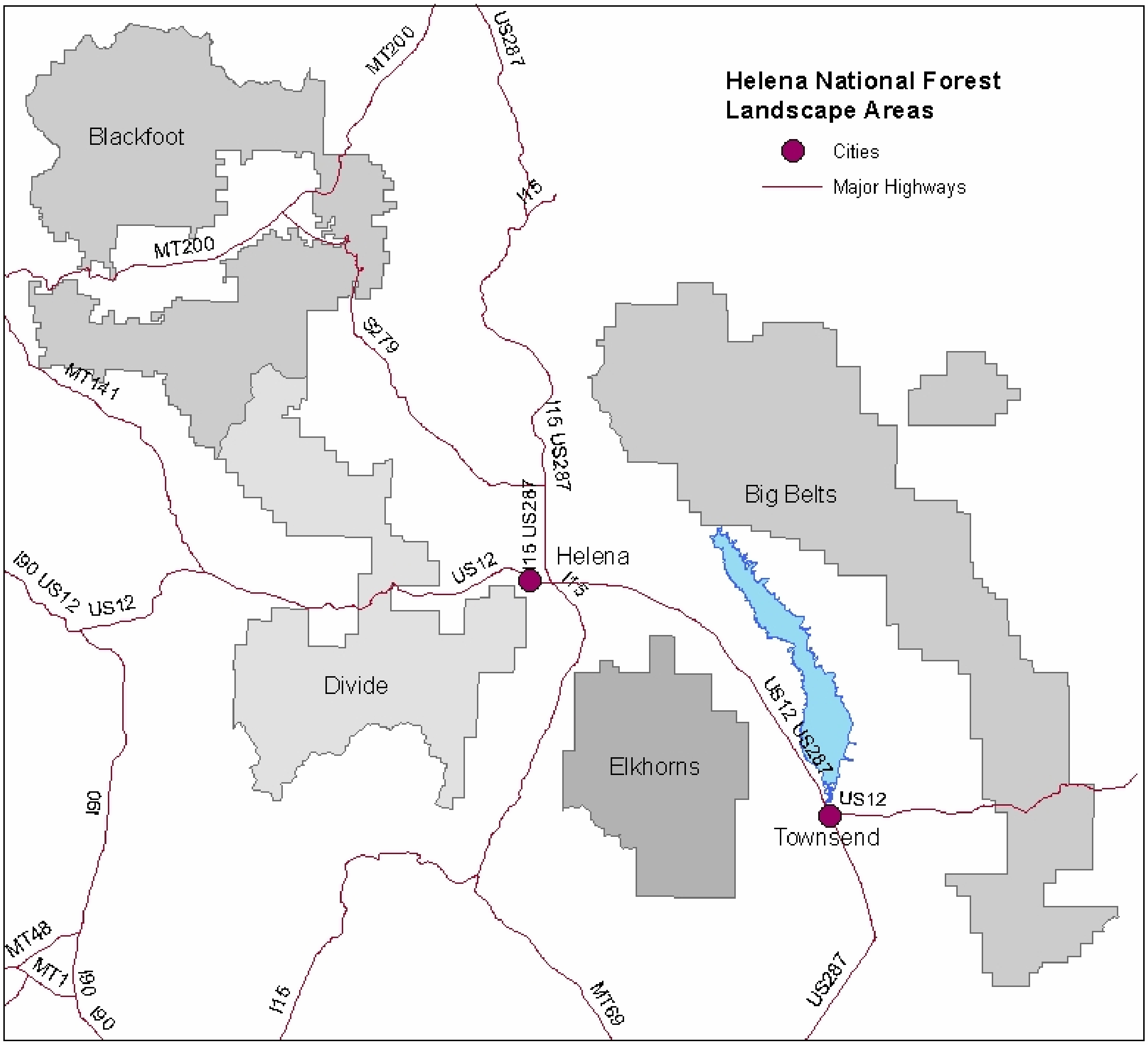
Ecosystem Analysis at the Watershed Scale, the Federal Guide for Watershed Analysis (USFS, 1995) has become the standard analysis protocol mid-scale analysis to aid Forests in determining appropriate management practices based on current and desired resource conditions. Watershed analysis is required within the Columbia River Basin (west of the Continental Divide on the Helena National Forest). While this type of analysis is not required east of the Continental Divide, the Forest feels that this type of analysis is important to establish context and scale for land management practices at a site-specific level.

The purpose of this analysis is to characterize the human, aquatic, riparian, and terrestrial features within the watershed and provide a watershed context for forest management. Ecosystem Analysis at the Watershed Scale is a six-step systematic approach that helps managers estimate potential for and effects of management decisions before implementation.

This process is not a decision-making process but rather is a stage-setting approach, which results in establishing the context for subsequent decisions.

The Forest's watershed approach is based on four large-scale landscape analyses. The four areas, Blackfoot, Big Belts, Divide and Elkhorns, are shown in Figure 1. These landscape areas are divided into smaller Ecosystem Analysis Watershed Areas (EAWA), which are groups of watersheds. These EAWAs are the analytical unit for analyzing and understanding total resource needs under NFMA, which sets the stage for site-specific projects that are "ripe for decision" under NEPA. The Tenmile EAWA, as described below and shown in Figure 1, is one such analysis area.

Figure 1-1 Helena National Forest Landscape Areas



The Tenmile EAWA lies within the Divide Landscape Analysis area. The Divide Landscape Analysis (USFS 1996) provides a large-scale overview of the existing resource conditions as well as management goals, opportunities, and potential conflicts within the analysis area. The analysis also describes, in general terms, the desired future condition of the area, including goals and objectives of the Helena National Forest Land Resource Management Plan (USFS 1986) and subsequent planning directives. The Ecosystem Analysis at the Watershed Scale process provides the Forest the context in which to further define specific management opportunities for the Tenmile EAWA that move existing conditions toward desired conditions for this area. The analysis will serve to validate Desired Conditions (and update Desired Conditions as appropriate) as well as identify management opportunities to achieve Desired Conditions in the area based on public and other stakeholder input.

The Tenmile EAWA includes approximately 45,000 acres and encompasses smaller three watersheds in the middle of the Divide landscape area (Figure 1-2). This EAWA contains the entire Tenmile municipal watershed for the City of Helena. The following table shows the approximate acreage involved in each area.

Figure 1-2 Tenmile EAWA Area and Watersheds

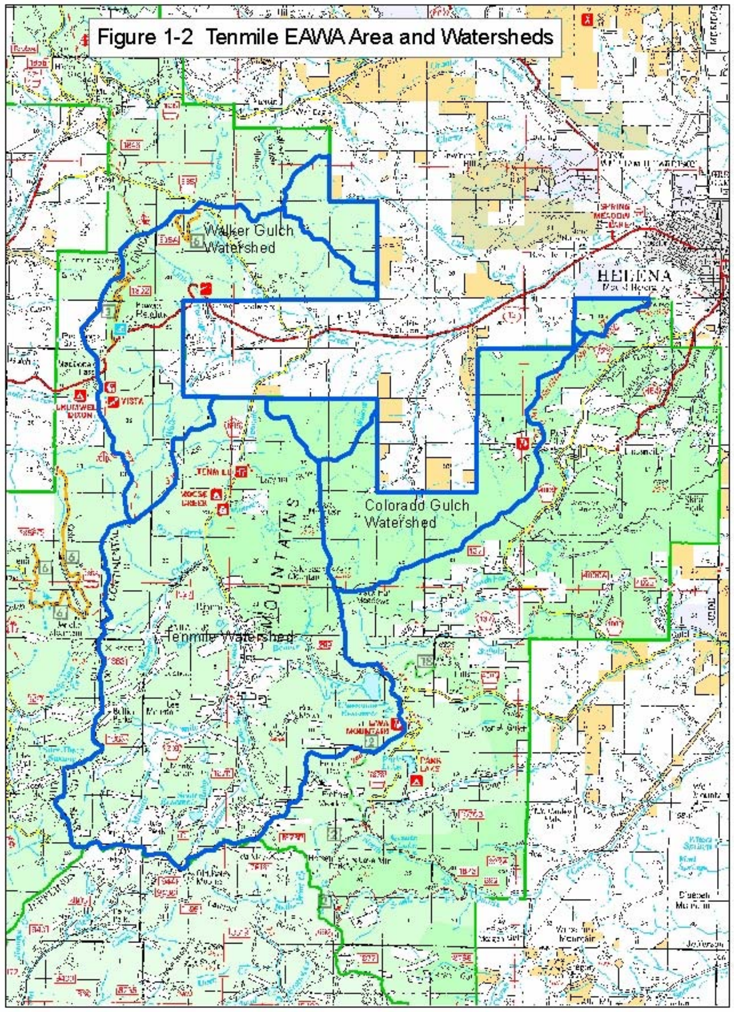


Table 1-1 Tenmile EAWA Watershed Acreage by Ownership

Watershed	**Watershed Acres**	**National Forest Acres**	**Private Land Acres**
Tenmile	25,690	20,950	4740
Walker Gulch	11,440	11,110	730
Colorado Gulch	8300	7840	460

The first step, watershed characterization, identifies dominant physical, biological, and human features or processes that shape the watershed's function. This section identifies particular management objectives that influence resource management and resource issues that will receive a detailed analysis in the following steps.

The second step, issues and key questions, focuses the analysis on ecosystem elements most relevant to management objectives, human values, and resource conditions within the watershed. This section determines the amount of detail needed to sufficiently address key questions.

Step three explains historic conditions of the watershed and how conditions have changed as a result of human influences and natural disturbances.

Step four documents current range, distribution, and condition of relevant ecosystem elements. In step four, the Helena Forest also outlines desired conditions for resource and ecosystem elements. Step four also addresses forest wide management directions, local management objectives, and conditions desired by forest visitors.

Step five of the watershed analysis, synthesis and interpretation, compares current, reference, and desired conditions, explains significant differences and/or similarities, and addresses capacity of the watershed to achieve desired conditions.

Step six, recommendations, brings together the information presented in the previous steps and focuses on management objectives responsive to ecosystem elements.

This document captures a somewhat abbreviated process using the above six-step process as a guideline. An interdisciplinary team of resource experts completed the process. A list of participants can be found in Appendix A. The Divide Landscape Analysis was used as a background document that provided much of the information for step 1, watershed characterization. Issues and key questions used in step two were taken from similar EAWA processes as well as recent projects from the area. Step three was taken in the Divide Landscape Analysis as well as provided by the national Fire Regime Condition Class system, which was incorporated into this analysis. Most resource areas combined steps four and five into one write-up. The team integrated their efforts through step six, the recommendations.

CHAPTER TWO: Watershed Characterization and Key Issues

This chapter documents steps one and two, outlined in Chapter One. Step one, watershed characterization, is described in detail in the Divide Landscape Analysis (USFS, 1996). Landscape wide descriptions can be found for all resources in that analysis and are briefly described below. Chapter 3 provides specific information for each resource area as well.

The Helena National Forest is undergoing landscape-level changes in the forest due to insect activity, as evidenced by the red trees visible to anyone living in or visiting our area. The primary culprit of the mortality is the mountain pine beetle, with help from other mortality agents. The scale of impact is large enough to warrant a careful assessment of conditions and identification of management options available to the National Forest, private landowners, and communities affected. It is important to remember that large-scale ecological disturbances are beyond our capability to control; however, depending on landowner objectives and values at risk, management opportunities do exist that can be effective at influencing outcomes in localized areas.

Many areas on the Forest are infested by mountain pine beetle as evidenced by red trees across landscapes. Historically mountain pine beetle has caused large, landscape-level mortality; an epidemic typically continues until either the beetle runs out of food (susceptible trees) or weather conditions cease to be conducive to their survival. Weather conditions that regulate the beetle population include very cold temperatures for extended periods in the winter, late spring or early fall frosts, and wet springs/summers. Lodgepole pine is a short-lived conifer species as compared to Douglas-fir and spruce, reaching maturity at around 80 years. Most of the lodgepole pine forests on the Helena NF mature. It is not possible to sustain mature and over-mature lodgepole pine forests across the landscape indefinitely as it is adapted to regenerate after stand-replacing wildfires and mountain pine beetle epidemics. There is evidence suggesting that due to the current warm dry climate conditions the mountain pine beetle is active at higher elevations, higher latitudes, and for longer durations than seen previously this century. The landscape today is largely dominated by homogenous mature forests that are susceptible to beetle infestation.

The changes that are ongoing in the Tenmile EAWA include high mortaility of many pine trees—lodgepole, ponderosa and whitebark--throughout the watershed. More trees are expected to die in the near future from insect attacks that are occurring currently. This is a changed condition that has occurred after most of this assessment was completed, and could affect many of the management recommendations in this document. The Forest felt it was important to document the conditions that existed at the time this assessment was done so reports were not updated to reflect the ongoing changes. Any actions that are undertaken in this EAWA in the future would be done with updated vegetation conditions and any corresponding changes in other resource areas. A detailed report on the current status of insect and disease conditions on the Forest is available in the project file “Master Bug Report”, 2008.

Characterization

The Tenmile EAWA is generally mountainous and forested and is influenced by a wide variety of rock types, including granite, volcanic rock, metasediments and limestone. Some higher elevation areas, both north and south of US Highway 12, are glaciated. The variation in geology and geomorphic features in different portions of the area, as well as the different climatic regimes, strongly influence local vegetation and soil patterns and hydrologic regimes within the analysis area.

The analysis area is dominated by lodgepole pine forests--approximately 55% of the area, with Douglas-fir and subalpine fir inclusions. Dry Douglas-fir habitats that include occasional ponderosa pine occupy about 34% of the ecosystem. Grasslands occupy a minor portion of the area, approximately 7%. Whitebark pine and rock make up the remainder of the landscape.

A majority of the soil types in the EAWA are characterized as “sensitive”. There are 48 landtypes (i.e. soil mapping units) identified in the Ten Mile NFMA analysis area. Of these, there are 32 landtypes that have been categorized as “sensitive” (i.e. these soil types are most vulnerable to disturbances, such as accelerated erosion, compaction, rutting, displacement, mass wasting, or flooding hazard). A summary of key characteristics for the soils within Ten Mile NFMA analysis area, including “sensitive” soils, is found in Chapter 3.

Tenmile Creek proper drains about 110 square miles of mountainous and valley terrain near the City of Helena, Montana. Upper Tenmile Creek (HUC 100301011406), defined as the reach above the confluence with Walker Creek, drains 40.85 square miles of mostly forested, steep volcanic and granitic glaciated terrain. The headwaters are on the continental divide, where the maximum elevation is more than 8,000 feet. Tenmile Creek flows in a generally north direction to the water treatment plant at the mouth of the canyon where the elevation is about 4,400 feet.

Streamflow in the upper part of Tenmile Creek and its tributaries is typical of mountain streams in Montana. Tenmile Creek and its major tributaries flow year-round above the municipal water supply diversions. Downstream from each diversion, streams generally go dry during late summer.

A variety of seasonal ranges for wildlife species are provided. The important habitats that are provided by the area include dry forests, shrublands, grasslands, riparian habitat, whitebark pine habitat and dead tree habitat. Featured wildlife species include elk, moose and mule deer; flammulated owls, goshawks, pileated and black-backed woodpeckers, marten and lynx.

An understanding of how humans influenced the environment of the Tenmile EAWA helps to paint the picture of both the “natural” ecological patterns and the existing conditions on the landscape. A look at the history of man in the Divide area is broken out in the Divide Landscape Analysis, 1996.

The Tenmile watershed is rich with heritage resources. Much interesting history has taken place in the small Ten Mile watershed, located only a few miles west of Helena. The history of this area is representative of many of the key themes in western history, as illustrated in Table 1 below.

Table 2-1. Historic Themes and Heritage Property Types in the Ten Mile Watershed

Historic Theme	**Surviving Historic Properties**
American Indian: 12,000 to 1900	Isolated prehistoric artifacts; No archaeological sites identified
White Settlement: 1864-1900	Chessman-Helena water ditch Rimini community Homesteads
Mining: 1864-1950	Placer claims and mines Lode mines and mills Cabins and related ruins
Transportation: 1864-1900	Old Rimini wagon road Helena-Red Mountain Branch Line Montana Central Branch Line & County road
Forest Service: 1908-present	Moose Creek Ranger Station Colorado Mountain Lookout Moose Creek Villa tract & cabins Campgrounds & trails

Historic Theme	Surviving Historic Properties
Great Depression & World War II: 1930-1945	CCC Camp Rimini CCC trail & other improvements WW II Dog Training Camp

There are numerous roads in the area with private landholdings being common and dependent on these roads as well as many popular recreation activities associated with these roads. Developed recreation and dispersed recreation uses are moderate to high throughout the watershed analysis area.

Issues and Key Questions

Fire/Fuels

- What is the risk to water quality in the municipal watershed following a wildfire?
- What are the City of Helena infrastructure facilities that support the water system and what is the risk to that infrastructure from a wildfire event and following such an event?
- What are the current conditions and trends of the fuels in the area?
- What is the current risk of wildfire in the area?
- What is the risk to public safety in a wildfire event?

Fisheries

- What is the current status of native and non-native fisheries, what is the potential for native fisheries throughout the analysis area, and what is the recreational fishery potential.
- What will be the magnitude of the effects of various management activities on any native and non-native fishes and their habitats.

Grazing

- Are there range allotments within the area? What are the conditions or concerns in the allotments?

Heritage

- What sites, properties, structures, and features still exist and stand out on the Forest?
- What is the condition of these sites, what are the present and future threats to the condition and integrity of these properties?
- Are there areas of special cultural and/or spiritual concerns to Native American tribal groups?

Hydrology/Watershed

- What are the current conditions and trends of the dominant hydrological characteristics and features in the watershed?
- What are the current discharge characteristics of the basin?
- What are the mechanisms that contribute to peak flow conditions in the basin?
- What are the current conditions and trends of stream channel types, and the sediment transport and deposition processes in the watershed?

Recreation/Roadless

- What are the recreational activities taking place in the watershed?
- What are the current inventoried ROS classes? ,
- Are there health and safety facility concerns?
- Are facilities accessible?
- Does recreational use affect other resources?
- Are recreation opportunities limited by other resource values in the area?

- Are access needs being met for recreation?
- Have activities, patterns, and use levels changed over the planning period? Is there a trend?
- Are there conflicts between different recreational user groups? Are the constraints and conflicts being managed or mitigated?
- Is the existing recreational use in conformance with management direction?
- What activities and levels of use can be sustained?
- What recreation opportunities should be provided in the area in the future?
- Is there a need to reconstruct or construct recreational trail facilities?
- Are there any special areas that have been identified or could be added in this watershed?
- What makes this a special area?
- Who is it special to and why?

Vegetation

- What is the historical vegetation composition, structure and pattern?
- What is the current vegetation composition, structure, and pattern within the watershed?
- How and to what degree has timber management and fire exclusion altered historic
- vegetation composition, structure, and pattern?
- What are future trends with and without active management?
- Where are the candidate areas for potential active management or retention that would result in trends toward historic vegetation conditions or desired future conditions?
- Are there concerns for special habitats in this watershed with reference to threats or conflicts?

Soils

- Where are the locations of “sensitive” soil types (i.e. soils most vulnerable to accelerated erosion, compaction, rutting, displacement, mass wasting, or flooding hazard) in the Ten Mile NFMA analysis area?
- What Best Management Practices (BMPs) or mitigation measures may be employed to conserve soil productivity with future, proposed management actions?
- What studies are available that document BMPs and mitigation measures are effective in minimizing detrimental soil disturbance (i.e. compaction, rutting, displacement, accelerated erosion, and mass wasting) and in retaining adequate amounts of organic material, including coarse woody material?
- What are the existing soil conditions (i.e. is there erosion, compaction, rutting, displacement, loss of organic material such as litter / duff and coarse woody material, or mass wasting) in areas affected by past management activities?

Weeds

- What is the current level of weed infestation in the watershed?
- What is the trend?
- What is being done to manage weed infestations?

Wildlife

- What are current conditions and trends in habitats and landscape patterns important to wildlife in the watershed analysis area?
- In which habitats will standard coarse filter vegetation management be sufficient to accommodate associated wildlife species? Which habitats and habitat components will require special attention in order to sustain associated species?
- What is the status of habitats and landscape conditions needed to support species of special concern (threatened, endangered, sensitive, priority, and indicator species)?
- Which species of special concern can be accommodated by course filter management and which will require additional species-specific management?
- What is the status of habitat for species whose populations are managed at levels sufficient to support hunting, trapping, and wildlife viewing?

- Which of these species will require special attention? Which will be accommodated by coarse filter habitat management or by management measures applied to other species requiring special attention?
- What are the current habitat conditions and trends for species at risk (threatened, endangered, sensitive species), management indicator species, and harvested (hunted and trapped) species?
- What is the status of wildlife habitat components not addressed under *Forest Vegetation, Special Habitats,* and *Riparian/Wetlands*: wildlife movement corridors, unroaded areas, snags and large woody debris, and rock habitats (scree, talus, rock outcrops, cliffs)?

CHAPTER THREE: Historic Reference and Existing Conditions

Step three of the Ecosystem Analysis at the Watershed Scale explains historic conditions of the watershed and how conditions have changed as a result of human influences and natural disturbances. Step four documents the current range, distribution, and condition of relevant ecosystem elements.

Historic condition is discussed briefly for each resource in the Divide Landscape Analysis (1996). More detailed discussions are included in the background documents for the Landscape Analysis and can be found in the project file of this assessment. The historic discussions included here are specific to the Tenmile area.

Existing conditions were written in 2006, prior to the full effect of the mountain pine beetle epidemic in the area becoming evident.

The following information is presented alphabetically by resource.

Fire Management

Historic Conditions

Historical Data

The map that accompanied the Helena Forest Reserve Report (Hatton 1904) displays a vegetation composition including grasslands, woodlands, timber, harvested areas, and cultivated areas for the Tenmile area around the turn of the last century. A large portion of Minnehaha Creek (approximately 5,000 to 6,000 acres) east of Rimini was shown as burned but restocked.

A range survey map for the area completed in the 1920s or 1930s displays closed timber occupying the southern portion of the watershed area around Chessman and Scott Reservoirs as well as the northern section of the watershed in the vicinity of Blue Cloud. The remainder of the watershed area is represented by grasslands, open (grazable) timber, aspen, and riparian vegetation.

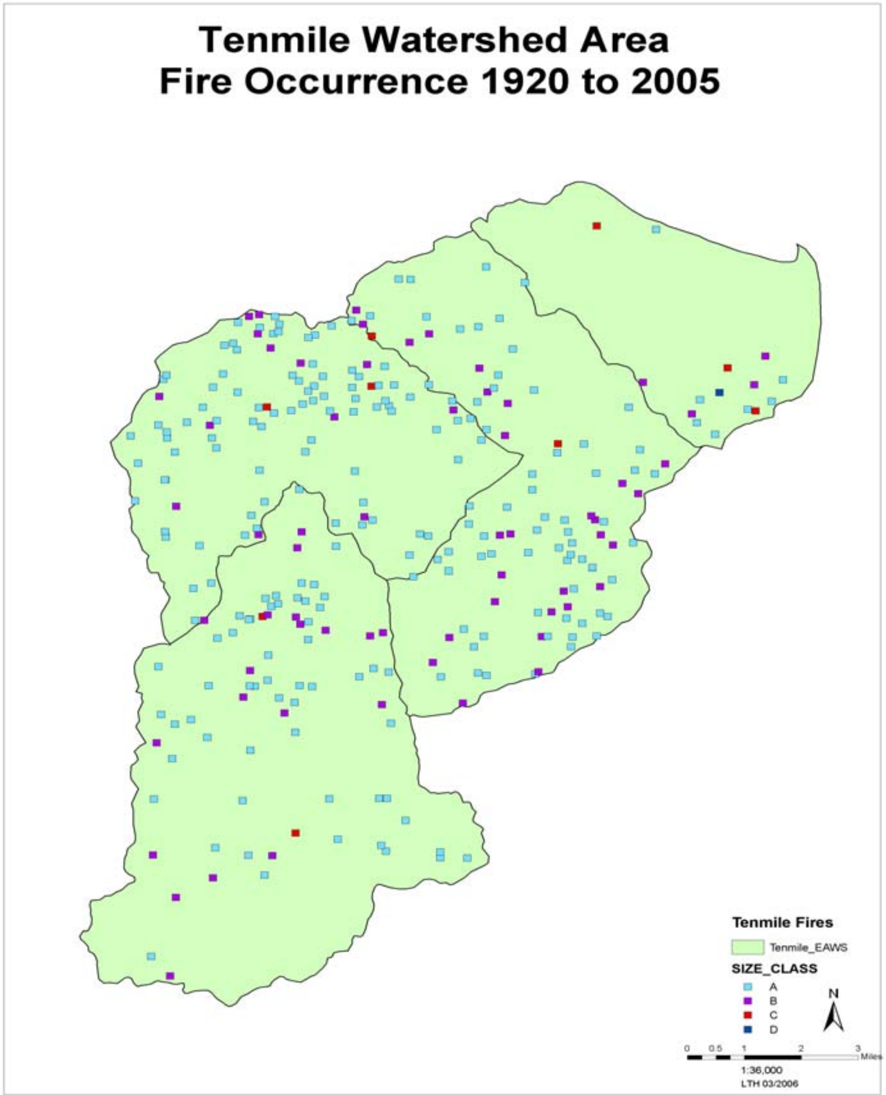
Fire Suppression

Newspaper records indicate fires burning in Tenmile Creek and Colorado Gulch from July through September of 1889 as reported in numerous regional newspapers. Accounts indicated heavy timber consumption, thick smoke, and setting backfires to fight the blaze.

Hatton (1904) documented destructive fires in the Tenmile Creek drainage lasting from the beginning of July until September rains during 1904. Although Hatton (1904) recorded fire suppression activities by local residents at the turn of the last century, for the most part no action was taken until human life or private interests were threatened.

Within all ownerships in the Tenmile watershed area, 312 fires were reported from 1920 to 2005 as depicted in Figure 3-1 and displayed in Table 3-1. Approximately 215 fires were located on the HNF. Acreages for fire size classes are as follows: (A) less than 0.25 acres, (B) 0.26 – 9.9 acres, (C) 10 – 99 acres, and (D) 100 – 299 acres.

Figure 3-1



Although many fires had no accompanying written information and therefore were not included in fire occurrence maps, this data does give a glimpse of the fire suppression history for this area of the Divide landscape. Fires that escaped detection would not be included. The fire occurrence data was digitized as point source data from historic maps that portrayed fires by year, size class, and cause for 1920 to 1969. For 1920 to 1969, no more than 1,145 acres on all ownerships would have burned based on the maximum acreage per size class and the number of fires that occurred in that size class. For 1970 to 2003, fire occurrence information was developed from the Kansas City fire database. The records from this period have detailed information including acreage, cost, and physical location. The HNF fire atlas was consulted for fires in this area that occurred in 2004 and 2005 that were then added to the master fire occurrence database. During the period from 1970 to 2005, 104 reported fires burned approximately 239 acres. Therefore, fire occurrence records indicate that less than 1,384 acres of the total 72,575 acres in all ownerships, or approximately 2 percent of this watershed area under all ownerships, have burned since 1920.

Table 3-1. Number of fires in the Tenmile watershed area per decade by size class

Decade	A	B	C	D
1920-1929	21	9	1	
1930-1939	52	18	2	
1940-1949	21	3	2	
1950-1959	30	7	1	
1960-1969	31	9	1	
1970-1979	22	7	2	
1980-1989	15	10		1
1990-1999	28	6		
2000-2005	13			
Total	**233**	**69**	**9**	**1**

On HNF lands within the Tenmile watershed, 215 fires occurred between 1920 and 2005. The majority of these fires were small class A fires (161 fires) plus 49 class B fires and 5 class C fires. Using the same methodology as presented above, less than 602 acres burned between 1920 and 1969 and 103 acres burned between 1970 and 2005. Therefore, less than 705 acres of HNF lands have burned since 1920 or about 1.5 percent of the HNF within the Tenmile watershed area.

Table 3-2. Number of fires on all ownerships in the Tenmile watershed area per decade by cause

Decade	Lightning	Equipment Use	Smoking	Campfire	Debris Burning	Railroad	Arson	Children	Land Occupancy	Misc.
1920-1929	15		4	1	2	3	4			2
1930-1939	23		18	7	5		18			1
1940-1949	16		6	1	1	1				1
1950-1959	28		2	3	1					4
1960-1969	27		5		1		2		3	3
1970-1979	17		4	6			1	3		
1980-1989	10	2		8			2			4
1990-1999	17	2	1	8	1		1			4
2000-2005	5			8						
Total	**158**	**4**	**40**	**42**	**11**	**4**	**28**	**3**	**3**	**19**

Forest Processes

Historically fire operated as one of the principle disturbance processes that stimulate secondary forest succession in the northern Rocky Mountains. Fire suppression within the Tenmile watershed area has been quite effective since records were kept in 1920. The removal of fire as an important process has affected the juxtaposition of fuel models and the current fire regime, most notably the current fire interval and current fire severity.

Current Conditions and Trends

Thirteen fuel models were described by Rothermel (1972, p. 36) and Albini (1976, p. 92) and further developed by Anderson (1982). Fuel models are stratified into four groups: grass, shrub, timber, and slash. Fuel models are determined by the vertical and horizontal structure of the vegetation and reflect the primary carrier of fire through the system (Anderson 1982). Fuel models assume fuels to be continuous and homogeneous. An AML (automated machine language) was written to assign fuel model depending on the strata and vegetation-fuel class (refer to FRCC section). Five fuel models have been classified within the watershed area as representing the existing condition.

Existing Conditions

Commodities and Other Land Uses

Five municipal water collection points are located within the Tenmile watershed area, including: Walker Creek, Moose Creek, Minnehaha Creek, Beaver Creek, and upper Tenmile Creek. The Walker Creek drainage is mostly located on private land although the headwaters are located on the Helena National Forest (HNF). Moose Creek and Minnehaha Creek both serve as collection points for water within that respective drainage. Beaver Creek funnels the outflow from Chessman Reservoir whereas upper Tenmile Creek is the eventual catch point for water from Ruby Creek and Scott Reservoir. In addition, a flume diverts water from Banner Creek to fill Chessman Reservoir. The flume is 5.8 miles in length, composed of 2 miles of wooden structure and the remainder an unlined ditch.

Wildfire Threat

Wildland fire poses numerous threats to the municipal water supply. Direct threats include the effects of fire to the water supply infrastructure including the wooden flume and all collection point equipment. Indirect effects incorporate the potential sediment delivery and erosion due to the loss of ground cover such as woody debris, duff, and litter depending on the amount of vegetation and woody debris consumption.

Table 3-3. Existing condition – fuel models

Fuel Model No.	Fuel Model Description	Tenmile Watershed Area Composition (% of area)
1	Short grass (1 ft)	21%
2	Timber (grass and understory)	9%
5	Brush (2 ft)	5%
8	Closed timber litter	27%
10	Timber (litter and understory)	27%

Given time, fuel models 5 and 8 will move to a fuel model 10 in mature stands as woody debris loadings accumulate and ladder fuels continue to increase.

Current Risks

Current risks to the watershed area include a stand-replacing fire on a significant portion of this landscape, such as occurred in 1988 during the Warm Springs Fire in the Elkhorn Mountains and in 2003 during the Snow-Talon Fire in the Copper Creek drainage northeast of Lincoln. A number of reasons support this conclusion, including: (1) a substantial amount of stands have been classified as mid and late seral closed canopy, (2) a large portion of the watershed area was described as closed timber when the range survey map was completed and these areas have had few disturbances since, and (3) fire has essentially been removed as a process within this landscape and therefore has not been functioning to heighten stand heterogeneity including diversifying structure and composition.

Public Safety

Public safety is of utmost concern during a wildland fire event. However, if a large fire incident were to occur within this watershed numerous issues would warrant attention. Colorado Gulch and Tenmile Creek both pose significant ingress/egress issues. Colorado Gulch has one road that provides the only ingress and egress. Tenmile Creek has one major travel corridor although there are secondary ingress/egress roads along Beaver Creek and Minnehaha Creek; however, these are narrow one-lane roads passable only by four-wheel drive vehicles.

A wildland fire incident can drastically lower air quality, which is especially of concern for children, the elderly, and people with respiratory problems but also the general public. A large fire incident will generally contribute higher levels of particulate matter than prescribed fire due to the fact that prescribed fire smoke and particulate matter is stringently regulated by the Montana Department of Environmental Quality. Reduced air quality can also be of concern due to limited visibility which can affect vehicle traffic.

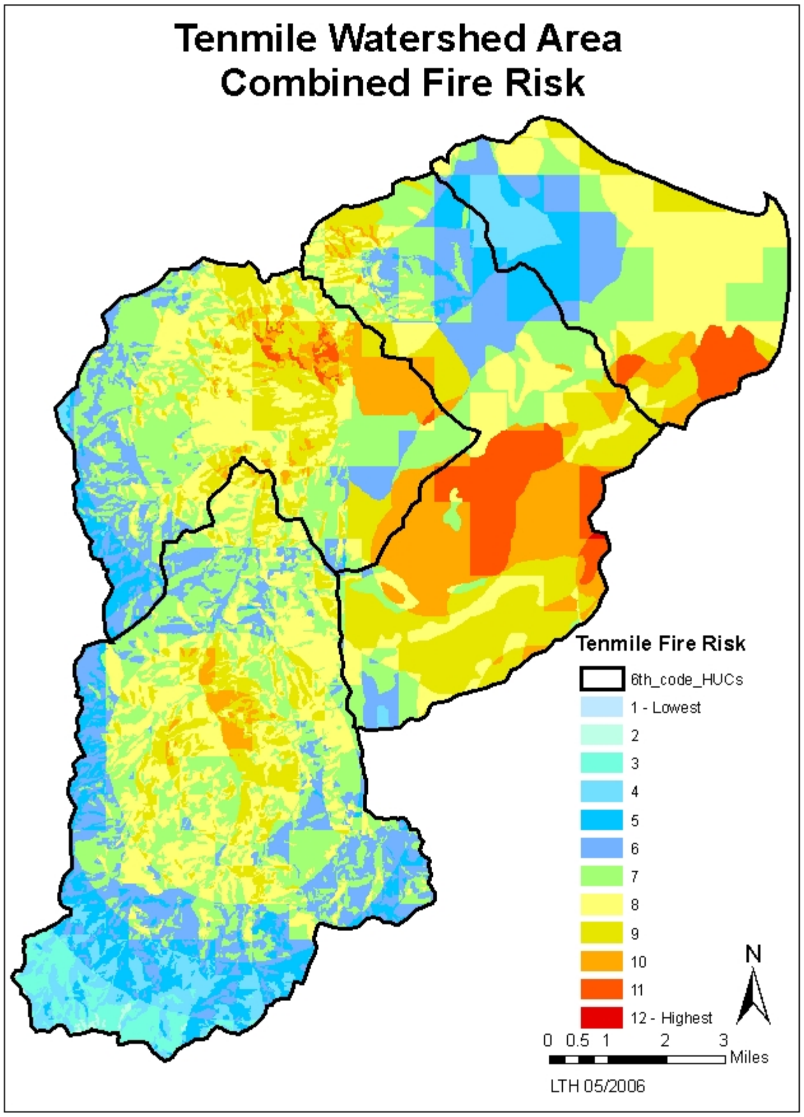
Numerous portions of the Tenmile watershed area are utilized by recreationists. These recreationists may complicate evacuations as they have to be located and then safely evacuated. If evacuations did occur, often many people choose to remain in an attempt to protect their property and structures. Due to the dominant narrow canyons in this area, especially Colorado Gulch and Tenmile Creek along with numerous tributary canyons, the safety of these homeowners may be compromised given the extreme heat and gases that permeate narrow canyons during a large fire incident.

Falling trees, especially snags present near roadways, and rocks could present hazards if fire was burning adjacent to roads. Fire often weakens or burns through roots, thereby making trees more susceptible to falling. Likewise, rocks may be dislodged as anchoring vegetation is consumed.

Community Wildfire Protection Plan

The Tri-County Community Wildfire Protection Plan involved a collaborative process including Broadwater County, Lewis and Clark County, Jefferson County, Montana Department of Natural Resources and Conservation, and federal agencies. Fuel hazard ratings on private land immediately adjacent to the HNF were assigned by the counties and SILC satellite imagery was used to classify fuel hazard ratings on the HNF based on attributes such as elevation, aspect, slope, and vegetation data. Fuel hazard ratings were combined with fire ignition probability and wildland-urban interface (WUI) ratings to produce a fire risk map for the tri-county area. The fire risk map for the Tenmile watershed area is displayed below. Firugre 3-2 displays the fire risk from lowest to highest rating.

Figure 3-2


Tenmile Watershed Area
Combined Fire Risk
Tenmile Fire Risk
6th_code_HUCs
1 - Lowest
2
3
4
5
6
7
8
9
10
11
12 - Highest
N
0 0.5 1 2 3
Miles
LTH 05/2006

The majority of the Tenmile watershed area is classified as WUI as seen in Figure 3-3

Figure 3-3

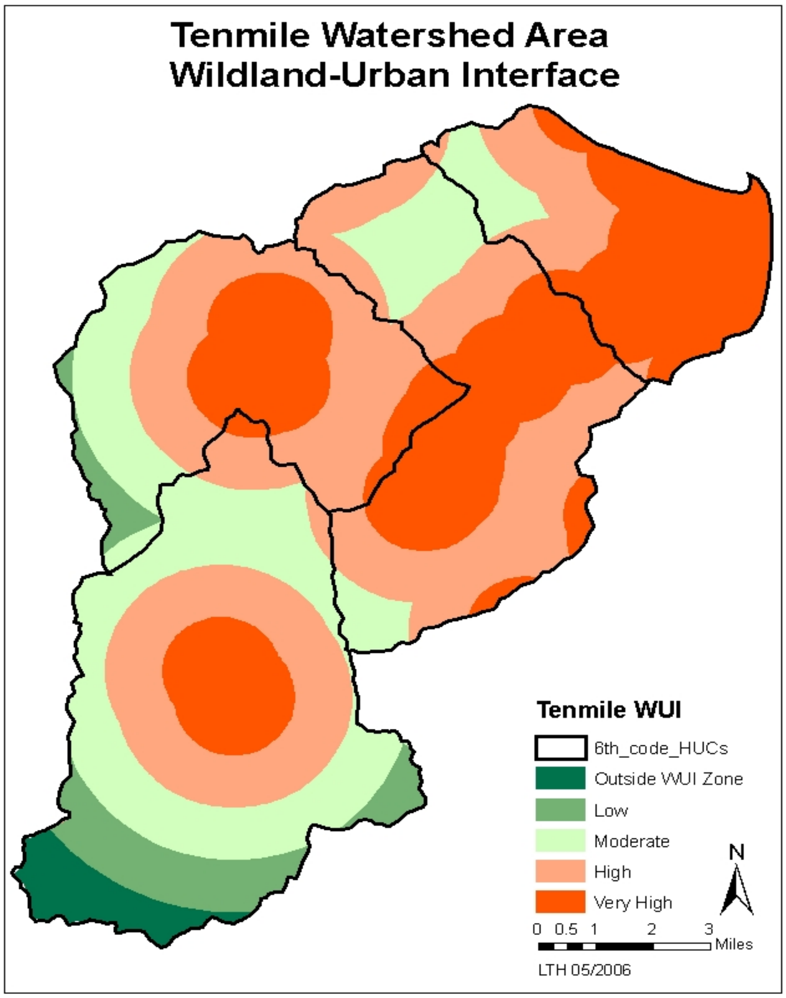


Figure 3-4 presents the fuel hazard ratings for the watershed area.

Figure 3-4

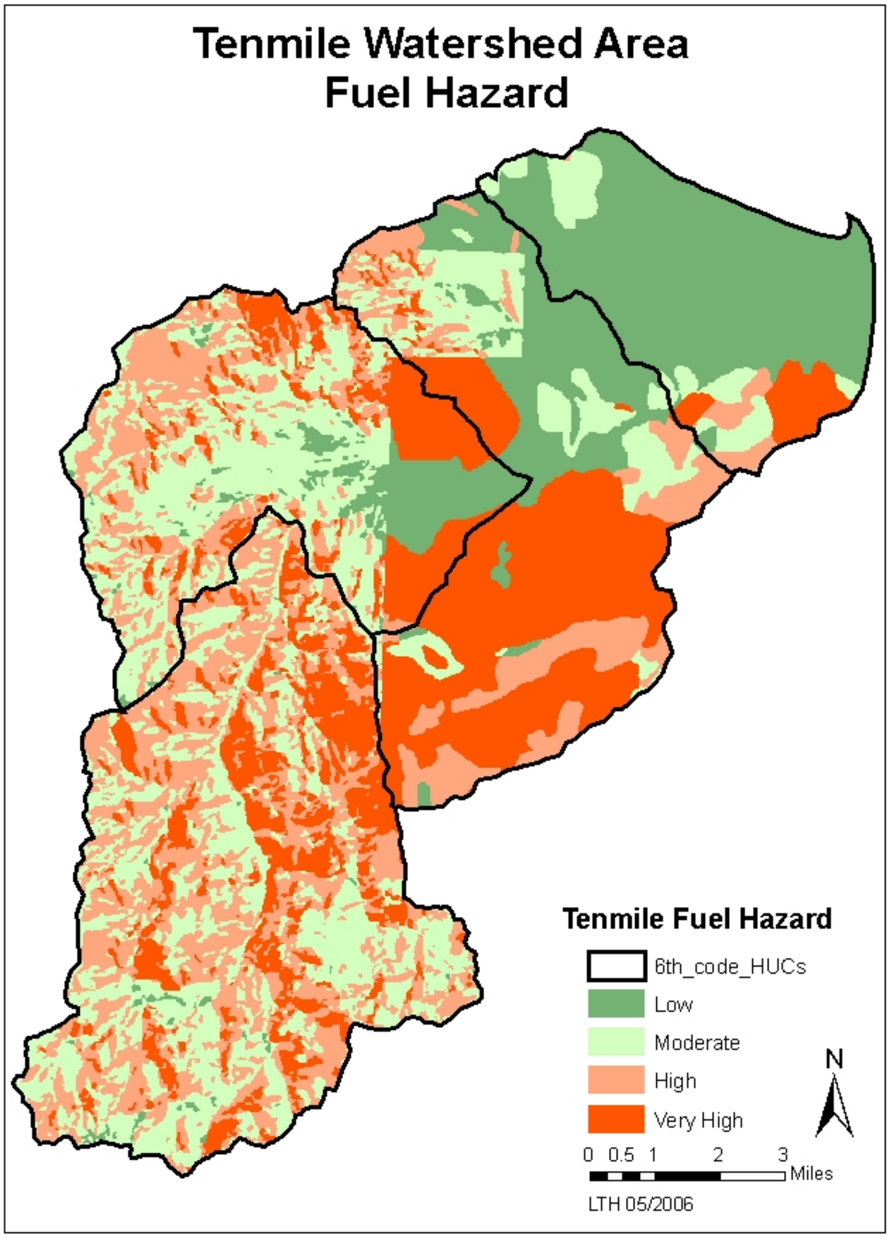
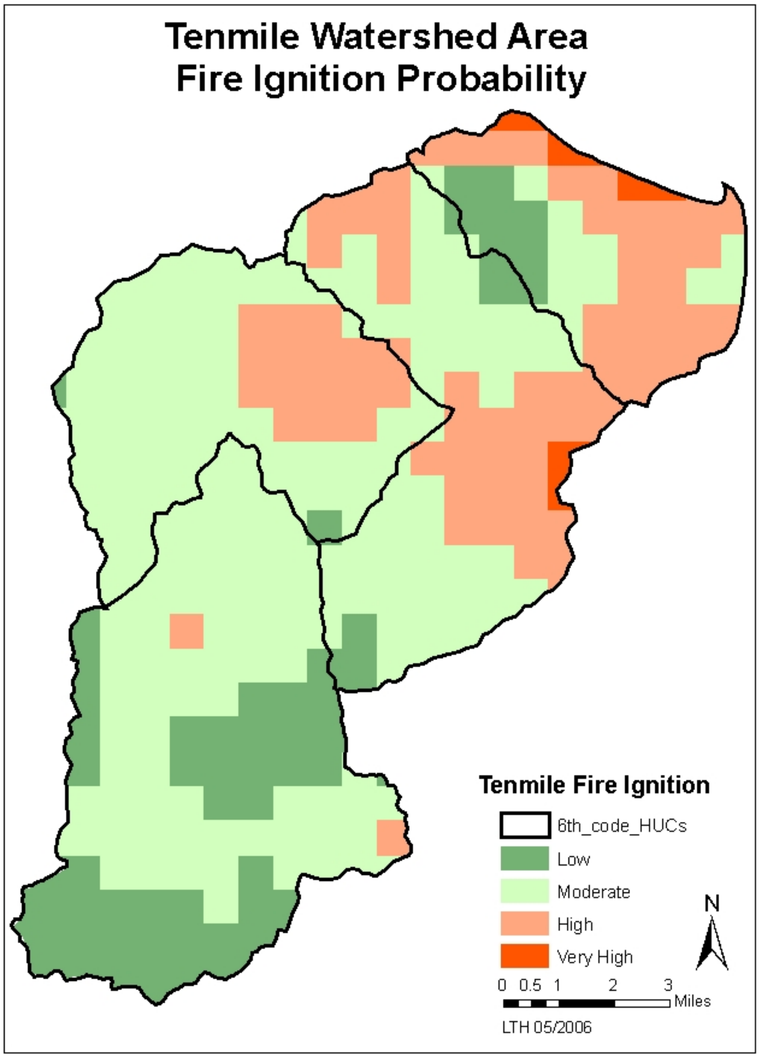


Figure 3-5 identifies the fire ignition probability for Tenmile. These maps show the ratings for each attribute across all ownerships.

Figure 3-5



Fisheries

Historic Conditions

Westslope cutthroat trout (wsct) would have been the dominant salmonid throughout much of the analysis area historically, although it is likely that some Arctic Grayling may have also been present in the lower reaches of Tenmile Creek especially near its confluence with the Missouri River. Wsct would have been distributed in all the reaches where non-native salmonids are now present. Only two natural barriers to fish movement have been identified within the analysis area;

a rock outcrop on the lower reaches of Beaver Creek near its confluence with Tenmile Creek and a rock outcrop barrier on Moose Creek.

Beaver would have been much more prevalent in Tenmile Creek, Colorado Gulch, lower Walker Creek, Sweeny Creek, and Colorado Gulch Dry than they are currently.

Existing Conditions

This information has been assembled to date for the Westslope cutthroat trout sub-basin plan for the Upper Missouri 4th code hydrologic unit, other information in forest Service fishery and hydrology files, existing information from other agencies, and any new information from various state, federal, county and private sources.

Information has been assembled for each of the 6th code hydrologic units and specific information for streams is described below. This information provides some of the answers to the core questions specified for fisheries in the Federal Guide to Watershed Analysis. Of the three 6th code hydrologic units in the analysis area currently being evaluated all have substantial problems of varying types that result in fish habitat conditions being in somewhat less than optimum condition. Key factors in poor habitat include lack of streamflow in portions of Tenmile Creek and contamination of water quality from past mining**.** Regarding westslope cutthroat trout, they occupy no habitat within the analysis area compared to habitat that they historically occupied. Prior to the influence of man WCT likely occupied all habitats currently occupied by non-native salmonids. Currently there are two identified **natural barriers** to fish movement known to be present in the analysis area.

Non-native salmonids are known to occupy portions of Tenmile Creek, Ruby Creek, Monitor Creek, Minnehaha Creek, an unnamed tributary to Minnehaha Cr, Moose Creek, Walker Creek, and Colorado Gulch. Fish populations are currently mapped and are available through GIS. However, the map needs reviewing and updating with information collected in 2002 and 2003. The information focuses on salmonids. Additionally, there are a few data gaps where no information on fish species is available (ie upper limits of fish distribution in Walker Creek and the tributaries feeding Chessman Reservoir). **In this analysis area it would be very difficult to manage for native fishes as non-native salmonids have completely taken over streams within the analysis area that are currently capable of supporting fish.**

A broad assessment of the roads posing high, moderate, and low risk to fisheries has been completed as part of the Forest Roads Analysis. This analysis addresses risk from all vehicle types. Specific projects for improving conditions for fish via road improvements are available in fishery project files and include a variety of approaches that vary from complete obliteration, gated closures with intensive erosion control and removal of road culverts, to additional erosion control and upgrade of roads and culverts that are to be left open.

Site specific road sediment surveys have been conducted for portions of the analysis area (the main Tenmile Road and Minnehaha Road). Road sediment surveys have not been completed for some of the roads. Having the specific road sediment information allows us to document opportunities to reduce overall sediment delivery to streams. It is especially important for road segments that received high watershed risk ratings during the Roads Analysis process to have site reviews completed to identify sediment contribution points.

Culvert surveys have been completed for the most part and assessed for fish passage capability. However, this data needs to be reviewed and summarized further. There are a few opportunities to replace culverts to improve fish passage on federal lands and non-federal lands Moose Creek, Minnehaha, and Colorado Gulch).Additionally, human caused fish barriers are also discussed on streams where known to exist in Appendix A with specifics on culverts in fishery project files.

The level of fine sediment in spawning gravels has not been documented in Tenmile Creek or other fishery streams within the analysis area. It is likely that sediment levels are elevated in some streams due to sedimentation from roads and past mining practices.

Dispersed recreational sites are present in a few locations along Minnehaha Cr, but are relatively limited as compared to other areas on the Forest. There is one recreational residence that is encroaching on the stream channel of Tenmile Creek. Overall, the impact of recreation to the limited fishery that is present is low.

The impacts of grazing allotments (throughout the analysis area have not been assessed in detail by fisheries personnel. Some grazing impacts to riparian areas are known to occur in the headwater reaches of Colorado Gulch (Big Buffalo allotment) on portions of Sweeny Creek (Tenmile Allotment) and Lazyman Gulch (Priest Pass Allotment Creek).

The loss of beaver from what was likely present before the influence of man in some portions of the analysis area has been a negative for fisheries. The loss of beaver has been due to a variety of factors including mining, road construction, and subdivision.

There is substantial impact to fishery resources due to diversion of water for municipal purposes. There are diversions on Forest Service lands.

<u>Individual stream by stream discussion</u>

Below is a summary of information known for streams within the Tenmile Drainage. Streams are organized around NRCS 5th and 6th code hydrologic units. Information on each stream within an individual 6th code is included below. The Tenmile analysis area consists of three 6th code HUCs.

6th code HUC 100301011301

Tenmile Creek to the confluence with Walker Creek-- includes, Minnehaha Creek, Banner Cr, Ruby, Monitor, Moose, Deer, Bear Cr

Tenmile Creek- the lower reaches near Moose Creek Campground are known to support both brook and rainbow trout. Fish abundance was very low when sampled in the late 1980s. Negative effects from mining have a detrimental effect on fish habitat throughout much of the drainage. Low water flows due to water withdrawals for city water supply also have a negative effect on the reaches below Rimini and Moose Cr. Sampling conducted in the headwater reaches in the 1990s and again in 2003 indicated brook trout were the only salmonid present in sections 13 and 14. Brook trout were the only species found in the vicinity of Ruby Creek as well. Potential for cutthroat trout management is considered to be low. *It is interesting to note that old angler guidebook mentions cutthroat trout as being present in the drainage*.

Banner Creek- Very little is known about this drainage except that it is known that mining has had negative effects on water quality. Fish evaluations at one site in section 9 did not yield any fish. Additional evaluations were conducted along the lower reaches in 2002 and again no fish were found.

Ruby Creek- Supports a population of brook trout near the confluence with 10 mile Creek. It is unknown as to whether any natural barriers are present in the stream. Negative effects from mining are present near the confluence with Tenmile Creek.

Monitor Creek- Brook trout were found during sampling efforts conducted in 2003. The stream has suffered severe negative effects from outwash of contaminated mine tailings in the 1990s.

Minnehaha Creek- Brook trout were found to be the only salmonid present in the stream. Abundance of fish was very low. Negative effects from past mining are present throughout the drainage. Cursory sampling efforts conducted in the 1990s indicated that brook trout distribution extended upstream into section 31. Additionally the tributary in section 30 also supports brook trout. Fish habitat has been extensively impacted by placer mining is some reaches.

Beaver Creek- No fish were found in this drainage during sampling efforts conducted in the late 1980s below Chessman Reservoir. Past mining has negatively influenced water quality. Additionally, the use of Copper sulfate in Chessman Reservoir is likely having a negative effect on water quality needed for production of plants and invertebrates necessary for fish food. Habitat degradation from road construction is also present. There is a natural barrier to fish movement near the confluence with Tenmile Creek. Thus, if water quality and habitat quality were to be improved it is possible that the drainage could be managed for cutthroat trout above the natural barrier.

Bear Gulch- No fish found during sampling near the confluence with Tenmile Creek. Sampling conducted again in 2002 and no fish were found. Past mining influence from upstream reaches may be a factor as adequate habitat appeared to be present to support a limited population of salmonids in the lower reaches. Mining impacts have been documented in the upstream reaches.

Lazyman Gulch- Perennial stream, but no fish due to inadequate stream flows and lack of over-wintering habitat

Moose Creek- Brook trout were abundant in this stream. Sampling was conducted in section 20. The upstream extent of fish distribution was determined in 2002 and found to extend upstream into section 21 where a 10 ft vertical rock outcrop was present . Only brook trout were found up to the barrier- no fish found above the barrier. The reach above the barrier needs to be reviewed for the potential to introduce WCT.

Deer Creek- Sampled in the 1990s and again in 2002 for a short distance upstream from the confluence with Tenmile Creek to confirm that no fish are present. Stream flow appears to be limiting the potential for a fishery.

6th code HUC 100301011302

Walker Cr, Little Porcupine, Sweeney Cr

Little Porcupine Creek- Fishery sampling efforts conducted in 2003. No fish were found on the forest either above or below the culvert crossing of US Highway 12.

Sweeny Creek- No fish are believed to be present. Visual review indicates that small stream size and low flows limit fishery potential.. Review in 2004 found seepage flows are present in the lower reaches above and below the culvert crossing in section 34 just upstream where it joins with Tenmile Creek.

Unnamed tributary to Sweeny Creek in section 27-- Sampling conducted in the 1990s found no fish to be present in this very small stream with perennial flow.

Walker Creek- Virtually no fish habitat on the Forest due to low water flows. Rainbow trout were found to extend just up onto the Forest and are believed to be originating from a private pond below the forest boundary. There is a diversion on Forest taking water to Tenmile Creek. It is unknown if fish are present above the diversion.

6th code HUC 100301011307

Lower Tenmile, Blue Cloud, Nelson Gulch

Colorado Gulch- Rainbow and brook trout were found during surveys in 2004. There are no barriers to fish movement from the confluence with Tenmile Creek

Blue Cloud Creek- This stream is all on private land below the Forest. Generally an intermittent stream and not believed to support a fishery. Hoever, the upper reaches have not been reviewed. The channel is located within a subdivision where it joins with Tenmile Creek.

Nelson Gulch (trib to Colorado Gulch)- No fish present on the forest due to low stream flow. Sampling conducted in 2003 again confirmed the lack of fish. Mining has had negative impacts on stream channel morphology on the Forest.

Grazing

Historic Conditions

There are no grazing records to indicate that cattle or sheep traditionally grazed beyond the current allotments. It can be assumed that livestock were raised to provide food for early settlers in the area, but unlikely that livestock used the National Forest extensively.

Existing Conditions

There are portions of 4 allotments within the Ten Mile Watershed Analysis area. These include MacDonald Pass, Ten Mile/Priest Pass, Big Buffalo, and Austin. These are all cattle allotments. Grazing systems vary, however all allotments incorporate some sort of grazing rotation, either by season or by year. NEPA for new allotment management plans is in progress for several of the allotments: a new plan will be implemented for Big Buffalo in 2006, and for Austin and MacDonald Pass in 2007. Some data collection has taken place for two of the three Units of the Ten Mile/Priest pass Allotment. The various grazing systems, dates and numbers are displayed in Table 3-4.

Table 3-4

Allotment	Num-bers	Season of use	Grazing system	Plan date	Comments
MacDonald Pass	79 pair	June 16 to October 10	Deferred Rotation	1990 new plan in progress – will implement in 2007	Cattle run on both sides of the Divide
MacDonald Pass	25 pair “on” 125 pair “off”	June 25 to October 15	Season long	1990 new plan in progress – will implement in 2007	Cattle run on both sides of the Divide
Priest Pass Unit Ten Mile/Priest Pass Allotment	80 pair	June 11 to Sept 25 or July 1 to Oct 15	Rest Rotation Used two out of three years	1983	Cattle run on both sides of the Divide
Minnihaha Unit Ten Mile/Priest Pass Allotment	100 to 120 pair	June 11 to Sept 25 or July 1 to Oct 15	Rest Rotation Used two out of three years	1983	Cattle Run on both sides of the Divide
Black Mtn Unit Ten Mile/Priest Pass Allotment	100 to 120 pair	June 11 to Sept 25 or July 1 to Oct 15	Rest Rotation Used two out of three years	1983	Unit is wholly within the Ten Mile Watershed – drains to Ten Mile and Colorado Gulch
Big Buffalo	125 pair	July 1 to Sept 30	Deferred Rotation	new plan in progress – will implement in 2006	Drains to Ten Mile and Colorado Gulch, but mostly to Prickly Pear
Austin	24	May 1 to	Rest	new plan in progress – will	Drains to Blue Cloud

Allotment	Num-bers	Season of use	Grazing system	Plan date	Comments
	"on" 56 "0ff"	June 15 not to exceed 30 days	Rotation Permittee does not use this every year	implement in 2007	Creek, then to Ten Mile

All of these allotments consist of a variety of rangelands which are interspersed throughout a variety of forested habitat types. Rangeland areas consist mostly of bunchgrass parklands with stringers of riparian areas dominated by aspen, willow or alder. Forage species in these areas consists of native grasses and in some places introduced species such as timothy or bluegrass. Most of the rangeland areas are in good to excellent condition (stage 1 or stage 2), based on their ecological status. There are also limited areas of sagebrush and bitterbrush rangelands.

All of these allotments have a minimal amount of range improvements. These consist mainly of water developments and sections of drift fence serving as allotment boundary or pasture division fences. Much of the area is unfenced, with permitees relying on natural barriers such as steep terrain or heavy timber to help keep cattle on the allotments.

All of the allotments have had some past timber harvest activity. This varies from 1970s era clear cutting, to more recent selective cutting and thinning, as well as extensive timber harvest in the 1800s for mine timbers, and lumber to supply the then young town of Helena. A saw mill was located off the forest at the junction of Colorado and Ten Mile Creeks in the 1860s and most of the Colorado Gulch drainage was heavily logged. Another mill was located just off the Forest in the Blue Cloud drainage north of Highway 12. Presumable the area of the Blue Cloud and Sweeney Creek drainages supplied logs for this mill. Old photographs of the Rimini area also show areas of denuded slopes. Areas cut over in more recent times include portions of the Porcupine and Sweeney Creek drainages as well as the Lazy Man area just east of the Ten Mile drainage. Private lands in Walker Gulch and behind the water treatment plant have been harvested along with lands along Minnihaha Creek. Most of these cut over areas have regenerated and provide little to no forage for livestock at this time.

Heritage

Historic Context Summary

First Americans

Archaeological evidence of prehistoric or historic American Indian habitation or use of the Ten Mile watershed is scarce. This is probably attributable to lack of survey information, natural processes (flooding and scouring); and historic-modern development. Archaeological sites have been obscured or destroyed. Intact sites may lie buried (or hidden) on higher, less disturbed, terraces and benches on both National Forest and private land. Opportunistic and compliance (project) inventories may eventually yield additional signs of ancient American Indian use, especially given the drainages close proximity to Mullan and Priest Passes—important east-west travel routes in the distant past. Presumably, American Indians were the source of both inadvertent and deliberately set fires (to improve horse pasturage, clear camp areas, and improve favored hunting-gathering locales) that contributed to the pre-white settlement fire regime in and around the Ten Mile watershed.

Historically, the powerful Blackfeet controlled the Helena area until the mid-1700s, having earlier pushed out the Shoshone, Salish and other western Montana Indian tribes. John Coulter encountered the Blackfeet in the area in 1807 and 1811. The murder of Malcom Clarke, a prominent Helena Valley rancher, by a member of Mountain Chief's band in 1869 precipitated the Baker Massacre on the Marias River in 1870. The Blackfeet thus relinquished control of Helena Valley area, easing the way for mining and white settlement. American Indians of different tribal affiliations continued to travel through the Helena Valley area well into the early 1900s, leaving their various Indian reserves in search of game, other foodstuffs and white goods. The Helena Valley (and Ten Mile drainage) area was used over thousands of years by many tribes but it does not lie within ceded treaty lands or reservation boundaries.

Uncharted territory

The Lewis and Clark Expedition traveled through the valley of the Prickly Pear (but did not venture into the Ten Mile drainage) in 1805. The promise of beaver pelts led an unknown number of fur trapping parties and traders into the Helena Valley and presumably into the Ten Mile drainage. In 1855, Congress appropriated funding for a 640-mile military road between Walla Walla, Washington and Fort Benton, the terminus of steamboat travel on the upper Missouri River. The road was named after the leader of the survey party, Lieutenant John Mullan, and it facilitated the development of the Helena area (and Ten Mile Creek) as an agricultural and mining region. The Mullan Road (located ca. 6 miles northwest of Ten Mile) and other routes across the Continental Divide followed ancient Indian “roads” that led the buffalo country of the Montana plains.

A clear cup of water

The discovery of gold in Last Chance Gulch created the community of Helena. The Ten Mile drainage has served as Helena’s water source ever since. William Chessman, seeing the financial benefits of supplying domestic water to the fledging Helena mining community, founded the Helena Water Works in 1864. He then constructed Chessman Reservoir and a series of flumes and ditches. Chessman Dam gave way in 1876, to flooding and scouring of the Ten Mile drainage. In 1886, the various water companies operating in Helena consolidated into the Helena Water Works Company (a New Jersey corporation). In 1911, the City of Helena acquired the company for about $440,000. Ten Mile Creek still supplies drinking water to Helena, but through a modernized system. The old water ditch system is one of the oldest historic ruins in Ten Mile, and is perhaps the oldest, surviving (major) municipal water system in Montana.

Because Ten Mile was an important municipal water source for Helena, various legal restrictions controlled and monitored mining activity, particularly the construction of mills. For example, the City of Helena refused to allow the Montana Lead Company to construct an ore concentrator at its Lee Mountain mine property. Today, toxic abandoned mine wastes are definitely an issue in the Ten Mile drainage, especially around the un-incorporated community of Rimini. But the water-quality concerns of early day Helena undoubtedly prevented a more critical environmental-health problem.

Get the rock in the box boys—the Ten Mile underground

As the Helena community developed into a mining center in the 1860s-1870s, attention turned to the promising area “10 Miles” west of Helena. Placer mining is reported in the watershed as early as 1864, but placer deposits were not abundant and the drainage bottom was spared the extensive sluicing and hydraulic mining seen elsewhere. Still, placer exploration was active in the upper Ten Mile around a camp known as “Young Ireland” (later to be called Rimini). In 1867, a ten-stamp, steam-powered operation, known as Allen’s mill, was developed at the head of Ten Mile Creek. Isolation and lack of transportation inhibited mining growth—ore was hauled by wagon to Helena and Fort Benton, thence to smelters in far away Wales.

The Ten Mile mining district (also called the Rimini, Vaughn, Colorado, Bear Gulch district) was rich in sulphide ores. By 1872, various hardrock lode (underground) mines were being developed as corporate ventures in the upper drainage, including the Beatrice, Emma, Lee Mountain, Josephine, Little Jennie, Susie, Try Again and others. Mines were opened to depths of 600 feet. Ore was sent to the Wickes and East Helena smelters. Hard rock mining activity in the Ten Mile drainage peaked between 1885 and 1915. The population of the community of Rimini also reached its high-water mark. The extensive mining activity stimulated investment interest and new wagon- and railroad construction.

By the turn of the Century, mining in the Ten Mile district began the economic roller-coaster ride that has characterized western mining ever since. A period of dormancy was followed by another period of activity fueled by World War I and America's continued industrialization. By 1915, ten lode mines operating in the drainage produced some 18,500 tons of sulphide ore. A 20-stamp amalgamation mill was located at the head of Ten Mile and the Porphyry Dike became the district's most active producer. Then, mining went into another period of decline. By the 1930s, the Rimini mining community was nearly deserted.

Widespread unemployment during the Great Depression, coupled with a 70% increase in fixed gold prices, fostered "subsistence" placer and lode mining. Placer operations in Banner and Monitor Creeks, and underground lodes were developed at the Eureka, Peerless Jenny, Porphyry Dike, Red Mountain and Valley Forge mines. World War II "strategic metals" (copper, lead, zinc) production likewise fueled critical mining investment and activity. The Anna May, Broadway, Armstrong, Bunker Hill, Eureka, Justice-Clementh and Valley Forge all shipped crude ore to smelters in East Helena and Midvale, Utah. Post-war changes rendered most of the lode mining in Ten Mile obsolete. Some mines (i.e., Armstrong, Evergreen) continued to operate independently, but the early 1950s, the few operating mines reported limited production. Today, although minor prospecting continues, there is no active lode or open-pit mining in the watershed.

<u>Rails to Rimini</u>

By the early 1880s, lode mining was successful and promising enough in the Ten Mile drainage to require railroad transportation. Mining companies courted the railroads. In 1883, the Northern Pacific Railroad (NPR) and the Montana Central Railroad (MCR)--a subsidiary of James J. Hill's Great Northern Railroad--was close behind. The two railroad companies competed to build a branch line to Rimini, and various prominent Montanans, such as Charles Broadwater, Samuel Hauser and Anton Holter, got into the act on behalf of either railroad. The upshot was that through hard work and various legal shenanigans, the NPR branch line was built and the MCR branch line was not. Named the Helena and Red Mountain Line (HRML), the branch line was open for service in 1886, and offered daily freight and passenger service to Helena for 14 years. The line had a depot and turn-table, and was linked to the aerial tramway from the Eureka mine in Rimini. The abandoned HRML railroad bed—with some wonderful rock work--survives today on the west side of Ten Mile Creek. The MCR railroad bed replaced the older, and somewhat meandering wagon route to Rimini. It was officially designated as the county road to Rimini in 1908.

<u>For the love of theater</u>

The early mining community in Ten Mile was called Young Ireland. As the story goes, it was renamed Rimini in the 1880s after the camp's inhabitants watched a traveling road company's apparently worthy rendition of the popular Italian drama, *Francesca da Rimini* (Rimini has been anglicized to "rim-in-eye"). The community's fortunes were closely tied to mining and the HRML branch line. It thrived from the 1890 to about 1915 during the height of the Ten Mile underground. Historic Rimini comprised several hotels and stores; a school; saloons, gambling houses and pool halls; livery stable; physician's office; church; several boarding houses; and a sawmill. About 300 people lived there. The Helena and Red Mountain Spur Line gave the community a significant socioeconomic boost. But the community quickly went into demise early in the 20th Century. By 1920, only 20 people lived there and the community was practically abandoned by the 1930s. The periodic resurgence of mining activity at Valley Forge and other mines did not equate to community revitalization.

Rimini was re-discovered in the 1970s, partly by Helena commuters and partly by retirees. It retains a number of picturesque buildings (many being renovated by their owners) dating from about 1885 to 1915, including Rose Wilson's store, the Red Mountain Tavern and the old livery-garage. The restored Rimini School-Community Center was built in 1904. It is listed in the National Register of Historic Places. Rimini is currently the scene of extensive mine waste cleanup by the EPA.

Freezes early, snow stays late

Because the Ten Mile drainage is so topographically constricted and mountainous, the earliest and most substantial homesteads were located at the canyon mouth. Various homesteads located here date to the 1880s-1890s. Within the Ten Mile drainage proper, one of the earliest is the Schwarzhaus Farm, located on the east side of Ten Mile Creek opposite the mouth of Bear Gulch. The current Mary Tipton place on the west side of Rimini Road was originally patented in 1913 by John Irwin. These early homesteads are located in private lands on benches and mountain slope above Ten Mile Creek. Another homestead was located behind the Moose Creek Ranger Station. As attested today, the drainage's agriculture potential was limited, although livestock grazing allotments are located within the drainage.

Logging in the Ten Mile drainage provided building materials and fuel for Rimini and the underground mining operations. The extent of early logging in Ten Mile is clearly evident in 1894 and 1916 photographs (from the Montana Historical Society) showing the near timber-barren country around the Josephine Mine. Historic photographs of the early Rimini community and other mines provide similar depictions. Logging ruins (camps, splash dams, ditches) have not been specifically identified in the Ten Mile watershed but clearly timber harvest was an important activity around the turn of the Century. Logging accelerated again (with environmental sideboards) on public lands during and following World War II, resulting in a proliferation of access roads and harvest and reforestation units.

Smokey's army

In 1881, the Division of Forestry was created in the Department of the Interior, and the Organic Act later created the Forest Reserves. In 1905, Forest Reserve administration was consolidated under the USDA Bureau of Forestry, and the term "National Forest" soon replaced the older "forest reserve" nomenclature. The Helena National Forest was created from the Big Belt, Elkhorn, and Helena forest reserves in 1908. That same year, the Moose Creek Ranger Station was built on Ten Mile Creek several miles north of Rimini. The various district rangers administered mining claims, logging operations, and range permits. The devastating 1910 wildfires made fire protection and suppression a major focus of all forest rangers. A lookout was located atop Colorado Mountain behind the ranger station (it was demolished sometime in the late 1960s-early 1970s).

Moose Creek Ranger Station operated until 1927 when District headquarters were consolidated and moved to Helena. Moose Creek was then operated as a guard and workstation. The property was converted to private ownership in 1944. The Forest Service terminated the Special Use Permit for the property in 1998. Renovation of the Moose Creek Ranger Station has been on-going since 2000. Surviving buildings include the original ranger's cabin, garage and cellar.

By the waters of Ten Mile Creek

By the turn of the 20th Century, outdoor recreation was commonplace in the vast forests of the west and northeast. The Forest Service instituted policies to regulate growing public and commercial tourist interests. The agency turned to recreation improvements, including the creation of residential tracts for summer homes, to reduce transfer of land to the National Park Service and to counter arguments that its only goal was resource development. Particularly in the years after World War I, the Forest Service encouraged summer home development in architectural themes consistent with surrounding forest landscapes. The Moose Creek Villa tract, composed of five cabins, was established in the late 1920s. All cabins survive today and continue to be authorized under Special Use Permits by the forest. Eventually, the Forest Service built trails and several facilities along Ten Mile to provide other developed recreation opportunities.

Young men willing to work

In order to reduce the hardships of the Great Depression, President Franklin Roosevelt created the Civilian Conservation Corp (CCC) as part of his New Deal reform. Beginning in 1933, the

CCC provided training and educational opportunities for unemployed men between the ages of 17 and 25. The US Army operated the camps, while the Forest Service helped direct and manage CCC work crews. Forest Camp A-79 or Camp Rimini was established in June of 1939. It was located just south of Moose Creek Ranger Station and on the west side of Ten Mile Creek. Populated by some 200 young men and 40 staff, the camp had barracks, a mess hall, infirmary and other buildings. All but one were portable. CCC crews performed a variety of work on the forest, including campground construction, road maintenance and fuel reduction. World War II led to the closure of Camp Rimini in 1942.

Allied invasion to artic rescue

CCC Camp 79-A was converted to an Army facility in April of 1942. Its purpose was a sled- and pack-dog training facility for the proposed Allied forces invasion of Nazi-held Europe through Norway. By 1943, invasion plans had changed and the facility refocused on training dogs and men for Artic Search and Rescue units. The camp was home to some 235 troops and 900 dogs. The considerable need for dog food was provided gratis of Army surplus horses. Training occupied both men and dogs year-round. The need for rescue teams diminished by 1944 and facility was closed. All buildings were sold (including the remaining structures at the nearby Moose Creek Ranger Station) and most were removed. Today, the remnants of the CCC Camp 79-A and Army dog-training facility are visible by way of concrete slabs, rock walls and the large parade ground—now a parking lot for snowmobile enthusiasts.

Not so remote anymore

Since the 1950s, the Ten Mile watershed has experienced changes and demographic growth similar to elsewhere in the Helena Valley area. During the past 50 years, the Forest Service has improved and/or constructed various roads for timber harvest and recreation, and now is in the process of reclaiming many of them as part of watershed restoration. The Moose Creek Campground and Ten Mile Picnic Area were developed in the 1960s and 1970s, and today are popular local facilities.

Various improvements have been made to the Helena municipal water supply system, including a large facility at the mouth of Ten Mile Creek. Residents of the un-incorporated community of Rimini have renovated older (historic) homes or built new ones. However, constricted topography and limited available private lands prevent significant growth and sprawl. Constant commuter and recreational traffic on the Rimini road has compelled the Federal Highways Administration to consider it as a candidate for paving. The drainage is an EPA-designated Superfund site and thus has been the scene of extensive abandoned mine reclamation over the last decade. The Ten Mile Watershed Working Group, composed of local citizens and agency representatives, assists in monitoring and managing various projects in the drainage.

Historic Theme	Surviving Historic Properties
American Indian: 12,000 to 1900	Isolated prehistoric artifacts; No archaeological sites identified
White Settlement: 1864-1900	Chessman-Helena water ditch Rimini community Homesteads
Mining: 1864-1950	Placer claims and mines Lode mines and mills Cabins and related ruins
Transportation: 1864-1900	Old Rimini wagon road Helena-Red Mountain Branch Line Montana Central Branch Line & County road
Forest Service: 1908-present	Moose Creek Ranger Station Colorado Mountain Lookout

	Moose Creek Villa tract & cabins Campgrounds & trails
Great Depression & World War II: 1930-1945	CCC Camp Rimini CCC trail & other improvements WW II Dog Training Camp

Table 3-5. Historic Themes and Heritage Property Types in the Ten Mile Watershed

In summary, a lot of interesting history has taken place in the small Ten Mile watershed located only a few miles west of Helena. Its history is representative of many of the key themes in western history, as illustrated in Table 1 above.

Existing Condition

The Ten Mile watershed west of Helena is rich with heritage resources. In many ways, it is a microcosm of many prominent themes in Montana history (Table 1). The surviving historic ruins and sites in the drainage provide numerous opportunities for study, education, enhancement, restoration and preservation.

Heritage surveys have been completed over the last several decades within the watershed primarily in advance of proposed ground-disturbing activities. These efforts have resulted in the identification and recordation of various historic ruins. Most recently, abandoned mine waste cleanup projects sponsored by the Montana Department of Environmental Quality (Abandoned Mines Program), USDA Forest Service, and Environmental Protection Agency (EPA), and a proposal by the Federal Highways Administration to improve Rimini road, have generated an abundance of historical information. Beyond the valley floor of Ten Mile Creek, less than 10% of National Forest system land within the watershed has been systematically inventoried for heritage resources. However, it is safe to assume that much of this steep, rugged, mountainous terrain has limited potential for heritage resources—with the exception of random mining prospect pits and trenches on unpatented claims.

Some 95 heritage sites are currently recorded within the Ten Mile watershed. Further project-compliance and opportunistic survey could easily double this site total (see Appendix 1). Beyond the collection of historic buildings in the community of Rimini, most of these sites are historic ruins located partly or entirely on the Helena National Forest. All of the known sites are historic in origin—although a few prehistoric American Indian artifacts have been reported from private land. Sites threatened by ground-disturbing projects (particularly abandoned mine reclamation) generally have been evaluated to determine their historical significance and eligibility for inclusion in the National Register of Historic Places (NRHP) (Appendix 1). The significance of many others is as yet undetermined. Several sites, including the City of Helena water supply system and the Moose Creek Ranger Station, are very significant in local history.

The identified heritage sites and ruins are in varying states of preservation. At least a dozen historic mining ruins have been the scene of toxic mine waste cleanup over the last several decades. Other, less-toxic mining sites are simply “melting” into the landscape. Beyond mining, historic recreation cabins along Ten Mile Creek and buildings in Rimini are still in use. The old Civilian Conservation Corp camp is now a campground and snowmobile parking area. The Moose Creek Ranger Station is currently undergoing restoration by the Forest Service. The World War II dog training camp remains a colorful part of local history—Rimini was the starting point for the annual *Race to the Sky* dog race 2005.

Hydrology

Watershed Characterization

Tenmile Creek proper drains about 110 square miles of mountainous and valley terrain near the City of Helena, Montana. Upper Tenmile Creek (HUC 100301011406), defined as the reach above the confluence with Walker Creek, drains 40.85 square miles of mostly forested, steep volcanic and granitic glaciated terrain. The headwaters are on the continental divide, where the maximum elevation is more than 8,000 feet. Tenmile Creek flows in a generally north direction to the water treatment plant at the mouth of the canyon where the elevation is about 4,400 feet.

Upper Tenmile Creek is the major water source of municipal water supply for the community of Helena. Because the drainage basin is small and located in a relatively dry mountain setting, annual and seasonal runoff is variable. Water volumes withdrawn for municipal demands often are sufficient to de-water portions of the stream in late summer, thereby reducing the aquatic habitat as unsuitable for a year-round fishery. The basin also has been impacted by substantial mining activity over the past 100 years, resulting in drainage from inactive mines entering the stream at various locations. Other land-use activities that may affect water quality in Tenmile include streamside residential development, recreation, roads, and timber harvest (predominantly on private land).

Middle Tenmile Creek (HUC 100301011402), defined as the reach from the confluence of Tenmile and Walker Creek down to and including the confluence of Colorado Gulch and Tenmile, drains 35.90 square miles comprised of both forested volcanic and granitic mountainous terrain and alluvial flood plains and terraced valley terrain. Land use in the middle Tenmile drainage include timber harvest on forested mountain slopes and irrigated hay, livestock grazing and residential development in the valley.

Lower Tenmile Creek (HUC 100301011406), defined as the reach just below the confluence with Colorado Gulch down to its confluence with Prickly Pear Creek, drains 31.91 square miles and is comprised of alluvial flood plains and terraces and broad alluvial valley. Land use in the lower Tenmile drainage is dominated by irrigated hay and small-grain production, livestock grazing and residential and commercial development (urban/suburban). Diversions for irrigation in the lower Tenmile watershed deplete stream flow during the summer months, causing some reaches to go dry in most years.

Current Hydrologic Characteristics

The table below displays the basic stream characteristics within the study area. The miles by stream order and miles or perennial and intermittent are given as well as the predominant land type aggregates through which they flow. Desired stream morphological characteristics are located further on in the document.

Table 3-6. Stream Characteristics in the Tenmile Area

Watershed	Miles By Stream Order 1st/2nd/3rd/4th	Miles Perennial/Intermittent	Predominant Aggregates (Miles)
807A	5.3/1.6	3.7/3.2	5(3.2), 11(3.2)
807B	2.8/.12	1.0/2.0	11(3.0)
809A	3.0/1.0	0.2/3.9	10(1.3), 27(0.9)
809B	4.1/0.8	0.8/4.1	10(2.4), 11(1.0)
809C	3.3/1.4	4.7/0.7	11(1.9), 5(1.1), 3(1.0)
809D	0.7	0.0/0.7	10(0.4), 11(0.2)

Watershed	Miles By Stream Order 1st/2nd/3rd/4th	Miles Perennial/Intermittent	Predominant Aggregates (Miles)
1001	39.7/22.7/5.9/3.7	52.0/17.1	24(14.3), 22(11.8), 29(6.8), 27(6.6), 2(6.0), 5(5.3), 11(5.1), 28(4.6)
1001A	9.3/2.6	3.8/7.8	27(4.4), 11(4.2), 10(1.3), 5(1.1)
1005	2.5/0.3	1.6/1.2	5(2.5)

Streamflow in the upper part of Tenmile Creek and its tributaries is typical of mountain streams in Montana. Flows are greatest in May and June when high altitude snowmelt combines with spring rains to produce more than two-thirds of the total annual stream flow. Natural flows, which are stream flows unaffected by storage and withdrawals, generally are lowest in the winter months when ground water seeping into the stream channel provides most, if not all of the streamflow.

Although streamflow in the upper part of the watershed is variable, both seasonally and from year to year, Tenmile Creek and its major tributaries flow year-round above the municipal water supply diversions. Downstream from each diversion, streams generally go dry during late summer. Figure 3-7 below compares estimated natural streamflow conditions at the USGS gaging site on Tenmile at Moose Creek with streamflow as it is currently managed. Although the effects of streamflow management are most readily observed in late summer when streambeds downstream of the diversions are dry, the effects of management on the quantity of streamflow are greatest in May and June when some water from snowmelt is stored in Scott and Chessman Reservoirs.

Streamflow in the lower part of Tenmile is more variable than in the upper part of the watershed because of the net effects of sporadic and highly variable tributary flow, irrigation diversions, irrigation return flows, and channel reaches that naturally lose flow to seepage at certain times of the year. Although the entire Tenmile watershed is more than three times as large as the upper part of the watershed, streamflow at the mouth of Tenmile is commonly less than the flows at the water treatment plant. From May through October the mean monthly flows are larger at the mouth for only two of those months. So, except for brief periods of runoff from lower tributaries (Sevenmile Creek) the lower part of the watershed contributes little or no additional flow to Tenmile Creek. Lower Tenmile is commonly dry downstream of the larger irrigation diversions in late summer.

Figure 3-7. Mean natural discharge on Tenmile Creek at the Water Treatment Plant.

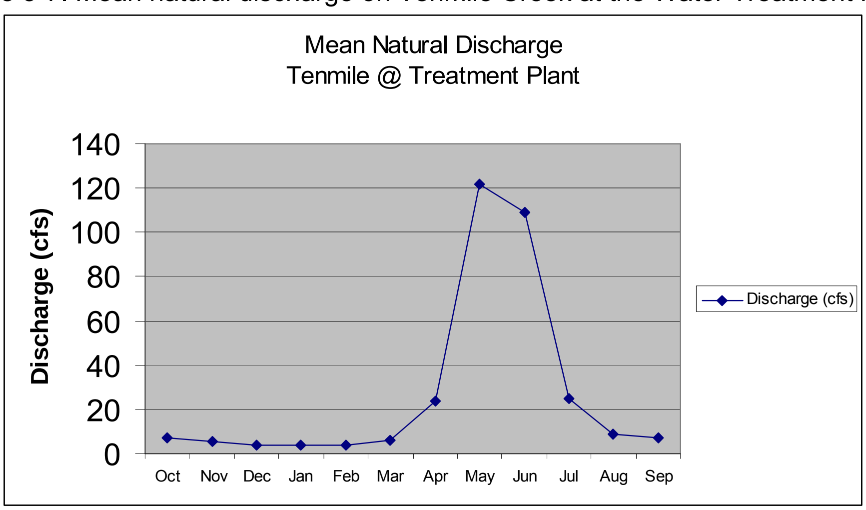
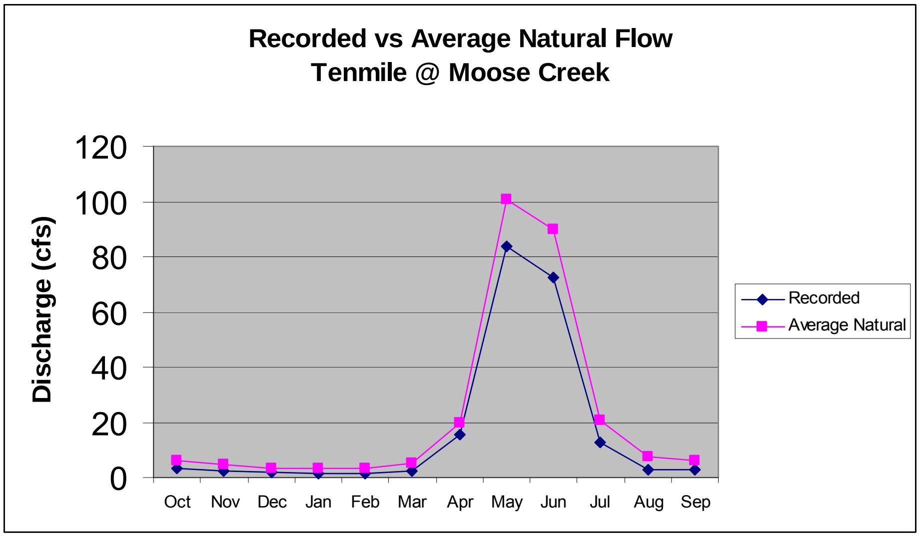


Figure 3-8. Recorded verses Average Natural Flow on Tenmile Creek at Moose Creek



Excess water yield from timber harvest on Forest Service land is minimal. The table below depicts the number of acres harvested by watershed and the Equivalent Clearcut Acres for each of those watersheds.

Table 3-7 Acres of timber harvest in the Tenmile EAWA

Watershed	Watershed Acres	Acres Harvested	Harvest on PVT	Fire	ECA
Sweeney Creek	2240	99		805	47
E. Fk. Sweeney	1050	32		821	15
Nelson Gulch	1932	3			1
Tenmile	25843	172	~745		558
Walker Creek	4019	176			83
Little Porcupine	998	49		7	27

In actuality little of this water yield increase will be realized downstream in Tenmile Creek. The general principle is that streams are relatively efficient in conveying water downstream. However, as streams flow from the mountains and into the valleys, streams may become losing rather than gaining. They become losing because the groundwater level is generally below the elevation of the stream bottom and they seepage is away from the stream rather towards it. This is particularly true of lower Tenmile as the stream progresses from the canyon mouth near the water treatment plant onto the broad alluvial valley floor. MacDonald and Stednick (2003) have noted that at least 15 to 20% of a forested basin must be treated within a short period of time in order to detect a change in runoff. They also noted that 20-30% of a watershed must be treated to detect a statistically significant change in flow. The present amount of harvest in the Tenmile watershed is below the level of detectability. It should also be noted that annual precipitation must exceed 18-

20 inches in order to detect an increase in runoff. While the upper portions of this watershed would meet that requirement the lower portions would not and it is unlikely that we would realize much if any water yield from the dry habitat types within the greater Tenmile watershed. This combined with the fact that changes in flows will be undetectable at the larger scale due to the limitations in measuring techniques mean that we should not expect to measure significant changes in runoff in Tenmile Creek. Field research, hydrologic theory, and modeling studies all indicate that a change in forest cover will affect streamflows, particularly at higher elevations where there is more precipitation and hence a greater potential to alter interception and transpiration. The resulting changes will be transmitted downstream, but with increasing drainage area the changes from a given set of activities will become proportionally smaller and hence undetectable.

Flooding in upper Tenmile has probably shaped the drainage more than anyone single perturbation. Flooding occurred in 1908 and extensive flooding occurred in 1981. A series of extensive rainstorms during the month of May culminated in record flooding not only in Tenmile, but in west-central Montana in general during May 22nd and 23rd of 1981. Precipitation amounts for the first half of May, which were generally well above average at most rainfall recording stations in the area, saturated the ground and raised streamflow levels to near bankfull stages. The larger storms of May 22nd and 23rd then combined with snow-melt to produce the destructive flooding that followed. The flooding in Tenmile destroyed five bridges between the small community of Rimini and Helena and forced the evacuation of more than 100 people. The peak discharge for Tenmile was 3,290 cubic feet per second (cfs), which was three times the previous recorded peak flow and probably exceeded the historic flood discharge of 1908. Near Helena the discharge was 3,770 cfs and was also three times the previous recorded peak in 1908. Damage in and downstream from Helena was also extensive as floodwaters left the main channel and flowed northward through residential areas in the valley.

Current Water Quality

The water quality of Tenmile Creek is affected by natural processes as well as by human activity within the watershed. For Example, runoff from rainfall and snowmelt can dissolve and suspend natural materials and residues of domestic, agricultural, and commercial activities. Water that percolates beneath the land surface can dissolve minerals from soil and rock before seeping into Tenmile Creek or one of its tributaries.

Extensive water quality sampling has occurred in the upper Tenmile watershed. Water quality sampling has determined that arsenic, cadmium, copper, lead, zinc and sediment are currently impairing aquatic life, fishery and drinking water beneficial uses in upper Tenmile. The relevant sources of metals to stream segments in the upper Tenmile watershed include abandoned mines, natural sources and dirt roads. The majority of the metals loading comes from abandoned mines and natural sources. The upper Tenmile watershed falls within the Rimini mining district. The Abandoned and Inactive Mines database shows mineral location, placer, surface, surface-underground, underground and other unknown mining activities in the drainage area of the streams within the watershed. Historic mining types include lode, mill and placer. Of the more than 20 mines present in the headwaters area, 12 are listed in the State of Montana's inventory of high priority abandoned hardrock mine sites.

In terms of sediment the primary anthropogenic sources of sediment in the overall Tenmile drainage, in order of sediment load are agriculture, unpaved roads, anthropogenic streambank erosion, timber harvest, urban areas, non-system roads/trails, abandoned mines, and active mines and quarries. Agriculture was the single greatest sediment source within the greater Tenmile Creek watershed, representing 30 percent of the total anthropogenic sediment load. This is primarily located in the lower elevations in middle and lower Tenmile Creek. Unpaved roads were the second greatest anthropogenic sediment source, accounting for 24 percent of the total sediment load. The majority of the road sediment was generated in high road density watersheds of upper and lower Tenmile. Road densities, miles of road within the Riparian Habitat

Conservation Areas, number of road stream interactions, and overall road/watershed risk analysis is presented in the table below.

This is also done for each individual road by watershed as well. In addition an overall road rating is given in tables 3-8 and 3-9 that follow.

WTRSHD	Watershed Name	ID	TOTAL MILES	Mi in RHCA	STRM_XING	Watershed Rating	Road Rating
0807A	Sweeney Creek	1860-A1	0.19	0.03	0	M	0
0807A	Sweeney Creek	335	2.63	1.65	6	M	H
0807A	Sweeney Creek	335-A1	1.18	0.11	1	M	M
0807A	Sweeney Creek	335-A2	1.34	0.23	2	M	M
0807B	E. Fk. Sweeney Creek	1860	1.35	0.35	2	0	M
0807B	E. Fk. Sweeney Creek	1860-A1	0.02	0.00	0	0	0
0809A	W. Fk. Colorado Gulch	4177	0.44	0.00	0	0	M
0809C	Nelson Gulch	647	0.21	0.00	0	0	0
1001	Tenmile Creek	1813	2.17	0.73	11	H	H
1001	Tenmile Creek	1813-A1	0.50	0.35	2	H	0
1001	Tenmile Creek	1813-B1	0.41	0.07	0	H	0
1001	Tenmile Creek	1813-C1	0.48	0.00	0	H	0
1001	Tenmile Creek	1863	4.04	0.12	1	H	H
1001	Tenmile Creek	1863-A1	0.14	0.00	0	H	M
1001	Tenmile Creek	1863-B1	0.01	0.00	0	H	0
1001	Tenmile Creek	1863-C1	0.37	0.03	0	H	0

Watershed	Watershed Name	Area Wtrshd Mi^2	Miles Road	Road Density	Mi in RHCA	Rd_Strm_Xing	Watershed Rating
0807A	Sweeney Creek	3.5	5.33	1.52	2.02	9	M
0807B	E. Fk. Sweeney Creek	1.64	1.37	0.83	0.35	2	L
0809A	W. Fk. Colorado Gulch	2.65	0.44	0.17		0	L
0809C	Nelson Gulch	3.02	0.21	0.07		0	L
1001	Tenmile Creek	40.38	59.60	1.48	27.31	74	H
1001A	Walker Creek	6.28	7.05	1.12	0.06	1	L
1005	Little Porcupine Creek	1.56	1.73	1.11	0.42	4	L

WTRSHD	Watershed Name	ID	TOTAL MILES	Mi in RHCA	STRM_XING	Watershed Rating	Road Rating
1001	Tenmile Creek	1863-E1	0.73	0.00	0	H	M
1001	Tenmile Creek	1863-F1	1.12	0.53	2	H	M
1001	Tenmile Creek	1864	2.36	1.59	1	H	M
1001	Tenmile Creek	1864-A1	0.26	0.00	0	H	0
1001	Tenmile Creek	1866	0.11	0.03	0	H	0
1001	Tenmile Creek	1876	5.48	3.72	11	H	H
1001	Tenmile Creek	1876-A1	2.35	0.11	0	H	M
1001	Tenmile Creek	1876-B1	2.93	1.03	2	H	H
1001	Tenmile Creek	1876-B3	0.47	0.00	0	H	0
1001	Tenmile Creek	1876-C1	0.87	0.00	0	H	M
1001	Tenmile Creek	1876-D1	0.26	0.00	0	H	0
1001	Tenmile Creek	1876-E1	0.57	0.02	0	H	M
1001	Tenmile Creek	1880	0.48	0.46	0	H	0
1001	Tenmile Creek	218	6.67	3.22	10	H	H
1001	Tenmile Creek	218-A1	0.65	0.65	0	H	M
1001	Tenmile Creek	218-A2	0.41	0.00	0	H	M
1001	Tenmile Creek	218-B1	0.17	0.03	0	H	0
1001	Tenmile Creek	299	4.78	3.14	10	H	H
1001	Tenmile Creek	299-A1	0.81	0.64	0	H	M
1001	Tenmile Creek	299-B1	1.36	0.07	0	H	M
1001	Tenmile Creek	299-C1	0.47	0.00	0	H	0
1001	Tenmile Creek	299-D1	0.83	0.05	0	H	0
1001	Tenmile Creek	299-E1	0.40	0.28	1	H	0
1001	Tenmile Creek	299-F1	0.43	0.39	2	H	0
1001	Tenmile Creek	299-F2	0.30	0.00	0	H	0
1001	Tenmile Creek	299-F3	0.36	0.00	0	H	0
1001	Tenmile Creek	299-H1	1.51	0.44	3	H	M
1001	Tenmile Creek	4009-A1	1.00	0.12	2	H	0
1001	Tenmile Creek	4009-B1	0.13	0.00	0	H	M

WTRSHD	Watershed Name	ID	TOTAL MILES	Mi in RHCA	STRM_XING	Watershed Rating	Road Rating
1001	Tenmile Creek	4009-B2	0.19	0.00	0	H	0
1001	Tenmile Creek	4009-B3	0.55	0.00	0	H	M
1001	Tenmile Creek	4009-F1	0.18	0.00	0	H	M
1001	Tenmile Creek	4164	0.23	0.00	0	H	0
1001	Tenmile Creek	4177	0.72	0.00	0	H	M
1001	Tenmile Creek	4180	0.46	0.46	1	H	0
1001	Tenmile Creek	527	4.92	3.25	5	H	H
1001	Tenmile Creek	527-C1	1.07	1.02	4	H	H
1001	Tenmile Creek	695	4.87	4.76	6	H	H
1001A	Walker Creek	1016	0.59	0.00	0	0	M
1001A	Walker Creek	1017	0.06	0.00	0	0	0
1001A	Walker Creek	1802	2.10	0.03	0	0	M
1001A	Walker Creek	1802-A1	0.42	0.03	1	0	M
1001A	Walker Creek	1802-C1	1.43	0.00	0	0	0
1001A	Walker Creek	1864	1.52	0.00	0	0	M
1001A	Walker Creek	1896	0.27	0.00	0	0	0
1001A	Walker Creek	1897	0.52	0.00	0	0	M
1001A	Walker Creek	4197	0.15	0.00	0	0	0
1005	Little Porcupine Creek	1041	0.46	0.38	3	0	H
1005	Little Porcupine Creek	1802	0.18	0.00	0	0	M
1005	Little Porcupine Creek	1802-A1	0.18	0.04	1	0	M
1005	Little Porcupine Creek	1802-B1	0.22	0.00	0	0	0
1005	Little Porcupine Creek	1802-B2	0.60	0.00	0	0	M
1005	Little Porcupine Creek	1898	0.11	0.00	0	0	0

Segments within the greater Tenmile watershed generate large streambank erosion sediment loads. By far the majority of this erosion and sediment loading is from natural sources. Loading from natural sources is estimated to be five times that of anthropogenic sources. Anthropogenic causes of streambank erosion include riparian grazing, road encroachment, stream channelization, riparian vegetation removal, and historic mining activity.

Nutrients are a source of impairment for lower Tenmile Creek. The primary sources of nitrogen in the Tenmile Creek watershed, in order of importance include septic systems, natural sources, urban areas, agriculture, dirt roads, anthropogenic streambank erosion, timber harvest and paved roads. Additionally, dewatering has affected the natural hydrology of the stream and the quality of aquatic habitat. The primary sources of phosphorous in order of importance are natural sources, agriculture, urban areas, dirt roads, anthropogenic streambank erosion, timber harvest and paved roads.

Recreation and Social Resources

Existing Conditions

<u>Social/Demographics</u>

The Tenmile watershed is located within the western boundary of Lewis and Clark County and just west of the City of Helena. This is worth noting, because much of the use and impacts to the watershed come from residents within the county or City of Helena. As the area population increases, so too do the impacts associated with the urban-interface: increased traffic, spread of noxious weeds, risk of wildfires, and growing recreation demands. The presence of private in-holdings result in a much higher density of homes and recreation cabins than is normally found within a National Forest setting. These residents, together with adjacent communities generate a need for more intensive management of the watershed. Some examples include specialized fire protection, increased recreation use, special-use requests and in some instances, illegal and unauthorized uses.

According to the most recent U.S. Census (2000), Lewis and Clark County's population was 55,716 persons in 2000, more than double the population in 1950 (24,540). The rate of population growth in the County has fluctuated significantly over the years, varying with the economy and other factors, as listed below:

- 1950s: 14 percent increase
- 1960s: 19 percent increase
- 1970s: 29 percent increase
- 1980s: 10 percent increase
- 1990s: 17 percent increase

The projected 2010 population for the County is 63,316, up from 55,716 in 2000 census, a 14 percent increase. There is a geographic split in population with those living in various areas of the county. Not surprisingly, a majority of the population reside in the southern end of the county within the Tenmile municipal watershed, Helena (26,000), Helena Valley (18,328) and East Helena (1,650). 44% of the county is located with the National Forest boundary.

From 1970 to 2000, the population growth rate in unincorporated portions of Lewis and Clark County (outside of Helena and East Helena) was the highest of any unincorporated area in Montana, at 218 percent. The long-range trend in the County is an aging population, with a number of important implications for the workforce, healthcare system, and other areas of life.

Preservation of natural resources--while managing economic and population growth--presents a challenge to the citizens of Lewis and Clark County. According to the Lewis and Clark County Growth Plan, development is affecting the rural character of Lewis and Clark County. Issues worth noting are the fire risks and increased wildland urban interface and communities at risk; the spread of noxious weeds; and water quality. Many of these issues are directly and indirectly tied to increased growth and changing demographics and continue to impact agricultural lands and natural vegetation.

Fire Risk and the Wildland Urban Interface: According to the Montana Statewide Pre-Disaster Mitigation Plan, Lewis and Clark County ranks among the highest counties in the state for Class II/III condition class land. 309,948 acres have been mapped and risk rated at the "high" level.

For wildland fuel hazards, the Tenmile watershed rates “moderate”, “high” to “very high”. The Tri-County Fire Working Group Regional Community Wildfire Protection Plan identifies critical and essential community infrastructure priorities. Of this list of priority structures, the City of Helena water supply and the Tenmile creek flume system are identified.

Water Quality **:** Currently Lewis and Clark County has two sites listed on the Environmental Protection Agency’s (EPA) National Priority List (NPL). The listed sites are the East Helena Smelter and the Upper Tenmile Creek Watershed. The NPL is a published list of hazardous waste sites in the U.S. eligible for extensive, long term, cleanup under the EPA's Superfund Program.

The Upper Tenmile Creek area consists of abandoned and inactive hard rock mines that produced gold, lead, zinc, and copper from the 1870s to the 1920s. Today the water quality in the Upper Tenmile watershed has been degraded by the historic mining operations. The remains of many of the historic mines contain trace metals known to be hazardous to human health and the environment. Coordinated by the EPA, reclamation in the area has started.

<u>Recreation</u>

The Tenmile watershed is an area of concentrated human use and trends indicate that use is increasing. Due to the close proximity of the watershed to local residents and the variety of opportunities available, it is a desirable location for recreation. In addition to close access to the state Capital, special features of the watershed include: the Continental Divide and associated Continental Divide National Scenic Trail (CDNST), the City of Helena’s municipal watershed, two Inventoried Roadless Areas, Red Mountain/Blackhall Meadows, numerous historic sites (Masonic site, Helena mining history, Red Mountain fire lookout tower, CCC camp and dog training site), and the variety of recreation events and features.

Forest Service recreation management is guided by the Recreation Opportunity Spectrum (ROS), which allocates and manages outdoor recreation opportunities by natural resource setting. The ROS settings for the Tenmile watershed consist of: semi-primitive motorized (SPM), semi-primitive nonmotorized (SPNM) and roaded natural (RN). Most use within the developed recreation sites occurs during the summer months (Memorial Day to Labor Day). The Ten Mile Picnic Area is also popular with school groups during the spring and hunters during the fall big game season. The parking lot at the picnic area is frequently used during the winter months by visitors who choose to sled or snowshoe.

Recreation uses consist of both dispersed and developed activities, including, hiking, driving for pleasure, firewood gathering, special uses and events, (ie Race to the Sky dogsled race), camping, picnicking, motorized trail use, cross-country skiing, snowmobiling, sledding, Christmas tree cutting, recreational mining, target practicing, horseback riding, and organized conservation/education programs. A majority of these uses are focused along established road and trail corridors and to some degree, historic sites. The watershed is also popular for big-game hunting. Fishing and water-based recreation activities are limited.

The area is typically used by Helena area citizens, residents living within or near the watershed (Rimini, Elliston, isolated homeowners), organized groups such as the Helena snowmobile and XC ski clubs, school and community groups, mountain bikers, hikers along the CDNST, and special event coordinators. The area has a long-history of kegger parties and transient camps. A recent increase of paintball enthusiasts has been documented.

Dispersed day-use recreation is the dominant use and opportunity in the watershed. While dispersed camping does occur, it is significantly less than on other areas of the Forest, due to the close proximity to Helena. However, some dispersed campsites experience extended use (exceed 14 day limit) by transients who receive services in Helena, but temporarily live on the

Forest. More traditional “dispersed camping” occurs in the Priest Pass and northwest portion of the watershed.

While ATV use does occur, it is limited due to terrain and the existing roadless areas that prohibit motorized use. The Lazyman Gulch Inventoried Roadless Area (#1608) and the Jericho Mountain Inventoried Roadless Area (#1607) are located within the Tenmile watershed.

The 11,928 acres of the Helena National Forest located within the Lazyman Gulch Inventoried Roadless Area historically received motorized recreation use such as firewood gathering, four wheel drivers, trailbikes, and snowmobiles. In 1984 the area was closed to vehicles year-round. There area a number of primitive roads and trails in the area. Non-motorized recreation use includes big game hunting, hiking and cross-country skiing. The area is surrounded by residences, and includes a powerline and aqueduct.

National Forest lands (8,968 acres) within the northern and eastern portions of the Jericho Mountain Inventoried Roadless Area are located within the watershed. The Tenmile and Minnehaha roads provide access to the Continental Divide and Telegraph Creek drainage. Residents of Rimini, Helena and Elliston use the area for wood gathering and hunting. Roads and digging from past mining is prevalent, allowing motorized access throughout the area. The Tenmile picnic area and Moose Creek Campground are located adjacent to but outside the area along the eastern boundary. Portions of the CDNST are also within the Jericho Mountain Inventoried Roadless Area.

Developed recreation opportunities are concentrated along the Continental Divide-Highway 12 corridor and the Rimini Road. Developed sites include the Moose Creek and Cromwell Dixon Campgrounds, the Moose Creek rental cabin, Moose Creek and Quigley group use areas, Tenmile Picnic Area and environmental education trail, target range, MacDonald Pass ski trails, and other trailheads and trail systems. Although trailhead facilities do provide visitor parking, sufficient parking capacity can be problematic during special events.

Two Recreation Residence Tracts are also located within the Tenmile watershed: Moose Creek Villa and Forest Heights. Both tracts contain privately owned cabins that are located and authorized on National Forest lands. There are five cabins within the Moose Creek Villa site located adjacent to the Rimini Road. Six cabins currently occupy the Forest Heights tract on MacDonald Pass but they are not visible from State Highway 12. Existing recreation residences are authorized under 20 year term permits.

To the degree that recreation activities affect other resources or other recreation opportunities is a matter of opinion as well as documented incidents. Inappropriate target shooting occurs near roads and developed facilities and may compromise resource values and recreation experiences. Ongoing and to some degree increased evidence of transient camps, keg parties and paintball activities (Sweeney Creek area) may have negative impacts on resources and recreation experiences.

User group conflicts are limited. There have been some concerns that waterbar improvements to the Switchback Ridge trail make for less than desirable conditions for mountain bike users on some portions of the trail. In the Priest Pass area, unauthorized motorized use is occurring and is affecting private lands. The Montana National Guard conducts training exercises in the area and an environmental analysis is being conducted to make a decision on a winter biathlon course. Further investigation may be needed to look at the impact of current recreational uses on traditional-cultural uses of the area by American Indian communities. As the Forest’s outreach and conservation education programs continue to grow in popularity, potential management challenges could arise with the use of Moose Creek cabin as a rental cabin and with the Tenmile group use area.

Health and safety concerns include the sanitary conditions of the recreation residencies and transient camps. Preseason safety inspections are required at all developed recreation sites to ensure they are suitable for public use. Most of the developed facilities do not currently meet national accessibility standards. Efforts to improve accessibility included improved pathways to restrooms at both the Ten Mile Picnic area and Moose Creek Campground. In addition, the recently renovated Moose Creek Cabin and new outhouse also meet accessibility standards.

Access needs (getting to the Forest and using Forest resources) are being met more successfully in some elements of the watershed than others. There appears to be a need to improve facility conditions within the developed campgrounds to accommodate modern equipment and use patterns. While, not an immediate need, many of the camping sites should be "updated" to accommodate changing RVs, requirements. It has also been noted that if improvements to the Moose Creek group use area were made, it is highly probably that it would be used more frequently and provide additional opportunities for special events.

It is difficult to qualify access since full-scale travel planning has not occurred in this area. While, an extensive system of trails and roads exist, may are non-system, user-created routes. Formal travel planning would include input from the public and determine whether or not access is meeting current demands.

Soils

Historic Conditions

The purpose of this section is to evaluate how soil conditions have changed over time as a result of human influence and natural disturbances. This type of evaluation requires knowledge of historic, baseline conditions to compare to current conditions. However, information describing historical soil conditions is limited and anecdotal (USDA Forest Service 1996). This anecdotal information is not sufficient to quantify soil reference conditions.

In the future, soil condition inventories could be conducted in unharvested forested ecosystems with similar soil types. This type of inventory would establish a benchmark for reference conditions to compare with existing soil conditions in past timber harvest units.

Existing Conditions

In the Ten Mile NFMA analysis area, soils have been affected by past timber harvest. A summary of acres of past timber harvest, by decade, is displayed in Appendix B (attachment). For each timber stand with past harvest, a list of landtypes including "sensitive" soils present in those areas is displayed in Table 3-10 which follows:

Table 3-10. Landtypes in the Tenmile EAWA. .Sensitive soil types are italicized.

Landtype Number	Landform	Geology	Slope Gradient	Topsoil Texture	Analysis Area %
12B	*Moraines (hilly)*	*Glacial till*	*25-40%*	*Gravelly Loam with surface loess influenced by volcanic ash*	*1%*
12C	*Moraines*	*Glacial till from granitic rocks*	*15-40%*	*Loam with surface loess influenced by volcanic ash*	*6%*
14	*Basins and Toeslopes*	*Colluvial deposits from basalt and metasedimentary rocks*	*25-50%*	*Very Cobbly Loam*	*4%*

Landtype Number	Landform	Geology	Slope Gradient	Topsoil Texture	Analysis Area %
14C	*Basins and Toeslopes*	*Colluvial deposits from basalt and metasedimentary rocks*	*10-40%*	*Very Cobbly Loam*	*2%*
21-	Mountain Slopes	Limestone and calcareous sandstone	40-60%	Very Gravelly Loam	1%
26-	*Rolling Uplands (bouldery)*	*Granitic rock*	*10-40%*	*Sandy Loam to Gravelly Sandy Loam*	*7%*
31-	Mountain Slopes	Limestone and calcareous sandstone	40-60%	Very Gravelly Loam to Gravelly Silt Loam	1%
36-	*Rolling Uplands (bouldery)*	*Granitic rock*	*25-40%*	*Coarse Sand*	*17%*
36A	*Rolling Uplands*	*Granitic rock*	*10-40%*	*Gravelly Sandy Loam*	*2%*
36B	*Mountain Slopes with wet soils in draws*	*Granitic rock*	*10-40%*	*Gravelly Sandy Loam*	*3%*
39-	Steep Mountain Slopes	Argillites, siltites and quartzites	40-60%	Very Channery Sandy Loam	1%
39A	Mountain Slopes	Argillites, siltites and quartzites	25-40%	Loam	3%
47-	Mountain Slopes	Basalts, tuffs, andesites and breccias	25-40%	Cobbly Loam	3%
47B	Mountain Slopes (cool)	Basalts, tuffs, andesites and breccias	25-50%	Very Cobbly Loam	5%
49-	Steep Mountain Slopes	Argillites, siltites and quartzites	25-50%	Cobbly Loam to Silt Loam	2%
56A	*Steep Mountain Slopes*	*Granitic rock*	*40-60%*	*Extremely Cobbly Sandy Loam*	*1%*
57-	*Mountain Ridges*	*Basalts, tuffs, andesites and breccias*	*10-40%*	*Extremely Cobbly Loam with surface loess influenced by volcanic ash*	*3%*
76-	*Glaciated Mountain Slopes (bouldery)*	*Granitic rock*	*25-50%*	*Gravelly Loam with surface loess influenced by volcanic ash*	*7%*
76A	*Glaciated Mountain Ridges (bouldery)*	*Granitic rock*	*10-25%*	*Gravelly Loam with surface loess influenced by volcanic ash*	*3%*
77-	*Mountain Ridges*	*Basalts, tuffs, andesites and breccias*	*10-25%*	*Very Cobbly Loam with surface loess influenced by volcanic ash*	*4%*
77A	Mountain Ridges	Basalts, tuffs, andesites and breccias	10-25%	Loam	2%
77B	*Steep Mountain Slopes*	*Basalts, tuffs, andesites and breccias*	*40-60%*	*Very Cobbly Loam with surface loess influenced by volcanic ash*	*1%*
80-	Cirqueland - glacially scoured	Metasedimentary rock	40-60+%	Bedrock	4%

Landtype Number	Landform	Geology	Slope Gradient	Topsoil Texture	Analysis Area %
	bedrock				
86-	*Glacial Trough Walls*	*Granitic rock*	*60-90%*	*Very Gravelly Sandy Loam*	*2%*
87-	Glacial Trough Walls	Metasedimentary rock and basalt	60-90%	Very Channery Loam	1%
89-	*Glacial Trough Walls*	*Granitic rock*	*60-90%*	*Gravelly Loam with surface loess influenced by volcanic ash*	*1%*
90-	*Glacial Trough Walls*	*Metasedimentary rock and basalt*	*60-90%*	*Silt Loam to Cobbly Silt Loam with surface loess influenced by volcanic ash*	*1%*
100	*Flood plains and Terraces*	*Mixed alluvium*	*0-10%*	*Gravelly Silt Loam to Extremely Gravelly Sandy Loam*	*1%*
120	*Glaciated Mountain Slopes*	*Granitic rock*	*10-25%*	*Gravelly to Very Cobbly Sandy Loam*	*3%*
136	*Moraines with Wet Soils*	*Glacial drift*	*0-10%*	*Sandy Clay Loam to Very Cobbly Sandy Loam*	*2%*
210	Mountain Slopes	Limestone and calcareous shale or argillite	40-60%	Very Gravelly Loam	1%
260	*Rolling Uplands (bouldery)*	*Granitic rock*	*10-40%*	*Sandy Loam to Gravelly Sandy Loam*	*2%*
360	*Mountain Ridges (bouldery)*	*Granitic rock*	*10-40%*	*Gravelly Sandy Loam*	*1%*
390	Mountain Slopes	Argillites, siltites and quartzites	40-60%	Gravelly to Very Gravelly Loam	1%
790	*Glaciated Mountain Slopes*	*Glacial till from meta-sedimentary rock*	*25-40%*	*Loam with surface loess influenced by volcanic ash*	*2%*

Past harvest activities may have affected soils by removing organic material, such as coarse wood, and through compaction, rutting, displacement, accelerated erosion or mass wasting. Soil effects resulting from past harvest can persist for several decades following management actions. Thus, residual soil impacts may be present in past harvest units under existing conditions. However, field evaluation to quantify existing soil conditions has not yet occurred in these areas.

Other anecdotal information describing existing soil conditions in the Ten Mile NFMA analysis area has been reported in the “Final Draft, Watershed Historical, Existing, Desired Conditions, Divide Landscape Analysis Area” (USDA Forest Service 1996).

Vegetation

The vegetation data was compiled in 2006 using information from the Master Vegetation Dataset, which is based on TSMRS information. The forested lands in this area have undergone drastic change from mountain pine beetle mortality. The numbers in the following analysis can be used in the future as a comparison for pre-beetle conditions. These numbers do not represent current conditions. Data are being collected for future analysis that will more accurately represent the forest condition.

Fire Regime Condition Class

A nationwide system called Fire Regime Condition Class--FRCC (Hann and Bunnell, 2001; Schmidt et al., 2002; Hann et al. 2003; Hann and Strom, 2003; Shlisky and Hann, 2003; Hann et al. 2004) has been created for the purpose of describing reference vegetative, fuel and fire conditions and comparing them to current conditions.

A natural fire regime is a general classification of the role fire would play in a relatively large land base without intervention by modern day man (Agee 1993; Brown, 2000; Hann et al. 2004). The influence of burning by aboriginal man is included in the classification. The classification includes a description of the types of vegetation-fuel classes that would occur in a given biophysical unit, the reference fire frequency and the reference fire severity. These reference values are compared to current conditions and a rating is given for each item as well as an overall rating for the land base. A detailed description of the rating system can be found in the project file (FRCC Condition Class Version 1.2) as well as on the website www.frcc.gov.

The FRCC system rates various parts of a biophysical setting by comparing the current conditions to documented reference conditions (Hann and Bunnell, 2001; Schmidt et al., 2002; Hann et al. 2003; Hann and Strom, 2003; Shlisky and Hann, 2003; Hann et al. 2004). Ratings are given for vegetation-fuel conditions, fire frequency, fire severity, and combination of frequency and severity for each biophysical setting, and finally an overall rating for the biophysical setting, combining vegetation, fuel and fire frequency/severity conditions.

Biophysical settings (Bps) are the primary environmental settings used to determine a landscape's natural fire regime and fire regime condition class (Hann and Bunnell, 2001; Hann and Strohm, 2003). These settings are land delineations based on the physical setting of an area—elevation and aspect, and the vegetation community that can occupy the setting.

Vegetation-fuel classes are used to describe conditions for each biophysical setting for the tree sizeclass and canopy cover of the reference condition. Instructions on classifying vegetation-fuel classes can be found in the Fire Regime Condition Classification Workbook, V 1.2 (see project file).

There are five standard vegetation-fuel classes (see project file, Fire Regime Condition Classification Workbook, V 1.2).

AESP is an early seral stage with various dominant lifeforms, depending on the Bps setting. This stage is the first vegetative response to a disturbance such as fire, insects, disease or logging which has removed or killed the overstory.

BMSC is a mid-seral stage that is dominated by conifers that are in a forested setting, or dominated by perennial grasses or shrubs in a nonforest setting. This class represents a closed overstory canopy with trees that are 5 to 9 inches inches diameter at breast height (dbh). "Closed" is defined differently for various settings. For example, PPDF1 (dry ponderosa pine/Douglas-fir) is considered closed when canopies cover greater than 30% of the forested area, or stand. DFIR2 (dry Douglas-fir) is considered closed when canopies are greater than 50% closed.

CMSO is a mid-seral stage similar to BMSC, but is an "open" canopy. Again, the canopy cover varies by biophysical setting.

DLSO is a late seral, open canopy stand. In a forested setting this type is dominated by trees that are greater than 9 inches dbh and is older than a mid-seral stand.

ELSC is a late seral closed canopy stand. The assumptions used for assigning vegetation-fuel classes for the South Belts can be found in the project file (Cabin Gulch Data Set, 2006).

Fire frequency is defined as the average number of years between fires or the mean fire interval (Baker and Ehle, 2001; Hann and Bunnell, 2001). Fire severity is defined as the effects of a fire on the vegetation and forest floor, and is measured in terms of surface and overstory fuel consumption and heat transference to the organic and mineral soil (DeBano et al. 1998).

The FRCC use of fire severity is expressed as the percentage of the overstory that is consumed in a “typical” fire event. For the purposes of this analysis, the following overstory mortality effects are predicted to correspond with soil fire severity effects as described by Debano et al. (1998) and discussed in detail in the Soil section of this chapter:

high mortality: over 50% of green tree canopy is consumed, including overstory tree foliage and understory vegetation. This generally corresponds to high severity.

mixed mortality: Between 30% and 50% of the tree canopy and understory vegetation are intact or are not consumed to a lethal level by the fire. This generally corresponds to moderate severity.

low mortality: less than 30% of tree canopy is consumed by the fire, but may have evidence of fire in it. This generally corresponds to low severity.

Three condition classes have been described in the fire regime condition class rating system (Hann and Bunnell, 2001; Hann and Strohm, 2003) and are described in the following table.

Condition Class 1 Low departure from reference	Vegetation composition, structure, and fuels are similar to those of the natural regime and do not predispose the system to risk of loss of key ecosystem components. Wildland fires are characteristic of the natural fire regime behavior, severity, and patterns. Disturbance agents, native species habitats, and hydrologic functions are within the natural range of variability.
Condition Class 2 Moderate departure from reference	Vegetation composition, structure, and fuels have moderate departure from the natural regime and predispose the system to risk of loss of key ecosystem components. Wildland fires are moderately uncharacteristic compared to the natural fire regime behaviors, severity, and patterns. Disturbance agents, native species habitats, and hydrologic functions are outside the natural range of variability.
Condition Class 3 High departure from reference	Vegetation composition, structure, and fuels have high departure from the natural regime and predispose the system to high risk of loss of key ecosystem components. Wildland fires are highly uncharacteristic compared to the natural fire regime behaviors, severity, and patterns. Disturbance agents, native species habitats, and hydrologic functions are substantially outside the natural range of variability.

The departure is defined as the amount of a given parameter such as vegetation-fuel class relative to the central tendency for the reference condition of that parameter. The “similar” rating represents all values +/- 33% of the central tendency. Relative amounts which compare current conditions to reference conditions are shown for each vegetation-fuel class. The ratings for the relative amounts are shown in the following diagram:

Relative Amounts

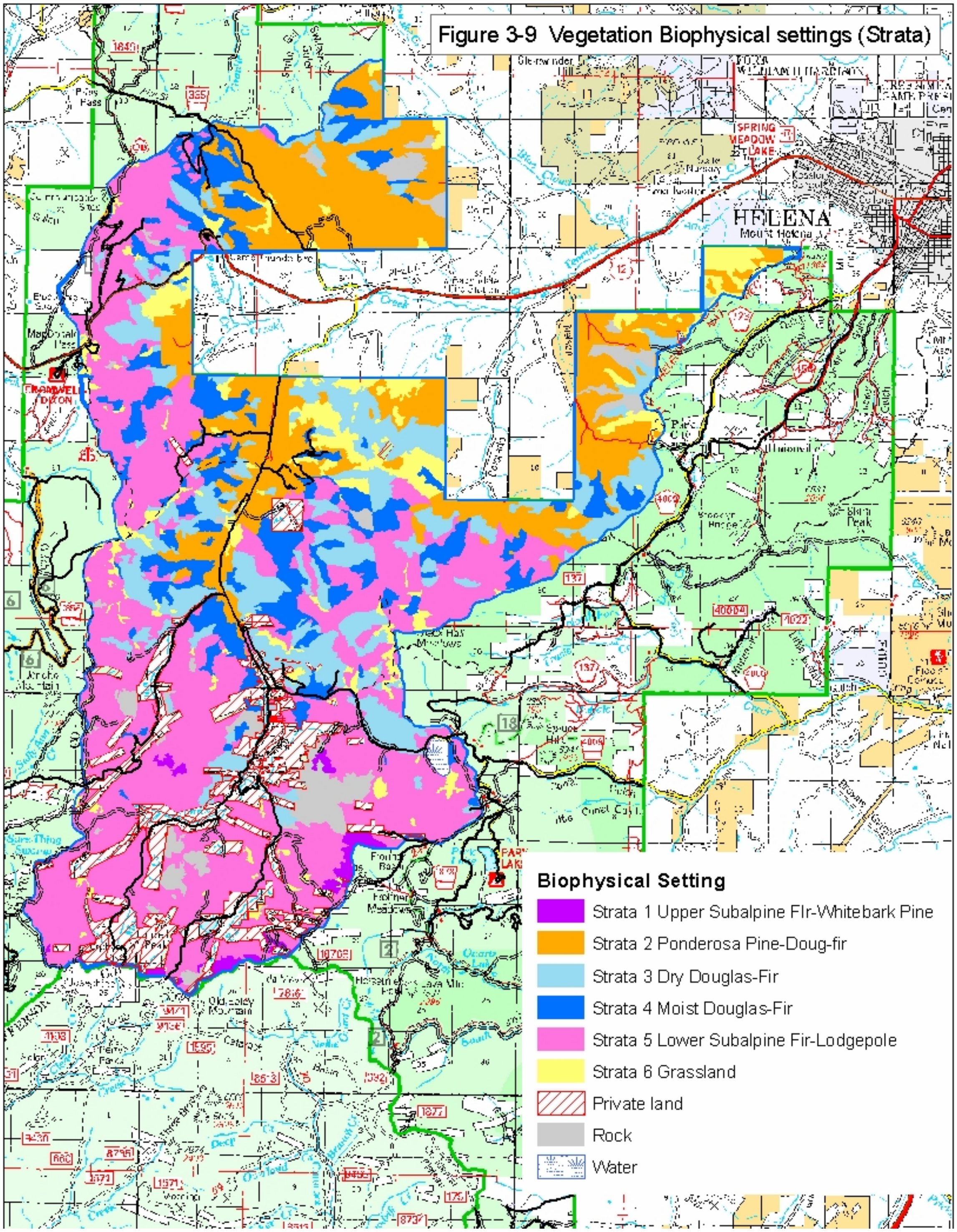
__________|_______________|_______________|_______________|______________|____________
Percent -66% -33% 0% +33% +66%
Difference
|__________|_______________|______________________________|______________|____________
__ Trace Under Similar Over Abundant
--------------------Represented Represented

Tenmile EAWA Fire Regime Condition Class Ratings

There are seven biophysical settings that occur in the Tenmile watershed analysis area. Each setting is assigned a strata number. These biophysical settings were modeled using stand exam plot information and on the ground knowledge of the plant communities. One of the biophysical settings, Douglas-fir Interior Northern and Central Rocky Mountains (DFIR2), has been split into two strata as the Helena Forest specialists felt that the vegetation conditions and response were different enough between the two physical settings to warrant a separate discussion and rating. The biophysical settings are shown on figure 3-9.

A description of each biophysical setting has been downloaded from the website (www.frcc.gov) and are available as individual pdf files in the project file.

Figure 3-9 Biophysical settings (strata) in the Tenmile EAWA



An overall condition class is assigned to each biophysical setting, as well as each vegetation-fuel class, fire frequency and severity within the setting, and for the landscape as a whole based on departure from reference conditions.

Strata 1--Interior West Upper Subalpine Forest (SPFI2)

This strata occupies a very small acreage, approximately 385 acres (1 %) of the National Forest land in the project area. Strata 1 consists of fire group 10, which is primarily dry, upper elevation whitebark pine. The majority of this stratum is found from 6900 to 8000 feet elevation.

Current and Reference Composition

The current composition of stands within this stratum in project area is as follows:

Vegetation Fuel Class	Reference Percent	Current Percent	Abundance
Early Seral	20	0	trace
Mid-Seral Closed	25	43	over-represented
Mid-Seral Open	25	0	trace
Late-Seral Open	15	0	trace
Late-Seral Closed	15	57	abundant

There are 34 stands identified as this strata and only 2 have stand exams. The area is dominated by lodgepole pine with a few stands of mixed Douglas-fir. Whitebark pine is indicated as the dominant in one of the stand exams. The mid (BMSC) and late seral closed (ELSC) vegetation fuel classes occupy substantially more acres than the reference composition,while the other classes are not present on the landscape. This is a highly unstable, non-sustainable condition.

This strata is present only in the Tenmile area of the Tenmile EAW area.

The reference fire frequency for this setting was a 143 year mean fire interval; the current frequency is 140 years. The reference severity, which represents the amount of overstory mortality that would occur in a wildfire, is 57% while the current severity is 70%. The fire return interval is not different from the reference but the amount of tree mortality from a wildfire would be greater than what would be expected under reference conditions.

Strata 2-- Ponderosa Pine-Douglas-fir (Inland Northwest) (PPDF1)

This stratum occupies approximately 7363 acres (20%) of the National Forest land in the project area. Strata 2 consists of fire groups 1, 2, and 4, which include ponderosa pine, Douglas fir and limber pine. The majority of this stratum is within the 4800 and 6000 foot elevation and distributed throughout the lower elevations of the analysis area.

Current and Reference Composition

The current composition of stands within this stratum in the project area is as follows:

Vegetation Fuel Class	Reference Percent	Current Percent	Current Status
Early Seral	15	13	similar
Mid-Seral Closed	10	24	over-represented
Mid-Seral Open	25	0	trace
Late-Seral Open	40	21	under-represented
Late-Seral Closed	10	41	over-abundant

This stratum is generally a mixture of Douglas-fir and ponderosa pine. Ponderosa pine is an important seral species at lower elevations and may occur as an incidental species on some upper elevations. Juniper may be common in forest understories and does contribute to fire intensity, where present. Only the early seral (AESP) vegetation fuel class is similar to the reference composition. This stage may actually be grasslands or savannahs that have been colonized by conifers. Both the mid and late seral closed classes should be reduced in this setting to more closely resemble the reference composition. The mid and late seral open classes should be increased, especially the mid seral open. An “open canopy” in this setting is less than 30% canopy cover.

The reference fire frequency for this setting was a 22 year mean fire interval; the current frequency is 70 years. The reference severity, which represents the amount of overstory mortality that would occur in a wildfire, was 24% while the current severity is 70%. Both the fire return interval and severity are very different from reference conditions. The amount of tree mortality from a wildfire would be substantially greater than what would be expected under reference conditions.

Strata 3 Douglas-fir Interior Northern and Central Rocky Mountains Biophysical Setting (DFIR2)

This strata occupies approximately 6114 acres (16%) of the National Forest land in the project area. This biophysical setting has been split into two stratas. Strata 3 represents the drier end of the setting, and consists of fire groups 5 and 6D, which is dominated by Douglas fir with lodgepole on the more moist aspects. The majority of this stratum is within the mid elevation zones and occurs on all aspects within the analysis area.

Current and Reference Composition

The current composition of stands within this stratum in project area is as follows:

Vegetation Fuel Class	Reference Percent	Current Percent	Current Status
Early Seral	15	3	trace
Mid-Seral Closed	25	23	similar
Mid-Seral Open	20	0	trace
Late-Seral Open	25	12	under-represented
Late-Seral Closed	15	62	over-abundant

This stratum is dominated by Douglas-fir with a mix of other species. Ponderosa pine may occur as an incidental species on some warmer aspects while lodgepole may be present on more moist aspects. When contrasted with the reference condition of the Fire Regime Condition Class, the late seral (ELSC) has substantially higher acreage than would occur historically, while the mid (CMSO) and late seral open (DLSO) have fewer acres. This forest type tends to be long lived in the landscape. “Open” is considered less than 50% canopy cover in this setting.

The reference fire frequency for this setting was a 30 year mean fire interval; the current frequency is 70 years. The reference severity, which represents the amount of overstory mortality that would occur in a wildfire, was 10% while the current severity is 70%. Both the fire return interval and severity are very different from reference conditions. The amount of tree mortality from a wildfire would be substantially greater than what would be expected under reference conditions.

Strata 4 Douglas-fir Interior Northern and Central Rocky Mountains Biophysical Setting (DFIR2)

This strata occupies approximately 4636 acres (12%) of the National Forest land in the project area. Strata 4 represents the more moist conditions in this setting, and consists of fire group 6W, which is primarily Douglas fir and lodgepole pine mixed forests. This strata is distributed throughout the project area, mid to high elevations and all aspects.

Current and Reference Composition

The current composition of stands within this stratum in project area is as follows:

Vegetation Fuel Class	Reference Percent	Current Percent	Current Status
Early Seral	15	5	under-represented
Mid-Seral Closed	25	33	similar
Mid-Seral Open	20	< 1	trace
Late-Seral Open	25	< 1	trace
Late-Seral Closed	15	61	over-abundant

This strata represents a transition from the warmer and drier forest types to a cooler climate where lodgepole pine begins to dominate stand composition. This type also represents a transition from frequent lower intensity fires to more infrequent, but higher intensity fire behavior.

This stratum is dominated by lodgepole pine with Douglas-fir intermixed. When contrasted with the reference condition of the Fire Regime Condition Class, the late seral (ELSC) vegetation fuel class has substantially higher acreage than would occur historically, while the mid (CMSO) and late seral open (DLSO) vegetation fuel classes are rare. The early seral stage (AESP) is also rare in this setting. “Open” is considered less than 50% canopy cover in this setting.

The reference fire frequency for this setting was a 30 year mean fire interval; the current frequency is 70 years. The reference severity, which represents the amount of overstory mortality that would occur in a wildfire, was 10% while the current severity is 70%. Both the fire return interval and severity are very different from reference conditions. The amount of tree mortality from a wildfire would be substantially greater than what would be expected under reference conditions.

Strata 5--Interior West Lower Subalpine Forest (SPFI1)

This strata occupies approximately 16,055 acres (43%) of the National Forest land in the project area. This is the dominant setting in the area. Strata 5 consist of fire groups 7, 8, and 9, which is primarily lodgepole pine and subalpine fir/spruce forest. This setting is at higher elevations and occurs on all aspects.

Current and Reference Composition

The current composition of stands within this stratum in project area is as follows:

Vegetation Fuel Class	Reference Percent	Current Percent	Current Status
Early Seral	20	8	under-represented
Mid-Seral Closed	35	33	similar
Mid-Seral Open	15	0	trace
Late-Seral Open	10	1	trace
Late-Seral Closed	20	57	over- represented

This stratum represents the subalpine fir forest habitat type residing in cooler and more moist climates. Fires tend to be infrequent and high intensity. When contrasted with the reference condition of the Fire Regime Condition Class the landscape contains substantially more acres currently in a late seral closed canopy (ELSC) that should be in a mid or late seral open canopy condition.

Lodgepole pine is a dominant seral species in this forest type, and it would be difficult to maintain this type in a late seral open stand condition due to the tendency of lodgepole pine to naturally regenerate. On a site specific individual tree basis structural diversity will be maintained where appropriate.

The reference fire frequency for this setting was a 111 year mean fire interval; the current frequency is 140 years. The reference severity, which represents the amount of overstory mortality that would occur in a wildfire, was 67% while the current severity is 75%. Neither the frequency or severity are substantially different from reference conditions. A wildfire would not behave uncharacteristically due to those factors. The disparity of the vegetation-fuel classes to the reference composition would likely cause greater overstory mortality than under reference composition.

Strata 6-- Mountain Grassland with Shrubs (MGRA3)

This strata is approximately 2771 acres (7%) of the National Forest land in the project area. Strata 6 consists of fire group 20, which is grassland and currently has less than 10% timber canopy. This strata occurs on all elevations, predominantly on warm dry aspects.

Current and Reference Composition

The current composition of stands within this stratum in project area is as follows:

Vegetation Fuel Class	Reference Percent	Current Percent	Current Status
Early Seral	5	0	under-represented
Mid-Seral Closed	90	100	similar
Mid-Seral Open	5	0	
Late-Seral Open	0	0	
Late-Seral Closed	0	0	

Grasslands in this area are dominantly rough fescue/Idaho fescue, rough fescue/bluebunch wheatgrass and bluebunch wheatgrass habitat types (Mueggler and Stewart, 1980). See the livestock grazing report for more information on this setting.

Conifer encroachment into historic grasslands and shrublands changes native plant diversity, soil productivity and herbaceous productivity (ref) by reducing available water, sunlight and nutrients. This has happened throughout the grasslands in this area. Conifer encroachment since the 1930's can be seen using historic aerial photos as well as range mapping shown on 1945 range survey maps. Historically, grasslands had a high frequency fire regime.

Strata 7 Shrubland

This strata occupies a small percentage of the National Forest land in the project area (less than 1%). Strata 7 consists of fire group 30 plus on the ground mapping of existing sagebrush and bitterbrush communities. This strata occurs at all elevations and is found on warm dry aspects. This strata has yet to be identified for site specific location, but it is known to exist on the landscape.

Current and Reference Composition

The current composition of stands within this stratum in project area is as follows:

Vegetation Fuel Class	Reference Percent	Current Percent	Current Status
Early Seral	20	unk	unk
Mid-Seral Closed	35	unk	unk
Mid-Seral Open	15	unk	unk
Late-Seral Open	10	unk	unk
Late-Seral Closed	20	unk	unk

Europeans began to have a major influence in this area around 1850 when miners came to the Rimini area followed soon by ranchers with grazing animals. These activities altered the fire frequency throughout the area. The Helena Forest Reserve was established in 1905. At that time fire had been excluded from the majority of this area since around 1850 when fire suppression and livestock grazing combined to effectively eliminate fire from the ecosystems. The primary effect of this on the sagebrush and bitterbrush distribution is that Douglas-fir and Rocky Mountain juniper have colonized sagebrush and bitterbrush habitats and have reduced the shrub composition. The Sweeney Creek area had a fairly large fire in 1948, which promoted the growth of aspen and bitterbrush.

Less than 1% of the analysis area is currently mapped as sagebrush habitat types. The sagebrush habitat types present are mountain big sagebrush (*Artemisia tridentata* var. *vaseyana*)/rough fescue (*Festuca scabrella*) or mountain big sagebrush/bluebunch wheatgrass (*Pseudoroegenaria spicatum)*. This area does not support a thriving sagebrush community so it is important to protect and expand the sagebrush distribution to more closely represent the distribution that is represented on historic maps and photos at a minimum.

Bitterbrush is very limited on the Helena Forest generally and the populations that exist in this area are relatively healthy. The bitterbrush habitat type present is antelope bitterbrush (*Purshia tridentata*)/rough fescue (*Festuca scabrella*) or mountain big sagebrush/bluebunch wheatgrass (*Pseudoroegenaria spicatum)*. The Sweeney creek area supports one of the larger bitterbrush communities on the Forest. Invasion of noxious weeds (spotted knapweed and sulfur cinquefoil) is the biggest threat to these communities.

<u>Summary of Vegetative Conditions</u>

The following table shows the amount and FRCC rating for each biophysical setting and strata in the Tenmile watershed analysis area.

BPS & Vegetation Fuel Class	SPFI2-1 Strata 1 FG 10	PPDF1-2 Strata 2 FG 1,2, 4	DFIR2-3 Strata 3 FG 5, 6D	DFIR3-4 Strata 4 FG 6W	SPFI1-5 Strata 5 FG 7,8,9	MGRA3-6 Strata 6 Grassland	# Strata 7 Bitter-brush, sagebrush	Rock	Pri-vate
Approx Acres by Strata	385	7363	6114	4636	9138	2771	Bttrbrush	1814	5523
Strata % of Area	1%	20%	16%	12%	43%	7%	<1%	Not included	Not included
	Ref/Curr %	**Ref/Curr %**	**Ref/Curr %**	**Ref/Curr %**	**Ref/Curr %**	**Ref/Curr %**	**Ref/Curr %**		
Early seral	20/0	15/13	15/3	15/5	20/8	5/0			NA
Midseral closed	25/43	10/24	25/23	25/33	35/33	90/100			NA

BPS & Vegetation Fuel Class	SPFI2-1 Strata 1 FG 10	PPDF1-2 Strata 2 FG 1,2, 4	DFIR2-3 Strata 3 FG 5, 6D	DFIR3-4 Strata 4 FG 6W	SPFI1-5 Strata 5 FG 7,8,9	MGRA3-6 Strata 6 Grassland	# Strata 7 Bitter-brush, sagebrush	Rock	Pri-vate
Midseral open	25/0	25/0	20/0	20/1	15/0	5/0			NA
Late seral open	15/0	40/21	25/12	25/1	10/1	0			NA
Late seral closed	15/57	10/41	15/62	15/61	20/57	0			NA
Condition Class & Departure	CC 2 60% Dep	CC 2 60% Dep	CC 3 71% Dep	CC 3 71% Dep	CC 2 38% Dep	CC 2 35% Dep	Not mapped yet		

Although FRCC ratings are most appropriate at the scale of the entire Tenmile Watershed Ecosystem Analysis Area, it is useful to look at more discreet areas in order to determine priorities and appropriate management activities.

Insects and Disease

[This is the only section that has been updated due to the ongoing insect activity. Following are excerpts from “Master Bug Report” which can be found in it’s entirety in the project file].

The Helena National Forest is undergoing landscape-level changes in the forest due to insect activity, as evidenced by the red trees visible to anyone living in or visiting our area. The primary culprit of the mortality is the mountain pine beetle, with help from other mortality agents. The scale of impact is large enough to warrant a careful assessment of conditions and identification of management options available to the National Forest, private landowners, and communities affected. It is important to remember that large-scale ecological disturbances are beyond our capability to control; however, depending on landowner objectives and values at risk, management opportunities do exist that can be effective at influencing outcomes in localized areas.

Many areas on the Forest are infested by mountain pine beetle as evidenced by red trees across landscapes. Historically mountain pine beetle has caused large, landscape-level mortality; an epidemic typically continues until either the beetle runs out of food (susceptible trees) or weather conditions cease to be conducive to their survival. Weather conditions that regulate the beetle population include very cold temperatures for extended periods in the winter, late spring or early fall frosts, and wet springs/summers. Lodgepole pine is a short-lived conifer species as compared to Douglas-fir and spruce, reaching maturity at around 80 years. Most of the lodgepole pine forests on the Helena NF mature. It is not possible to sustain mature and over-mature lodgepole pine forests across the landscape indefinitely as it is adapted to regenerate after stand-replacing wildfires and mountain pine beetle epidemics. There is evidence suggesting that due to the current warm dry climate conditions the mountain pine beetle is active at higher elevations, higher latitudes, and for longer durations than seen previously this century. The landscape today is largely dominated by homogenous mature forests that are susceptible to beetle infestation.

The changes that are ongoing in the Tenmile EAWA include high mortaility of many pine trees—lodgepole, ponderosa and whitebark--throughout the watershed. More trees are expected to die in the near future from insect attacks that are occurring currently. This is a changed condition that has occurred after most of this assessment was completed, and could affect many of the management recommendations in this document. The Forest felt it was important to document the conditions that existed at the time this assessment was done. Any actions that are undertaken in this EAWA in the future would be done with updated vegetation conditions and any corresponding changes in other resource areas.

Special Plant Species, Plant Communities, Unique Habitats

Certain vegetation communities or conditions exist within the project area which may warrant enhancement, protection, or control efforts. These include aspen stands, riparian areas, bitterbrush communities, sagebrush communities, and areas of conifer encroachment.

Aspen stands and other riparian communities (sedge meadows, alder & willow draws, and ponds) are extensive and scattered through much of the project area. Often aspen stands are intermingled with other riparian communities of concern.

Shrub communities such as sagebrush and bitterbrush are not extensive in the study area.

Because most of this area is heavily forested, there are not extensive areas of rangeland for forests to encroach upon.

Locations of these types of plant communities follow:

Aspen--Aspen stands exist as riparian stringers or as stands on some upland ridges.

- Along the headwaters of the west fork of Colorado Gulch
- On the west side of Colorado Mountain, draining towards Beaver Creek
- Along the timber/ meadow interface in Blackhall Meadows
- Northwest of Chessman Reservoir, above the Beaver Creek road
- On the east side of MacDonald Pass in the Porcupine and Walker Gulch drainages
- Lazy Man drainage
- Old burn area north of Sweeney Creek
- Headwaters of Banner, Minnihaha and Ruby Creeks

Sagebrush – stands of sagebrush occur in limited areas scattered throughout the Ten Mile drainage

- On the ridge south of Colorado Mountain
- North of Chessman Reservoir
- On the knob approximately ½ way between Chessman Reservoir and Colorado Mountain

Bitterbrush – some of these stands have been impacted by noxious weeds and subsequent herbicide treatment of weeds.

- Sweeney Creek area at the bottom of Priest Pass road

Conifer Encroachment

- On the Colorado Black Mountain Pasture – ridge between Ten Mile and Colorado Gulch

Seeps/ponds/wetlands

- West side of Colorado Mountain
- South end of Chessman Reservoir
- North west of Chessman, above the Beaver Creek road
- Headwaters of Walker Gulch
- Headwaters of Minnihaha, Ruby and Banner Creeks
- Headwaters of Colorado Gulch

Whitebark pine is being affected by white pine blister rust, advancing forest succession and mountain pine beetle. Extensive stands of whitebark pine occur at upper elevations in the northern portion of the project area. Aspen and riparian communities are limited in extent and in decline due to advancing forest succession. Feature this community where present.

Weeds

Existing Condition

The varied habitats in the Ten Mile Watershed Analysis Area affect the distribution of weeds as well as what species of weed thrive there. Due to the heavily timbered nature of much of the watershed there are extensive areas where weeds are rare and found mostly along roadways. Some of the harvest units dating back to the 1960s or 1970s, before noxious weeds became a concern, have populations of spotted knapweed on the logging roads and in the cutting units. Areas of rangeland, for the most part undisturbed and in good condition, in some areas are host to invasive weeds that do not necessarily require disturbance to get established. Weed species found in this area include spotted knapweed, musk and Canada thistles, leafy spurge, Dalmation toadflax, sulphur cinquefoil, and hounds tongue.

Areas of large weed infestations include open areas in Walker Gulch, which has an extensive population of leafy spurge, and the Willow Creek area south of highway 12 and between Ten Mile and Colorado Gulch which is infested with sulfur cinquefoil. The lower end of Sweeney Creek, which has been extensively disturbed by fire, logging, and off road motorized travel, is infested with knapweed and sulfur cinquefoil. An isolated, but large patch of Dalmation toadflax has been found on Colorado Gulch. Spotted knapweed and several species of thistle are scattered along roadways that are not heavily shaded. Private ground adjacent to or near the HNF boundaries has a variety of weeds including knapweed, leafy spurge and Dalmation toadflax. A map of weed distribution in this area follows this section.

Treatment of weeds has included ground spraying from trucks and ATVs. Most of the treatments have been along roadways, in the campground and picnic areas. The rangeland area and timber thinning area at the bottom of Sweeney creek is treated on a regular basis. Biological control agents have been released in Walker Gulch on the leafy spurge, but due to various site characteristics has not had as much impact on the weed populations as would be expected to occur at a drier site.

Wildlife

The Wildlife Assessment for the Tenmile Analysis Area assumes that *coarse filter* vegetation management will provide a diversity of habitats sufficient to support viable populations of most wildlife species. *Fine filter* management will then be applied to key wildlife habitats, to species of special concern (whose population viabilities may be at risk), and to certain featured species maintained at elevated population levels in order to accommodate hunting, trapping, and wildlife viewing. This discussion is organized as follows:

I. Habitat Analysis
  - Biophysical Settings (Strata)
    - Dry Forests (dry Douglas-fir & ponderosa pine)
    - Cool, Moist Forests (moist Douglas-fir & lower subalpine forest)
    - Upper Subalpine Forest (whitebark pine)
    - Mountain Grassland with Shrubs
    - Bitterbrush & Sagebrush
    - Rock (cliffs, outcrops, scree, caves)
  - Unmapped Stand-level Habitats
    - Aspen
    - Riparian Shrub and Wet Meadow
    - Dead Tree Aggregations (burns, winterkill, insect mortality)
  - Unmapped Within-Stand Components
    - Snags & Large Woody Debris

Large Trees
- Landscape Features
  - Linkage Zones & Corridors
  - Unroaded Areas
  - Wildland-Urban Interface

I. Detailed Focal Wildlife Species Accounts
- Elk Habitat Assessment
- Priority Species Accounts

II. Habitat Relationships Spreadsheet

Habitat Analysis

In the following assessment, more emphasis is placed on the first two biophysical settings—dry forest and moist forest—than on the others that follow. The dry and moist forest habitat groupings occupy approximately 87% of the National Forest land in the Tenmile analysis area, and their management will essentially define the coarse filter configuration of wildlife habitats in the upper Tenmile drainage.

Dry Forest--Historic and Existing Conditions

General Habitat Features

Dry forest types comprise 5 million out of 25 million total forest acres in Forest Service Region One. Approximately 4 million acres reside in Montana—primarily east of the Continental Divide in a band running through the southwestern, central, and north-central part of the state at lower to middle elevations (5300 to 7350 ft) on both public and private lands.

Warm dry forest types are dominated by a mixture of ponderosa pine and Douglas-fir. In Montana, pre-European-settlement fire intervals in these forests ranged from 5 to 25 years. While many fires were initiated by natural causes, Native Americans regularly set fires for a variety of purposes. These frequent fires were usually of low intensity and promoted a forest structure of open, uneven-aged stands with vigorous grass, forb, and shrub growth in the understory (Knight 1989, Barrett and Arno 1989, Braun *et al.* 1996). Since then, a different pattern of human intervention—primarily intensive logging and fire suppression—has produced dramatic changes in the historic structure of the dry forests. With fire intervals now estimated at more than 70 years, forest succession in most stands has progressed unimpeded toward site potential vegetation, resulting in dense, multilayered stands with sparse ground cover.

Cool dry forest types are dominated by Douglas-fir. Prior to European-settlement, they experienced fire intervals of 35-45 years in western and central Montana (Fischer and Clayton 1983; Fischer and Bradley 1987). As in the warm, dry habitat types, most fires appear to have been of low to moderate intensity and served primarily to thin younger stands and maintain mature stands in an open, park like condition (Arno and Gruell 1983). In some cases, a mosaic of fire conditions maintained stands as scattered groves on the landscape (Fischer and Clayton 1983). Denser stands would have been most likely to survive on moist microsites, rock outcrops, talus slopes, and stony ridges with sparse grassy fuels. Douglas-fir colonization of grasslands was rare and limited to time periods with long fire intervals (Gruell 1983).

By the 1930s, fire suppression in Montana forests had become highly organized and effective (Gruell 1983). The long fire intervals that resulted allowed seedling/sapling undergrowth to form fuel ladders that have gradually made the dry Douglas-fir and ponderosa pine stands more susceptible to stand-replacing fires. Over the last 25 years, fire suppression in these forests has become increasingly difficult as fire fighters have been confronted with high intensity crown fires in forests that historically experienced only low-intensity underburns (Arno 1996).

As dense stand structures have increased, the rich grass, forb, and shrub components, once prominent in the understories, have been lost and replaced with young conifers, needle mats, and sparse ground vegetation. In the absence of fire's rejuvenating influence, the cool, dry Douglas-fir forests of central Montana have expanded dramatically into previously non-forested grasslands and sagebrush habitats. Aspen stands have deteriorated due to competition from Douglas-fir and ponderosa pine. Douglas-fir forests that were previously open and distributed in groves are now often dense and relatively continuous across the landscape. Old-growth forest has declined due to the logging of older trees, particularly in the accessible, low-elevation ponderosa pine forests (Fischer and Clayton 1983; Gruell 1983; Losensky 1993).

The major change common to most dry forest types in Montana and elsewhere in the American West is a profound alteration in age-class structure, physical structure, tree density, and tree species composition as a result of logging and fire suppression (Barrett 1979, Schubert 1974, Shepperd et al. 1983). Stands that were dominated by mature and old-growth trees in an open-parkland setting have been changed to abnormally dense stands dominated by younger trees.

Reference and Current Condition in the Analysis Area

Dry forests currently occupy about 34% (13,477 acres) of National Forest land within the Tenmile analysis area[1]. Most are located at low-mid elevation (4,800-6,000 ft) in the northern half of the Tenmile drainage, in Colorado Gulch, and in the Sweeny Creek area at the far northern end of the analysis area. The following tables summarize the current and reference (estimated historic) coverage of dry forests in the National Forest portion of the analysis area.

Dry Ponderosa Pine / Douglas-fir Forests

Vegetation Fuel Class	Reference Percent	Current Percent	Current Status
Early Seral	15	13	similar
Mid-Seral Closed	10	24	over-represented
Mid-Seral Open	25	0	rare
Late-Seral Open	40	21	under-represented
Late-Seral Closed	10	41	over-abundant

Dry Douglas-fir Forests

Vegetation Fuel Class	Reference Percent	Current Percent	Current Status
Early Seral	15	3	rare
Mid-Seral Closed	25	23	similar
Mid-Seral Open	20	0	rare
Late-Seral Open	25	12	under-represented
Late-Seral Closed	15	62	over-abundant

In both dry forest types, open canopied stands in mid and late-seral stages (mature and old-forest) are currently under-represented in the Tenmile analysis area compared to reference

[1] Percentages are calculated for National Forest land within the analysis area (39,247 acres) rather than for the entire analysis area (44,770 acres)—which includes private land (5,523 acres). Currently, we have no accurate estimates of vegetation types on private land.

conditions (natural regime). The open-canopied mid-seral forests are *significantly* under-represented (rare). Meanwhile, late-seral habitats with closed canopies are over-abundant.

Local Wildlife Habitats

Open-grown pre-settlement stands provided a unique combination of overstory structure and ground-level forage for herbivores of all sizes (Knight 1989). This contrasts with most stands on the sites today (Barrett and Arno 1999), which exhibit closed canopies or open canopies with cluttered, multi-layered understories. This structure provides more hiding cover and structural diversity but less forage than historic stands. The following table lists wildlife species likely to be found in dry conifer forests in the Tenmile area. Dense stands are compared with open stands. Most of the species tallied here will be accommodated by coarse filter vegetation management. Those that may need special attention are displayed in the bottom 3 rows of the table.
Data comes from a variety of wildlife surveys on the Helena National Forest (1992-2005) including Landbird point-count surveys (1995-2004). Additional information comes from a number of studies reported in the literature: Thomas (1979), Hein (1980), Smith (1980), Gruell et al. (1982), Hejl and Wood (1990), Tobalske et al. (1991), Dobkin (1992), Hutto et al. (1992), Hejl (1994), Hutto (1995), Hutto and Young (1999), and Foresman (2001).

Species Status	Closed Canopy or Open Canopy with Dense Conifer Understory	Open Canopy with Grass/ Forb/ Shrub Understory
Species Likely to be Abundant or Relatively Common	red-breasted nuthatch, pine siskin, mountain chickadee, ruby-crowned kinglet, dark-eyed junco, yellow-rumped warbler, Clark's nutcracker, red squirrel, deer mouse, mule deer, porcupine,	red-breasted nuthatch, pine siskin, dark-eyed junco, mountain chickadee, yellow-rumped warbler, American robin, Clark's nutcracker, red crossbill, western wood-pewee, chipping sparrow, deer mouse, dusky flycatcher, mule deer, elk, coyote
Species Likely to be Present but Less Common	white-breasted nuthatch, Townsend's solitaire, hairy woodpecker, red crossbill, gray jay, evening grosbeak, blue grouse, American robin, northern redback vole, dusky flycatcher, elk, coyote, ruffed grouse	white-breasted nuthatch, Townsend's solitaire, hairy woodpecker, gray jay, evening grosbeak, blue grouse, western tanager, mountain bluebird, common flicker, pygmy nuthatch, lark sparrow, tree swallow, violet-green swallow, vesper sparrow, mourning dove, red-tailed hawk, red squirrel, mountain cottontail, yellow pine chipmunk, Richardson's ground squirrel, badger, northern pocket gopher, red fox, porcupine, gopher snake

Species Status	Closed Canopy or Open Canopy with Dense Conifer Understory	Open Canopy with Grass/ Forb/ Shrub Understory
Species Likely to be Uncommon or Rare	Cassin's finch, pygmy nuthatch, downy woodpecker, red-naped sapsucker, pileated woodpecker, chipping sparrow, orange-crowned warbler, solitary vireo, northern goshawk western tanager, black-capped chickadee, western wood-pewee, chipping sparrow, Coopers hawk, brown creeper, sharp-shinned hawk, golden-mantled ground squirrel, yellow pine chipmunk, vagrant shrew, Merriam's shrew, little brown myotis bat, mountain lion, bobcat, black bear, red fox, long-tailed weasel, wolf, moose, white-tailed deer, gopher snake, western toad	Cassin's finch, red-naped sapsucker, pileated woodpecker, ruby-crowned kinglet, northern goshawk, black-capped chickadee, solitary vireo, song sparrow, American kestrel, brown-headed cowbird, house wren, saw-whet owl, merlin, Coopers hawk, sharp-shinned hawk, Merriam's shrew, vagrant shrew, little brown myotis, mountain lion, bobcat, black bear, long-tailed weasel, wolf, white-tailed deer, meadow vole, long-tailed vole, yellow-bellied marmot, least chipmunk, bushy-tailed woodrat, western toad
Species of Special Concern	northern goshawk, pileated woodpecker, western toad, wolf	flammulated owl, northern goshawk, pileated woodpecker, western toad, wolf
Priority Species	chipping sparrow, blue grouse, pileated woodpecker, red crossbill, Cassin's finch	flammulated owl, chipping sparrow, blue grouse, pileated woodpecker, red crossbill, Cassin's finch
Featured Species	elk, mule deer, moose, ruffed grouse	elk, mule deer, moose, ruffed grouse

The abundance of several of the species listed above will depend upon the density of understory conifers, the density of deciduous shrubs and aspen, the distribution of snags and woody debris, the number of large trees, the presence of boulders or rock outcroppings, and the configuration of forest edges and openings in these dry forest habitats.

<u>Moist Douglas-fir / Lodgepole Pine Forest</u>

Douglas-fir forests are difficult to classify and describe, because interior Douglas-fir (var. *glauca*) has the broadest ecological amplitude of any western tree (Arno 1991). It is moderately shade-tolerant, so it can be a climax species in some areas as well as being a common seral species in many habitat types. The moist Douglas-fir stratum covers the transition zone between warm, dry, lower elevation forests dominated by Douglas-fir and ponderosa pine and the cool, moist higher elevation forests dominated by lodgepole pine and, to a lesser extent, subalpine fir. In the Tenmile analysis area the moist Douglas-fir forest is not arrayed as a unified "zone" but rather as a pattern of fragmented blocks amongst the more continuous dry forest zone below and the lower subalpine zone above. It occurs on all aspects from mid to high elevation, mostly in the northern and central portions of the analysis area.

Historically, stands in this stratum were co-dominated by Douglas-fir and lodgepole pine and experienced a *mixed-severity* fire regime with fire intervals averaging 30 to 100 years (Arno 1980, Barrett et al. 1991, Brown et al. 1994, Arno and Fischer 1995). Mixed-severity fire regimes are marked by variability. In pre-settlement times, frequent non-lethal fires and infrequent stand-replacement fires occurred in the same areas at different times depending on weather and fuel accumulations. In some cases, individual fires were of "mixed severity", with many trees dying and many surviving (Brown 1995, Arno et al. in prep). The result was a patchy, erratic pattern that fostered development of diverse plant communities and wildlife habitats within forest stands and across the landscape as a whole (Barrett et al. 1991, Arno *et al.* in prep).

Since the late 1800's the combination of logging and fire-suppression has produced a more homogeneous landscape dominated by mid- and late-seral forests in which lodgepole pine in the dominant species. Under the pre-settlement fire regime, more young and old-growth forest have been present, and Douglas-fir would have been more prominent. In addition, tree densities and fuel loadings are now much higher than they were historically (Hann et al. 1996).

Cool / Moist Lower Subalpine Forest

This forest stratum is dominated by lodgepole pine—a seral species under most conditions—with increasing dominance by subalpine fir in late seral stages. Engelmann spruce is prominent on some sites, particularly on north slopes, in draws, and along streams and other riparian areas. These forests occur at higher elevations in cool, moist conditions, and they occupy all aspects. This is the largest forest formation in the Tenmile analysis area, dominating most of the ground in the southern and southwestern half of the analysis area, in addition to extensive tracts along the Continental Divide and around Colorado and Black Mountains.

Historically, fires were relatively infrequent but often burned with high intensity, replacing entire forest structures over extensive areas. At any given time, an average of 15-30% of this forest type was in early seral condition. Young forests were dominated almost entirely by lodgepole pine because of its ability to bring viable seeds through stand replacing fires and regenerate prolifically on the nutrient-rich post-fire mineral soil. Although lodgepole pine is a thin-barked tree unlikely to survive fires of any intensity, some stands do underburn, leaving large, sometimes widely spaced, overstory trees with thick ground vegetation often dominated by pinegrass, elk sedge, grouse whortleberry, and beargrass. Underburns typically occur in cool, moist higher elevation stands with gentle topography—areas where snow and damp ground often linger into early summer and where fires may have difficulty building intensity. If understory fuel ladders—usually regenerating subalpine fir—are able to build up between fires, these stands may then be susceptible to stand-replacing crown fire.

Under pre-settlement conditions, an average of about 20-30% of mid- and late-seral stands are estimated to have exhibited open canopy structure. Some of this configuration was generated by harsh growing conditions (due to local climate or substrate) or by the death of overstory trees in older, deteriorating lodgepole stands. Some, however, was generated by low intensity fire that selectively killed some overstory trees and reduced crowding in the understory. Today, few stands in the subalpine forest have open canopies. Effective fire suppression during the 20th century reduced the frequency of stand-replacing fires, allowing understory vegetation to build up in older forests, greatly increasing the potential for crown fires in stands that historically had under-burned. As a result, fires in this stratum are now burning with greater intensity and over larger areas than would have been the historical norm.

Fire suppression has also lowered the representation of early seral stands on the landscape. Throughout the Rocky Mountains, clearcutting operations since the 1950's have created extensive swaths of early-seral forest in this stratum, but in most cases, the acreage has not been enough to re-attain pre-settlement proportions of this seedling/sapling dominated habitat. In addition, from a wildlife perspective, clearcutting normally removes most of the large snags and large woody debris that contribute substantially to the diversity of post-fire habitats. Currently, lower subalpine forest composition is heavily skewed toward closed, late-seral forest structure, and, in spite of past clearcutting and increasing large fire frequency, it remains deficient in early-seral stands.

Reference and Current Condition

Moist conifer forests currently occupy about 53% (20,691 acres) of National Forest land in the Tenmile analysis area. About 12% is in moist Douglas-fir types and about 41% in lower subalpine forest (the largest forest formation in the analysis area). The following tables summarize current and reference conditions in the moist conifer forests.

Moist Douglas-fir / Lodgepole Pine Forest

Vegetation Fuel Class	Reference Percent	Current Percent	Current Status
Early Seral	15	5	under-represented
Mid-Seral Closed	25	33	similar
Mid-Seral Open	20	< 1	rare
Late-Seral Open	25	< 1	rare
Late-Seral Closed	15	61	over-abundant

Moist Douglas-fir forests are scattered through the upper reaches of the dry Douglas-fir and ponderosa pine zone and the lower reaches of the lower subalpine zone in the northern and central portions of the analysis area. Lodgepole pine is the predominant component in these stands. As can be seen in the table above, early- and mid-seral stands are under-represented (38% currently vs. 60% historically), while late seral stands are over-abundant (62% currently vs. 40% historically). Additionally, open canopied stands that accounted for an estimated 45% of the forest historically occur only as rare elements today: closed canopied stands make up virtually all of the mature forest in this stratum.

Cool / Moist Lower Subalpine Forest

Vegetation Fuel Class	Reference Percent	Current Percent	Current Status
Early Seral	20	8	under-represented
Mid-Seral Closed	35	33	under-represented
Mid-Seral Open	15	0	rare
Late-Seral Open	10	1	rare
Late-Seral Closed	20	57	over-abundant

The lodgepole pine-dominated forests of the lower subalpine zone show a similar pattern. Early and mid-seral stands are under represented compared to reference conditions, while late-seral stands are appreciably over-abundant (75% currently vs. 30% historically). Again, open canopied stands, which are estimated at 25% of reference stands, show up only as trace elements in the present-day forest. The highly skewed proportion of closed-canopied, late-seral stands is of particular weight in this case, because this forest type covers so much of the landscape in the Tenmile analysis area. In much of this older forest, the seral (lodgepole pine) old growth has begun to deteriorate and the replacement stands coming in underneath (predominantly subalpine fir) have already become multistoried and dense. Tree species change from seral to climax overstories is advanced in some areas.

Local Wildlife Habitats

The following table lists wildlife species likely to be found in moist conifer forests in the Tenmile area under current conditions. The list is confined to species associated with mid- and late-seral forests with closed canopies—habitats that make up 94% of the moist Douglas-fir forests and 92% of the lower subalpine forests in the analysis area. Species expected to move into the area or noticeably increase in abundance with increases in early seral or open canopied habitats are discussed in the section following the table. Species that may require special attention are displayed in the bottom 3 rows of the table. Sources of information are essentially the same as in the previous section on dry forest species.

Species Status	Wildlife Species associated with Moist Conifer Forests: Mid-Seral and Late-Seral Stands with Closed Canopies
Species Likely to be Abundant or Relatively Common	red-breasted nuthatch, mountain chickadee, ruby-crowned kinglet, gray jay, dark-eyed junco, pine siskin, red squirrel, deer mouse, mule deer
Species Likely to be Present but Less Common	golden-crowned kinglet, Clark's nutcracker, black-capped chickadee, Townsend's solitaire, hairy woodpecker, blue grouse, American robin, brown creeper, Swainson's thrush, hermit thrush, yellow-rumped warbler, red crossbill, black bear, American marten, long-tailed weasel, snowshoe hare, elk, coyote, golden-mantled ground squirrel, red-tailed chipmunk, northern flying squirrel, porcupine, northern redback vole, vagrant shrew, little brown myotis bat
Species Likely to be Uncommon or Rare	pileated woodpecker, white-breasted nuthatch, northern goshawk, boreal owl, great gray owl, ruffed grouse, red-naped sapsucker, Wilson's warbler, western tanager, northern three-toed woodpecker, evening grosbeak, Stellar's jay, Cassin's finch, spruce grouse, dusky shrew, long-tailed vole, bushy-tailed woodrat, yellow-pine chipmunk, mountain lion, bobcat, Canada lynx, grizzly bear, fisher, wolverine, wolf, coyote, moose, white-tailed deer, western toad, rubber boa
Species of Special Concern	northern goshawk, pileated woodpecker, Canada lynx, wolf, fisher, grizzly bear, western toad
Priority Species	northern goshawk, pileated woodpecker, American marten, Canada lynx, fisher
Featured Species	elk, mule deer, moose, American marten, ruffed grouse

As in the dry forests, the abundance of several of the species listed above will depend upon habitat components other than the species, size and density of the dominant tree species: understory vegetation, water, snags and large woody debris, rocks, edge configuration. Coarse filter vegetation management will meet the needs of most of these species. Those that may need additional attention are discussed in following sections.

Some of the species likely to increase measurably in abundance with expansion of early seral and open canopied habitat include mountain bluebird, warbling vireo, solitary vireo, chipping sparrow, dusky flycatcher, western wood-pewee, olive-sided flycatcher, northern flicker, western tanager, yellow-rumped warbler, violet-green swallow, great horned owl, northern pocket gopher, meadow vole, Richardson's ground squirrel, badger, red fox, and coyote.

Upper Subalpine Forest: Whitebark Pine

General Habitat Features

An assessment of the interior Columbia River basin found that the area in whitebark pine cover type has declined by 45% since 1900 (Keane 1995). Most of this loss has occurred in the more productive seral whitebark pine types, of which 98% has been lost. Prior to the early 1900's whitebark pine was more abundant because of frequent low intensity fires that prevented or slowed replacement by more shade tolerant species—subalpine fir and Engelmann spruce (Arno and Hoff 1989). Fire suppression throughout the 20th century disrupted natural fire cycles and has resulted in seral whitebark pine being replaced by competitors (Arno and Weaver 1989).

As seral whitebark pine stands advance toward spruce/fir climax, they become more susceptible to high intensity stand replacing fires (Morgan and Bunting 1989). Although whitebark pine can regenerate readily following such fires, the trees are not likely to survive subsequent fires that occur while the trees are still small and easily killed by fire (Morgan and Bunting 1989).

Mountain pine beetle (*Dendroctonus ponderosae*) is the most damaging insect in mature stands of whitebark pine (Arno and Hoff 1989). A large proportion of the mature whitebark pine in the northern Rockies was killed by an outbreak of this insect between 1909 and 1940 (Arno 1970 in Arno and Hoff 1989). Mountain pine beetle epidemics spread upward from the lodgepole pine forests, as evidenced in a 1970's epidemic which developed in lodgepole pine on the Flathead National Forest, resulting in most of the whitebark pine being killed (Arno and Hoff 1989).

The disease that has the most impact on whitebark pine is white pine blister rust—a Eurasian stem rust introduced to North America in 1910 (Hoff and Hagle 1989). Blister rust is particularly destructive where the range of whitebark pine overlap with that of currants (*Ribes* spp.), which serve as an alternate host in areas with adequate humidity (Arno and Hoff 1989). Efforts to reduce the occurrence of the alternate host have been relatively futile (Hoff and Hagle 1989). In northwestern Montana, an estimated 40 to 100% of whitebark pine are dead in existing stands and 50-100% of the live trees are infected with rust and have lost their capacity to produce cones. In southern Montana, whitebark pine health is better due to drier climate (Kendall and Schirokauer 1997).

Dwarf mistletoe, a parasitic plant, can cause severe local mortality in whitebark pine (Arno and Hoff 1989). Limber pine dwarf mistletoe, which infects and sometimes kills whitebark pine and occurs in scattered locations in Montana, has been documented to have caused heavy mortality around Mount Shasta, where surveyed stands averaged 96% infection rates with 58% mortality (Hoff and Hagle 1989).

Wide scale grazing, especially by large numbers of sheep, historically reduced the reproduction of whitebark pine. However current grazing may be less of an issue due to reduced animal numbers and scientific grazing plans (Willard 1989).

Reference and Current Condition in the Analysis Area

Whitebark pine currently occupies about 4% of the analysis area. The following table summarizes the reference and current condition of whitebark pine in the analysis area. Currently 76% is in the late-seral open class although most of that is dead.

Vegetation Fuel Class	Reference Percent	Current Percent	Abundance
Early Seral	20	0	Trace

Vegetation Fuel Class	Reference Percent	Current Percent	Abundance
Mid-Seral Closed	25	43	Over-represented
Mid-Seral Open	25	0	Trace
Late-Seral Open	15	0	Trace
Late-Seral Closed	15	57	Abundant

Mountain Grassland with Shrubs

General Habitat Features

Intermountain Grasslands usually occur on valley floors, foothills toeslopes and south aspects within the area. Distribution is a result of topographic characteristics, soils, precipitation and temperature regime. Forests invade when water becomes more available.

Mixed-grass prairie was historically found throughout Montana east of the continental divide. Since settlement and the advent of modern agricultural methods the amount of grassland has declined substantially. Losses have been most significant from the northeast corner west across the northern tier of counties to the foothills north and west of Great Falls. Within the northeast corner of the state, approximately 60 percent of the grassland has been converted to croplands (B. Martin, Pers. comm.). Most remaining large blocks of grassland are found in an area extending from the central to east-central regions of the state and trending to the southeast. The Nature Conservancy (TAC) has identified and mapped existing blocks of grassland. Montana Gap models define eastern Montana grasslands by cover class (Very Low, Low/Moderate, Moderate/High), covering a combined 12.8 million ha, or approximately 44% of the state (Edmond et al. 1998).

Mixed-grass prairie is defined here as incorporating both prairie grassland habitat with mid-sized grasses (mixed-grass prairie), and short-grass prairie with very open structure and low stature grasses. The two types are discussed below.

Typical mixed-grass prairie is comprised of denser and relatively taller grass species than short-grass prairie. Species composition is dominated by western and blue bunch wheatgrass with other species including needle-and-thread, June grass, Kentucky blue grass, and blue gamma present. Specialized microsites contain prairie centrad and little bluestem. Horizontal structure varies but in general is closed and dense compared to short-grass areas. Litter density also varies but is considerable more than that found in short-grass prairie. Litter may be very dense particularly in swales and along drainages. All of the 1.2 million ha of Moderate/High Cover Grasslands, and most of the 10.4 million ha of Low/Moderate Cover Grasslands identified by Edmond et al. (1998) fall in our Mixed-grass prairie type.

Potential management concerns within grasslands include:

- grazing regimes
- introduction of noxious weeds
- replacement of fire regime
- oil/gas and mineral development
- fragmentation of existing grassland
- increased cowbird predation
- urbanization
- shrub and tree encroachment.

Reference and Current Condition

Currently approximately 8% of the analysis area is considered grassland. The following table summarizes the percentages by Vegetation Fuel Class.

Vegetation Fuel Class	Reference Percent	Current Percent
Early Seral	5	5
Mid-Seral Closed	90	90
Mid-Seral Open	5	5
Late-Seral Closed	0	0
Late-Seral Open	0	0

Current conditions are a loss of grassland habitats due to:

- Conversion of native grassland to cropland (which is the most immediate threat)
- Grazing regimes
- Introduction of noxious weeds
- Replacement of fire regime
- Oil/gas and mineral development
- Fragmentation of existing grassland
- Increased cowbird predation
- Urbanization
- Shrub and tree encroachment

Montane Shrublands

Mountain and foothill shrublands where mesic or xeric shrubs are dominant and shrub cover ranges from 20-100%. Dominant shrub species on mesic sites are generally serviceberry, mountain maple, ceanothus, shiny-leaf spirea, ninebark and alder. More xeric sites are characterized by sagebrush, bitterbrush, mountain mahogany, creeping juniper, and even greasewood and rabbitbrush on the driest eastern sites. Shrub cover in the latter more typically runs in the 20-50% range.

Sagebrush is meant here to include both relatively pure sagebrush shrubland (20-80% sagebrush cover) and areas where there is a pronounced interspersion of grasses (5-20% shrub cover). Sagebrush has always been a common habitat in drier, lower elevation valleys in the west, where their distribution and patchiness was a result of natural moisture and fire regimes (Paige and Ritter 1999). Large-scale changes in land use, including the introduction of grazing, conversion to agriculture, and use of fire, chemical and mechanical means to remove sagebrush cover, have severely altered the distribution and condition of Montana's sagebrush shrublands. Invasion of weeds and losses to development have had further impacts on sagebrush habitat. Combinations of these factors, notably heavy grazing, removal of native grasses, and planting/invasion of non-native vegetation have this habitat in ways which have affected its suitability for nesting birds, many of which are sagebrush obligates (Paige and Ritter 1999).

Reference and Current Conditions

Shrubland currently occupies less than 1 percent of the analysis area. The following table summarizes the reference and current condition of sagebrush in the analysis area.

Vegetation Fuel Class	Reference Percent	Current Percent
Early Seral	20	unk

Vegetation Fuel Class	Reference Percent	Current Percent
Mid-Seral Closed	35	unk
Mid-Seral Open	15	unk
Late-Seral Open	10	unk
Late-Seral Closed	20	unk

Cliffs, Rock Outcrops, Caves and Scree

General Habitat Features

This habitat type is important to many wildlife species in the Tenmile analysis area—most notably, the golden eagle, peregrine falcon, pika, yellow-bellied marmot, bushy-tailed woodrat, yellow pine chipmunk, Townsend's big-eared bat, wolverine, and historically, the bighorn sheep. A number of habitat generalists ranging from dark-eyed juncos to long-tailed weasels to black bears also take advantage of the refuge, foraging opportunities, and denning sites offered by these unique substrates.

For the most part, rock-based habitats are less susceptible to alteration by current management activities than are habitats defined by their vegetation structure or the presence of water. Historically, they have been modified primarily by mining operations and associated roading, but little alteration of this sort is expected in the Tenmile analysis area in the future. In addition, much of this habitat (cliff faces, steep talus slopes) is among the least accessible in the drainage. In spite of this, some habitat components and associated species are at risk from human interference. These include disturbance of wolverine denning sites by snowmobiles and ATVs, disruption bat hibernacula and nursery areas by recreationists exploring caves and old mine adits, interference with peregrine falcon eyries and golden eagle nests by rock climbers, shooting of marmots and other small mammals by "varmint plinkers".

Maintaining this habitat type at current levels or less of disturbance is important to all species that use the area.

Areas with nearby riparian habitat and a wide variety of coniferous forest types should be of high priority to protect from disturbances as well as enhance since these habitat types are also important to the above wildlife species.

Unmapped Stand level Habitats

Aspen

Aspen stands while relatively rare in Montana, as compared to other states in the Rocky Mountains, provide for a diversity of species. Snowshoe hares and cottontail rabbits feed on its twigs and buds, while ruffed grouse are highly dependent on the buds in the winter. Ungulate species also benefit from a well managed aspen stand as it will provide good quality and abundant forage especially during the important winter months. Aspen also provides cavities and snags for cavity dependant wildlife.

Aspen is also important to recreation and tourism. Aspen provides visual diversity in a landscape dominated by conifers. It is especially a draw in the fall with its spectacular colors against a green background. The diversity of wildlife that inhabits an aspen clone is also a draw for photographers and bird watchers.

Fire is the primary factor in perpetuating aspen. When left undisturbed the life cycle for aspen is to become established following a disturbance, at which time it functions as a cover species for shade tolerant conifers and is eventually replaced by coniferous forest. Periodic fire sets back succession and maintains aspen on the site. In the absence of fire, remaining aspen trees eventually lose vigor, fail to sucker and are eliminated from the community.

Fires suppression has resulted in a decrease in the abundance of aspen stands compared to historic conditions. Most of the aspen stands are in the late succession stages and in critical need of regeneration.

Aspen trees are in poor condition over most of Montana. Most of the aspen remaining in the state are in the older age classes and are in critical need of regeneration. Older stands are usually less vigorous and least likely to regenerate successfully. Many of these stands are currently being crowded out by competing conifers and aspen will eventually be lost from the site. In addition, pure and mixed stands in the older age classes are of low vigor and are often heavily infested with pathogens. Effective fire suppression over the past 50 years has permitted competition and disease to reduce clone vigor to levels lower than would be expected under natural conditions. Compounding the situation, fire suppression has drastically reduced fire induced regeneration in recent years resulting in few young aged stands.

Aspen has long been recognized for providing quality wildlife habitat and recreational and scenic values. However, it has been only relatively recently that land managers have identified aspen as a priority for forest management. A focus toward ecosystem restoration, the realization of its recreation, landscape and tourism values and the fact that aspen abundance is declining, all have contributed to the increased interest in aspen management (Cartwright and Burns, 1994).

Reference and Current Condition

Historically, aspen stands may have been limited to riparian areas due to relatively low precipitation and few naturally seepy areas. However, where present, aspen stands would have been healthy and vigorous due to frequent disturbances. Currently, aspen occurs on upland sites as well as riparian areas – where the water table is high enough. Larger, late sucession aspen stands are found in the wetter areas. These stands are usually a single generation that will eventually die out as the conifer canopy cover increases.

Riparian Habitat

Riparian habitats typically support more species of breeding and migratory birds than any other terrestrial habitats in the West. Because most riparian habitats occur as a limited element in the landscape, even positive population trends of riparian-dependent species can be quickly reversed by changes in riparian habitat availability and management. This analysis describes riparian habitats in the following context: riparian deciduous forest, riparian coniferous forest, riparian shrub, and woody draws. However, the reference, current, and desired future conditions combine all types of riparian habitat into overall riparian.

The following table summarizes some of the bird species associated with these different riparian communities and the successional stage that each species depends upon. These species are discussed in more detail in the “Priority Species Accounts” section. Riparian habitats are also important for amphibian species including boreal toads and northern leopard frogs that are or were historically present in the analysis area.

Occurrence of priority species in the analysis area by riparian habitat type and successional stage (E=early, M=mid, L=late)

Species	Priority	Deciduous Forest:			Coniferous Forest:			Riparian Shrub:			Woody Draws:			Comments
		E	M	L	E	M	L	E	M	L	E	M	L	
Harlequin Duck	I					X	X							Overhanging trees
Sharp-shinned Hawk	III		X	X		X	X	X	X	X	X	X	X	
Peregrine Falcon	II	X	X	X				X	X	X				Mature trees
Ruffed Grouse	II	X	X		X	X								
Vaux's Swift	II			X			X							Snags, old growth
Downy Woodpecker	III		X	X						X		X	X	
Red-naped Sapsucker	II			X										
Hammond's Flycatcher	II		X											

Reference and Current Condition

The reference condition is based on the Divide Landscape analysis. Historically, the lower reaches of riparian areas were most likely wider with varied and abundant vegetation. These areas may have also been more abundant as a result of beaver activity, absence of placer mining, lode mining, etc. Riparian areas were historically dominated by grasses, shrubs, conifers, and deciduous vegetation in varying successional stages.

Riparian Deciduous Forest (Cottonwood/Aspen)

Riparian Deciduous Forest is used here to describe the gallery forests and woodlands of (generally) lower elevation floodplains, along with the complex riverine habitats they are associated with (gravel bars, sloughs, etc.). Riparian habitats, and those dominated by deciduous trees in particular, are known to support the highest diversity of breeding birds of any habitats in the western U.S. They also serve as critically important migration corridors for a wide variety of bird species, from waterfowl to canopy-dwelling warblers. At least 134 (55%) of Montana's 245 species of breeding birds use riparian forests during all or part of the year.

Mature stands are dominated by cottonwood, with a well-developed canopy. In many cases, there can be a coniferous component to the canopy as well. Generally, this habitat is naturally fragmented or linear in nature, with bands of mature trees interspersed with open areas of riparian shrub or flood-influenced areas of grasses/forbs. In natural flow regimes, there is a mix of age structures corresponding to different flood events and periods of regeneration. Lower elevation reaches with low gradients typically have braided river channels, which add further complexity to the habitat structure.

Specific activities which have the most direct effects on riparian deciduous forest and its wildlife bird communities include:

- Flood control and channelization through rip-rapping and other means
- Logging, particularly of older cottonwoods for lumber or pulp
- Water diversion for irrigation
- Clearing for agriculture (crops, hay, pasture)
- Grazing
- Recreational use

Riparian Shrubland

Riparian shrubland is closely associated with streams, lakes, ponds and marshy areas. Riparian shrublands are important component of riparian systems, because they provide both nesting and foraging habitat for a wide variety of bird species. Riparian shrubland is a relatively restricted habitat ,due to its linear nature. Cover densities vary greatly and may range from 15 to 100 percent. Most riparian shrublands have both a dense shrub canopy and dense grass/forb ground cover. Open water is frequently part of the type, whether as streams or rivers, or shallow lakes and ponds where open water is surrounded by a margin of shrub cover.

Riparian – Woody Draws

Woody draws generally occur east of continental divide in Montana, and found in grasslands, mountain foothills, and within conifer forests. They are usually found as a linear feature on the landscape, but also occur in snow and frost pockets on hillsides and on benches and terraces. High vertical structural diversity exists relative to surrounding grassland vegetation. Within riparian types under undisturbed conditions, vertical structural diversity is generally lowest in early seral condition and highest in late seral condition. Horizontal patchiness is greater in early and intermediate seral condition and lower in late seral condition. Some types of disturbance may increase vertical and horizontal patchiness, including fire, grazing, and firewood cutting. Late seral condition stands in good to excellent condition generally consist of four layers: grass/forb, low shrub, tall shrub, and a moderate to full tree canopy closure. Early seral stands generally lack tall shrub and have little or no tree cover and hence low canopy closure.

Snag density is related to stand age with higher snag densities in older stands. Where aspen or cottonwood are present, primary excavators may play a more important role in tree cavity formation.

Hardwood draws make up only a minor component of the analysis area. However, it can contain a high levels of species diversity. This habitat type serves as breeding and wintering habitat and stopover habitat during migration for many bird species. Specifically, this type provides cover and food and may be an important seasonal water source for birds particularly during migration and the brood-rearing stage of development. High plant species diversity, insect abundance, and berries also attract birds to this habitat type.

Loss of shrub layers and lack of overstory recruitment due to persistent grazing pressure is the major problem for maintenance of hardwood draws. Under this disturbance, Kentucky bluegrass replaces native grasses, and forb diversity is lost as yarrow and dandelion become the dominant species. As a result, these woodlands may be converted to grass or low shrub communities. Birds dependent upon the shrub component for nesting are directly affected but even ground nesting and tree nesting species are eventually affected. Other problems include firewood cutting, development, and loss of natural disturbance factors, especially fire.

Riparian – Conifer Forest

This habitat is defined as floodplain and stream side forests dominated by coniferous tree species. Riparian conifer types contribute to animal and plant diversity, out of proportion to their acreage within the landscape. They tend to have a more diverse forest structure than adjacent upland habitats, and therefore support higher bird species diversity. This is particularly true in drier regions at low to mid-elevations.

Vegetation structure can be highly variable both across and within habitat types depending on seral condition and disturbance factors such as logging, roads, fire and grazing. In higher elevation areas, the understory may vary from a relatively open condition of pinegrass under a canopy of seral lodgepole pine, to a dense understory of huckleberry under spruce-fir canopy. Dense stands of willow, alder (Alnus spp.), or red-osier dogwood may be interspersed with the tree canopy. The amount and size of down and dead woody debris can also vary substantially.

The riparian zone typically comprises a small percentage of the analysis area. Older seral stages are probably the most limited types, particularly at lower and middle elevations. This is in part due to ease of access and logging.

Although this type is generally confined to the riparian corridor, the adjacent upland habitat matrix can have a profound effect on the bird community. Leaving a narrow riparian buffer strip with a matrix of heavily cut forest, for example, may be detrimental to birds at the landscape scale (McCarigal and McComb 1992). Increased edge effect can increase predation and parasitism rates, for example, and windthrow can be increased dramatically. Riparian management for birds must therefore consider the entire landscape.

The major historical disturbance factors in this habitat type have been wildfire, insects and disease, and periodic flooding. Single treefall and stand blowdown are also fairly common disturbance factors.

Frequency and magnitude of flooding can determine both the extent and rate of change in riparian forest conditions. Large-scale flooding and deposition of new soil may result in a young forest dominated by deciduous species. Succession over time can lead to dominance by conifers. The full range of seral conditions implies that some of these areas would have to be in early successional deciduous cover. In riparian areas where frequent flooding occurs, it may be unreasonable to meet riparian conifer objectives.

Although riparian areas probably serve as a natural fire break on the landscape, their longevity in a particular seral condition is determined at least in part by the adjacent upland habitat types and fire regime. Moist habitat types within lethal fire regimes may contain an abundance of snags and dead and down material in the understory (Fischer and Bradley 1987). Stand replacement fires in these areas result in young conifer, young deciduous, or young mixed stands. Lower and middle elevation areas, in contrast, experience frequent non-lethal or mixed-intensity fires which generally burn individual or small clumps of trees and burn off the fine fuels. Many of the shrub and tree species in these stream reaches are fire-adapted and sprout vigorously following disturbance.

<u>Dead Tree Aggregations</u>

Fire has historically been the most prevalent major disturbance factor in the Rocky Mountains (Gruell 1983). For mid- to high-elevation forest types within this region (i.e., Douglas-fir, spruce, and subalpine fir), the predominant fire regime was one of infrequent, intense, stand-replacement fires, rather than one of frequent, low-intensity, understory burns (Fischer and Bradley 1987, Barrett et al. 1991). In fact, the origin of most Rocky Mountain forest stands can be traced to stand-replacement fires (Arno 1980, Heinselman 1981). This implies that the variety in forest cover types across the northern Rocky Mountains is as much (or more) a product of the presence of a variety of successional stages following stand-replacement fires as it is a product of the presence of a multitude of climax community types.

Stand-replacement fires occurred in more mesic forests, which were less likely to dry out enough to burn even in the driest years. These forests were more likely to achieve older age classes and to accumulate large amounts of dead and live woody fuels, not burning until sufficient fuels and conditions produced a crown fire. The importance of stand-replacement fires in this forest system is beginning to make the maintenance of such fires a high priority in land management agencies, especially since policy during the past 50 years has encouraged widespread fire suppression and post-fire salvage logging. The high density of standing dead trees (snags) that remain after stand-replacement fires makes this a unique habitat for birds, one that has similarities across several forest cover types that warrants a separate discussion in this section.

Stand-replacement fires kill most if not all of the trees in a forest, but leave most of the dead trees standing. They therefore create well-defined fragments of early successional-forest dominated by standing-dead trees. The immediate aftermath of the fire may look like a lifeless scene, but there are two factors that soon make this an area of high productivity for birds and all life. Of the most immediate importance for birds is the short-term abundance of foraging and nesting opportunities provided by the standing dead trees. Secondly, there is a rapid profusion of new growth from the forest floor as succession gets under way.

The cambium of most of the fire-killed trees remains intact after a fire, depending on the heat of the fire and the thickness of the bark (Agee 1993), which depends in part on tree species (Ryan and Reinhardt 1988). Although it is an ephemeral resource, this cambium is rapidly exploited by wood-boring beetles (Evans 1971), some of which are restricted to freshly dead wood (Fellin 1980). These beetles provide an abundant food source to timber-drilling woodpeckers for the first few years after a fire, and woodpeckers have long been known to concentrate in post-fire habitats to feed on these larvae (Blackford 1955, Koplin 1969). Many cavity nesters respond positively to post-fire habitats (Taylor and Barmore 1980, Harris 1982, Hutto 1995, Caton 1996). Although there is an obvious benefit of abundant snags for nesting, the tremendous increase in foraging opportunities is the likely reason why cavity-nesters reach such high densities in burned forests in both winter and summer (Caton 1996).

Some other bird species may do well in burned forests because of the numerous perches that provide vantage points for aerial capture of insects (e.g. Olive-sided Flycatcher, Mountain Bluebird). Ground and aerial foragers that are also cavity nesters (e.g. American Kestrel, Northern Flicker, Tree Swallow, Mountain Bluebird) are likely drawn to burned forest because of the unique combination of open foraging habitat and many more nest sites than are typically found in open areas (Caton 1996).

The regrowth of new vegetation may begin rapidly after a fire (Christensen et al. 1989). Stand-replacement fires open the forest floor to light and give the soil a variable pulse of nutrient-rich ash, depending on the severity of the fire and erosion (Woodmansee and Wallach 1981; Agee 1993, pp. 160-171). The nature of these early successional communities depends on survivors and seed sources (Stickney 1990). This surge in plant productivity will eventually result in higher invertebrate productivity, providing abundant food for ground and aerial foragers. As succession progresses, the ensuing shrub layer will provide foraging and nesting resources for a new array of early-successional bird species. As the snags fall over the years, the vegetation of the area may appear to converge on that following other disturbances such as clearcuts, but there may be legacies of fire that make even later successional stages unique. Fire affects tree species composition, favoring shade-intolerant species such as western larch, ponderosa pine, and lodgepole pine (Agee 1993). Fires may burn unevenly, leaving large surviving trees (and perhaps snags) to enrich the diversity of the young stand. We need more research on the lasting legacies of fire in nutrient retention, productivity, and vegetation components of forest stands throughout later succession.

Within-Stand Habitat Components

Snags and Large Woody Debris

Standing dead and dying trees, broken-top trees, stumps, and large logs scattered throughout stands of stands of living conifers present different habitat opportunities than burns or other large aggregations of snags and woody debris. While “generalist” snag dependent species will make use of either environment, some species concentrate on these habitat components only when they occur with an interior forest setting.

Large Trees

Some wildlife species are dependent primarily on large trees (generally greater than 12 inches dbh), living or dead, standing or down. Overall stand structure is less important than the presence of trees of a certain size.

Landscape Features

Continental Divide Linkage Zone

Servheen et al. (2003) identified potential wildlife linkage zones connecting larger blocks of habitat in northern and western Montana. The grizzly bear was the focus of the linkage zone analysis under the assumption that by meeting habitat needs of grizzly bears, habitats for many other species would be included as well. Although the USFWS has not completed a linkage analysis for the area between the Northern Continental Divide Ecosystem and the Greater Yellowstone Ecosystem (GYE), the region of public land between Rogers Pass and MacDonald has potential to serve as a linkage area due to low human use and contiguous forested habitat (Chris Servheen, USFWS, personal communication, August 2005). Also, draft potential linkage areas for Canada lynx have been identified and include the MacDonald Pass area (USDA 2003). As linkage habitat, the Rogers Pass to MacDonald Pass area could potentially serve to provide habitat connectivity to larger blocks of forested habitat to the north, including the Scapegoat Wilderness and Bob Marshall Wilderness. However, to the south and southwest of MacDonald Pass are mining districts with a substantial history of mineral-development and associated roads (for example: Rimini, Basin, Elliston, Cataract mining districts). Also, there are numerous private inholdings within public land in the Divide Landscape Area on the Helena National Forest, portions of the Beaverhead-Deerlodge National Forest, and land managed by Bureau of Land Management. The potential for areas five or more miles south of MacDonald Pass to provide linkage or core habitat has likely been compromised as a result of the past activity and road density.

If the MacDonald Pass area would provide functional linkage habitat for grizzly bear and lynx it may serve a similar function for many other species. Currently there are no animal movement data supporting the concept of the Continental Divide functioning as linkage habitat in the vicinity of MacDonald Pass area; but, efforts are underway to secure funding to collect presence-absence information on wildlife using the area (C. Servheen, USFWS, personal communication. August 2005). Limited information on road-killed animals along U.S. Highway 12 in the vicinity of MacDonald Pass is available, and includes numerous deer, one moose, one lynx and two wolves (D. Wambach, MTDOT, email communication, August 2005; G. Joslin, MTFWP, email communication, August 2005). Deer, elk and moose use the project area. Their seasonal movements are likely to be in a predominantly eastwest direction, following elevational gradients (MTFWP 1999, 2004a, 2005a). These movements may take advantage of drainages or ridges.

Unroaded Areas

A number of wildlife species focus their activities in areas away from persistent human presence and disturbance. For these species, areas free from open roads and motor trails provide the best opportunities to avoid such disturbance for long periods of time within large home ranges.

Wildland-Urban Interface

Human settlement on parcels of private land in various parts of the upper Tenmile and adjacent drainages (Colorado Gulch, Walker Creek) have been generating an array of management challenges over the past couple decades.

CHAPTER FOUR: Desired Conditions

The Helena Forest Plan was completed in 1986. The Plan has specific goals, objectives, standards and management direction. There is also a short description of the desired future condition of the Forest for decades one and five. The completion of mid-level analysis such as the Divide Landscape Analysis (1996) and the Tenmile EAWA .are efforts to work toward achieving Forest Plan goals and objectives by more specifically describing desired conditions for various resource areas.

Forest Plan Goals

There are eighteen forest-wide management goals listed in the Forest Plan (II/1-2). It is important to repeat those goals in this document to ensure that desired conditions support the goals. Goals 5 and 7 are specific to resources that do not exist tin the Divide Landscape Area and are not repeated here.

1. Provide a range of quality outdoor recreation opportunities within a forest environment that can be developed for visitor use and satisfaction.
2. Provide a range of quality recreation, including motorized and nonmotorized opportunities, in an undeveloped forest environment.
3. Protect and provide the benefits of wilderness values for the public in accordance with the Wilderness Act of 1964.
4. Maintain and improve the habitat over time to support big game and other wildlife species.
6. Manage vegetation to provide optimum forage conditions for livestock.
8. Maintain or enhance all identified bald eagle nesting sites and seasonal use sites, and potential nesting site to facilitate the recovery of bald eagles. Maintain or enhance all identified gray wolf habitat to facilitate recovery. Identify and maintain peregrine falcon habitat to facilitate recovery.
9. Provide Forest visitors with visually appealing scenery.
10. Maintain high quality water to protect fisheries habitat, water based recreation opportunities, and municipal water supplies and to meet or exceed state and Federal water quality standards.
11. Provide a sustained timber yield that is responsive to local industry and national needs.
12. Provide firewood as an energy resource for personal and commercial uses.
13. Provide for exploration, development, and production of mineral and energy resources on the Forest.
14. Provide a fire protection and use program which is responsive to land and resource management goals and objectives.
15. Develop and implement a road management program with road use and travel restrictions that are responsive to resource protection needs and public concerns.
16. Manage the Forest in a manner that is sensitive to economic efficiency.
17. Coordinate Forest management activities with the land and resource management efforts of other Federal agencies, state, and local governments, and adjacent private landowners.
18. Emphasize educational and public information programs to increase public awareness and understanding of Forest Service management activities.

Objectives for each resource area are also described in the Plan (I/2-10). Cultural resources, fisheries, range management, soils and lands are not specifically addressed under goals, but are addressed in the objectives as follows (parapharased):

Cultural: The cultural resource will be inventoried, evaluated, and protected, as appropriate.
(Wildlife and) Fish: .Programs will also be conducted to provide habitat for small game, furbearers, and other existing wildlife and fish species.

Range: Forage production will be continued at a level that slightly increases available forage for a portion of the year-round needs of the local livestock industry.
Soils: Soil productivity will be maintained and sediment will be minimized by applying soil and water conservation practices.
Lands: As opportunities occur, seek landownership adjustments such as land exchange, donations of easements on a willing grantor basis to support Forest goals and objectives.

Other concerns such as air quality and insect and disease activity are addressed within objectives for other resource areas.

The Tenmile watershed has specific management area direction under Management Areas H1 and H2.

H1 management goals:

- Provide a quantity and quality of water which will, with adequate treatment, result in a satisfactory and safe domestic water supply for the City of Helena.
- Provide cover and forage for big game animals and necessary habitat components for non-game animals.
- Provide for dispersed recreation opportunities.

H2 management goals:

- Provide a quantity and quality of water which will, with adequate treatment, result in a satisfactory and safe domestic water supply for the City of Helena.
- Provide cover and forage for big game animals and necessary habitat components for non-game animals.
- Provide healthy timber stands and optimize growing potential over the planning horizon while protecting the soil and water resources.
- Provide for dispersed recreation opportunities.

The desired future condition of the forest is described in the Plan for decade one. Paraphrasing, timber production (150 million board feet), road construction (130 miles of local and 90 miles of collector roads), tree planting (6000 acres) and firewood opportunities are addressed. A change in the age class distribution of timber on the forest is described, shifting from mature age classes to more seedlings and saplings. Forage production is addressed (19,700 acres treated, primarily with prescribed burning). Livestock AUM's and wildlife potential on winter range were predicted to increase. Fish habitat structures (200) and non-structural habitat (200 acres) were predicted to occur by the end of the decade. Wilderness would not change except to consider the additions proposed in the Plan, and a slight increase in visitor days. Recreation visitor days were predicted to increase substantially in primitive, semi-primitive motorized and non-motorized and roaded natural activities. Mineral development was expected to continue and have some impact on recreation opportunities. The roadless resource was expected to decrease by 33,900 acres due to mineral development and timber harvest. Sediment yield was predicted to slightly increase but not impact water quality. Air quality would not be impacted.

Desired condition descriptions at the end of decade five were included in the Plan as well.

The Forest found the above desired condition description to be fairly focused on outputs, and felt the need for additional descriptions of resource conditions from both a biological and social aspect, based on all Forest Plan goals. Four landscapes analyses were completed for the ecologically and socially important areas across the Forest—the Elkhorn Mountains, the Big Belt Mountains, the Divide Area and the Blackfoot Area.

Integrated Desired Condition

The following section is taken from the Divide Landscape Analysis and updated as appropriate for the Tenmile EAWA.

Fire Management

The overall goal for fire management is to allow fire's natural ecological role in ecosystem restoration, maintenance and functioning to occur, while minimizing the detrimental effects from unwanted wildland fires (wildfires). Fire Management programs and activities will be economically viable, based on resource management objectives and values to be protected. They will be based on the best available science and responsive to public health and environmental quality considerations. Firefighter and public safety is the first priority in every fire management activity; property and resource values are always the secondary priority.

Wildfires will be suppressed with an appropriate suppression response that results in minimum costs while fully considering firefighter and public safety, values at risk and resource objectives.

The full range of possible suppression responses is available, from an aggressive control strategy to simply monitoring the incident, and includes the management of wildland fires to meet resource objectives. The selected response for each wildland fire must consider safety of firefighters and the public as the highest priority.

Prescribed fires will be conducted in a manner consistent with land and resource management plans, public health considerations, and with an approved burn plan. Mechanical treatments may be used to facilitate the future application of wildland fire or may be used as stand-alone treatments to meet land management objectives.

The highest priority for application of prescribed fire will be in the short fire interval, fire-dependent ecosystems.

Fisheries

<u>Fish Distribution and Population Goals</u>

Maintain or restore spatial and temporal connectivity within and between watersheds, when non-native fishes do not pose a threat.

Cooperate with state, federal, local, and other agencies at maintaining or restoring current population of bull trout and westslope cutthroat trout.

Cooperate with state agencies to determine bull trout and westslope cutthroat trout populations, distribution, and structure; working towards bull trout populations reflecting that defined in the Clark Fork River and Blackfoot River Conservation Strategy.

<u>Habitat Goals</u>

Habitat Goals

Maintain or enhance riparian vegetation to that of later seral stages, especially for channels susceptible to ungulate grazing(ie Rosgen C/E and sensitive B/A types).

Maintain or restore water quality and quantity to allow for support of healthy riparian, aquatic, and terrestrial ecosystems.

Provide opportunities for low intensity surface fires within riparian zones.

Habitat Objectives

Maintain sediment levels to there defined range of natural variation in regards to there natural geologic erosion factors.

In aggregates with low sediment potentials (.03-.14) maintain sediment levels within the standard deviation of 21-41% fines; with an emphasis at 30% and below.

In aggregates with moderate sediment potentials (.15-.21) maintain sediment levels within the standard deviation of 19-45% fines; with an emphasis at 32% and below.

In aggregates with high sediment potentials (.22-.58) maintain sediment levels within the standard deviation of 28-41% fines; with an emphasis at 34% and below.

Maximum water temperatures for Upper Missouri River Basin westslope cutthroat trout

Inland Native Fish Strategy

Infish is intended to provide interim direction in the form of riparian management objectives, standards and guidelines, and monitoring requirements in order to protect habitat and populations of resident native fishes. This strategy ammends the forest plan and will apply to all new and proposed projects west of the continental divide. A watershed analysis will be required for some management activities within the riparian habitat conservation areas in priority watersheds. This process may also allow for changes in the standard in guidelines. Some of the Infish objectives are listed below but for a complete listing refer to the Infish Environmental Assessment.

Maximum water temperature below 59°F within adult holding habitat and below 48°F within spawning and rearing habitats.

Maintain pool frequencies at the following. 3 Wetted Width Pools/Mile Wetted width/depth ratio <10

Rosgen A-Type Channels: >4% Gradient, High Entrenchment(Generally Forested)
LWD >20 pieces/mile, >12 inch diameter, >35 foot in length.
Maintain pool frequencies
Maintain bank stability in sensitive channels.

Rosgen B-Type Channels: 2-4% Gradient, Moderate Entrenchment (Generally Forested)
LWD >20 pieces/mile, >12 inch diameter, >35 foot in length.
Maintain pool frequencies
Maintain bank stability in sensitive channels.

Rosgen C&E-Type Channels: 0-2% Gradient, Low Entrenchment (Generally meadow like)
>75% of banks with undercut
>80% bank stability
Maintain pool frequency

Grazing

Livestock grazing in the Divide landscape area is maintained to help preserve the integrity of open spaces and viable ranching opportunities in and around the Divide ecosystem. Domestic livestock grazing is managed to promote the desired conditions of other resources, including maintenance of adequate plant and litter ground cover, nutrient cycling, forage for wildlife species, quality recreation experiences, and the restoration and maintenance of riparian communities

Heritage

Goal

Provide for the preservation, protection, enhancement, interpretation, and management of the full range of heritage resources across the landscape analysis area.

Objectives

Preserve in perpetuity a full range of heritage resource site types across the analysis area; recognize that heritage sites are an inherent part of the "western landscape" and form important personal and community links with the past.

Document, investigate and protect heritage sites within the analysis area for the BENEFIT OF THE RESOURCE ALONE, and its appropriate management (and not simply to facilitate a ground-disturbing project of undertaking) as required under Section 110 of the National Historic Preservation Act, the Archaeological Resources Protection Act, and related legislation.

Educate and involve the public in the management of heritage resources in the analysis area through implementation of programs such as "Passport in Time", "Site Stewardships", "elderhostel", and others.

Involve relevant American Indian tribes in the management of heritage resources in the analysis area through their identification of "traditional cultural properties", including gathering areas and sacred sties.

Develop the educational, recreational, and economic potential of important, "high visibility" heritage sites in the analysis area through partnerships that emphasize on-site tourism, interpretation, restoration and enhancement, and protection and monitoring.

Actively share environmental and other data derived from heritage site investigations in the analysis area for use in forest ecosystem studies (e.g., fire history), environmental education, and public interpretation.

Hydrology

Goals

Physical and chemical stream characteristics, flow regimes, coarse woody debris and associated riparian system dynamics are within the historical range of variation where possible. Diverse and sustainable riparian plant communities are maintained. These characteristics and dynamics sustain riparian soil productivity. Natural flow levels are restored by managing vegetation to reflect a mixture of plant communities over the landscape.

Sustainable and diverse plant communities are maintained in the watersheds within the analysis area. They reflect historical conditions over much of the landscape which ensures adequate organic matter decomposition and nutrient cycling, as well as hydrologic function.

Desired riparian and stream morphological characteristics for riparian landtype aggregates.

Aggregate	D-50	D84	Sinuosity	Confinement	Width/ Depth Ratio	% Fines	Rosgen
2 Volcanic Rock/ Mtn. Slopes & Ridges	8-32mm MG-CG	128-512mm LC-SB	Low 1.05-1.3	Confined 1.4-2.5	4.8-10	30 - 42	A3,4 B4a

3 Metasedimentary Rock/ Mtn. Slopes & Ridges	2-8mm VFG-FG	16-128mm CG-SC	Low 1.01-1.4	Confined 1.2-3.3	8-12	34 - 46	A4, B4a
5 Mixed Colluvial Deposits	.062-32MM Silt-CG	16-128 CG-SB	Mod-High 1.02-1.5	Unconfined 2.3-5.7	NA 4-9	36 - 42	Wetlands C4, B4
10 Granitic Rock/ Mtn. Slopes & Ridges	1-4mm VCS-VFG	256-2048mm SB-LB	Low 1.02-1.1	Confined <2.7	8-15	48 - 60	A2/A5 B2/B5
11 Granitic Rock/ Rolling Uplands	1-4mm VCS-VFG	256-1024 SB-MB	Low 1.02-1.2	Confined <2.7	5-8	48 - 60	B2/B5 A2/A5
22 Granitic Rock/ Glaciated Mtn. Slopes	1-4mm VCS-VFG	128-2048mm LC-MB	Low 1.05-1.15	confined <1.7	8.5-9.4	36 - 42	A2, B2
24 Granitic Glacial Till/ Moraines	16-128mm CG-SC	256-1024mm SB-MB	Mod-Low 1.1-1.3	Mod 1.7-3.7	Low 2.2-5.2	36 - 42	B3, B2
25 Compact Loamy Glacial Till/ Moraines	16--64mm CG-VCG	128-512mm LC-SB	Low-Mod 1.1-1.3	Confined-Unconfined 1.1->10	23-33	30 - 36	B2, B3 DA, D3
27 Friable Loamy Glacial Till Moraines	.062-2mm Silt Clay Sand	8-512mm MG-SB	Unconfined- High-Mod >1.4	High- Mod >5.4	NA	28 - 60	E6, E5 B2, B3
28 Metasedimentary Rock & Till/ Glaciated Mtn . Slopes	16-256mm CG-LC	256-2048mm SB-LB	Low 1.04-1.2	Confined <2.7	10-22	26 - 40	A2, B2 A3, B3
29 Alluvial (Borolls)/ Floodplains & terraces	2-32mm CS-MG	8-256mm FG-LC	Mod-High 1.07-1.57	Unconfined	19-41	26 - 38	C4,B4 C3,B3

Insect and Disease

The Helena Forest is experiencing an epidemic of mountain pine beetle activity. It is important to accept that we cannot stop a beetle epidemic in progress. We can, however, impact the conditions that will remain after the epidemic and in localized areas change the shape of the insect activity and outcomes to provide for multiple resource objectives. We can hope that weather conditions will improve to provide conditions more conducive to tree vigor and lessen to beetle survival and expansion.

The following are desired results of various forest management practices:

Thinning: Creating a resilient stand is the best long-term way to reduce susceptibility and mortality from mountain pine beetle; tree density of around 80 basal area per acre or less is ideal (that is a spacing of 17-40' between trees depending on how big the trees are – the bigger the trees, the wider the spacing). There are many studies that show thinning greatly reduces mortality in ponderosa as well as lodgepole pine, and is most effective if done before or at the early stages of an epidemic. All currently infested trees should be removed during thinning to reduce the local source of beetles. It is important to not perform thinning, chipping, or creation of green slash piles during or immediately prior to beetle flight, as the turpenes released could attract beetles to the area and facilitate the build-up of other insects such as pine engraver.

Sanitation/Salvage: Removal of currently infested trees (sanitation) can reduce the localized beetle population. Infested trees are often those that have numerous pitch tubes but appear green. In addition to pitch tubes, a tree successfully attacked has copious amounts of boring dust in bark crevices and at the base; this dust may be hidden below the duff. Looking for beetles or larvae under the bark is the best way to identify infested trees. Infested trees should be removed from the area or burned prior to the next beetle flight. If this is not possible, infested trees should be cut into firewood lengths, the bark scored or removed, and scattered to facilitate drying. If wood must be piled in large pieces, burying it or wrapping it in tarps can mitigate beetle emergence, but are not highly recommended methods. Removal of dead trees (salvage) does not affect the beetle population or stand susceptibility, but can serve to recoup economic losses and reduce potential fire hazards. When sanitation/salvage is extensive enough to remove most or all trees, desirable regeneration can be managed for through site preparation for natural regeneration or planting (artificial regeneration).

Chemical Treatments: Pheromones and carbaryl are chemical means of protection – neither option kills enough beetles to affect a change in the epidemic, but do provide protection for healthy trees.

Synthetic pheromones are plastic caps containing a chemical that mimics the beetles' anti-aggregation signals. The capsules are stapled to trees on a grid basis for large areas (over 1 acre) or on individual trees (2-4 per tree). They are applied yearly before beetle flight. They are safe and easy to apply.

> *MCH* is for Douglas-fir beetle. It is usually 99% effective and is applied at a rate of 30/acre. Each cap generally costs $1-3. These should be put up April to late May.
> *Verbenone* is for mountain pine beetle. It is 50-100% effective and applied at 20-30/acre. They are $8-9 and should be applied late May/early June.

Carbaryl: This chemical can protect individual trees. The entire trunk must be soaked up to 5" diameter, at least 30' high. This provides 90-100% protection and needs to be applied every other year during the outbreak.

While there are anecdotal accounts of other tools, such as insecticide inserts, the use of these methods is not proven or supported by Regional entomologists for bark beetles at this time. There is work being done on a basal drench formulation of carbaryl that would make application easier, but it is not yet in use. Regardless of which treatment option is selected, currently infested trees should be removed to improve effectiveness.

Recreation/Scenery resource

Developed Recreation Goals

Maintain quality outdoor recreation facilities with a forested environment that provide for safe visitor use and enjoyment.

Manage recreation facilities (campgrounds, picnic sites, trails, etc.) in the most cost effective manner.

Develop and implement vegetative management plans for all developed recreation sties.
Provide and manage recreation facilities in compliance with accessibility standards.

Dispersed Recreation Goals

Provide a year-round range of quality outdoor recreation opportunities in an undeveloped forested environment.

Manage the Continental Divide National Scenic Trail on its' preferred location in accordance with Forest Plan direction and CDNST Environmental Assessment.

Develop and Maintain partnerships with user groups representing a variety of trail uses.

Do not increase the number of acres in the Roaded Natural ROS class.

Improve and professionally manage winter recreation opportunities to meet local demands.

Provide sufficient legal right-of-way access necessary to insure a variety of recreational uses.

Protect and manage popular dispersed recreation sites to mitigate resource damage.

Continue to recognize big game hunting as the most popular dispersed recreation activity within the Divide Landscape Area.

Proposed wilderness areas will be managed to retain their existing wilderness characteristics.

The proposed Mountain Helena National Education and Recreation Area will be managed in accordance with Forest Plan guidelines to provide a variety of semi-primitive non-motorized recreation opportunities.

Continue to manage the eligible portions of the Little Blackfoot River with emphasis on the protection of esthetic, scenic, cultural and scientific values.

Scenery Resource Goals

Landscape management will be practiced to protect the natural beauty of the Divide area, and will have special emphasis in areas seen from routes, use areas and water bodies with high recreation use. Scenery is improved over the long term as the landscape is restored to desired vegetation conditions. Vegetation is managed to maintain or improve scenic quality and forest health, as well as provide goods and services, in conformance with environmental limitations. Landscape design principles are followed to reduce contrast in form, line,color and texture and to mitigate the visual impacts of management activities.

Scenery Resource Objectives

Create natural-appearing edges on harvest units.
Shape harvest units to mimic natural openings or landform configurations in the landscape. Distribute (phase or stage) timber harvest units over time and space to create variety in forms, colors and textures. This will also help reduce negative visual impacts of vegetation management.
Minimize (evidence of) roads, landings and skyline corridors in sensitive viewing areas.
Future utility lines on National Forest land are located underground wherever feasible. If underground is not feasible, mitigate for visual quality and other resource concerns.
Scenery management is coordinated with neighboring forests Visual rehab opportunities are identified.
Rehabilitation may be achieved through alteration (unit edge modification, painting a structure, revegetation), concealment, or removal of obtrusive elements (structures, root wads, etc.).

Soils

For desired soil resource conditions, The National Forest Management Act of 1976 (16 U.S.C. 1600, Section 6C) and the Helena National Forest Plan (USDA Forest Service 1986, page II/26) direct the Forest Service to plan all management activities to sustain soil productivity. The Helena National Forest Plan provides guidance to help achieve the goal of sustaining soil productivity: “During project analysis, ground disturbing activities will be reviewed and needed mitigating actions will be prescribed”; and “Areas of decomposed granite soils will be identified and erosion control measures planned prior to ground disturbing activities" (USDA Forest Service 1986, page II/26).

The Forest Service Region 1 Manual for Soil Management (USDA Forest Service 1999; FSM 2500, Chapter 2550, R-1 Supplement 2500-99-1, Effective 11/12/1999) also furnishes guidance to help achieve the goal of maintaining or improving soil quality: "Design new activities that do not create detrimental soil conditions on more than 15 percent of an activity area. In areas where less than 15 percent detrimental soil conditions exist from prior activities, the cumulative detrimental effect of the current activity following project implementation and restoration must not exceed 15 percent. In areas where more than 15 percent detrimental soil conditions exist from prior activities, the cumulative detrimental effects from project implementation and restoration should not exceed the conditions prior to the planned activity and should move toward a net improvement in soil quality" (page 2).

Vegetation

The general desired conditions for this area are as follows:

<u>Dry Forests</u>

The dry forests are broken by slope class into 0-40% slope and slopes greater than 40%.

0-40% Slopes

These areas tend to be dominated by FRCC Strata 2 and 3. The desired condition is to maintain these areas as relatively open stands with fairly evenly spaced trees. The canopy closures will be 10-50% and older, larger trees dominate the sites. Wherever ponderosa pine or limber pine is found, it is managed to enhance the extent, size and age of these species. If ponderosa or limber pine are not present, Douglas-fir is managed to enhance the larger older trees. The areas around the larger trees are kept open; ladder fuels and dead and down fuels are not heavy under the canopy. These sites have diverse, productive understories that produce a variety of grasses and shrubs.

Slopes greater than 40%

These forests tend to be dominated by FRCC Strata 3 and 4. The desired condition is to manage these areas so that large areas are not prone to stand replacement fire at one time. Canopy closures are between 10% and 50% with little ladder fuel. Douglas-fir stands occur scattered across these slopes and are composed of different sizes and ages *within* an individual stand and *from one stand to another*. On slopes with naturally erosive soils, sparse vegetation or high shrub components, the forests can stay in a nonstocked condition for 30 to 50 years following an intense disturbance. Some of the areas with more productive soils can regenerate to trees quickly, and ladder fuels and tree regeneration can build up under canopies.

Stand appearance varies widely on these slopes. The more productive habitats (Douglas-fir/rough fescue, Douglas-fir/snowberry and Douglas-fir pinegrass for example) tend to carry fires through the understory rather than through the tree canopy. These stands have a more continuous canopy of larger trees, and the younger tree regeneration and fuels are kept thinned underneath them.

On the less productive sites (Douglas-fir/common juniper, Douglas-fir/bluebunch wheatgrass, Douglas-fir/bearberry for example), understories are sparse and have areas of bare ground between the plants. Fires tend to be carried through the tree canopy in these areas. A mosaic of stands with few trees next to stands of 30%-50% canopies are typical in the least productive areas.

Moist Forests

These forests are the more moist timbered sites and include Strata 1, 4, and 5. Douglas-fir occupies the lower elevations and lodgepole pine or less commonly, subalpine fir, dominate at the higher elevations. The desired conditions for these areas is to generally have an even distribution of age classes, in a mosaic pattern, across the mountain range.

The following age classes are desired for the purpose of reducing the fluctuations caused by vegetation change over time and to minimize the size and effect of large fires in the area. These age classes also support the Forest Plan sustained yield for timber production.

Maintain 15-30% of the area in a 0-40 year age class
Maintain 15-30% of the area in a 40-80 year age class
Maintain 15-30% of the area in a 80-120 year age class
Maintain 15-30% of the area in a 120-160 year age class
Maintain 5-15% of the area in a 160-300 year age class

Unstable, slumpy soils (LTA 14) will be managed for old growth to provide the highest stability for these areas over time. It is desired to maintain the maximum extent of seepy wet inclusions of deciduous forests possible within the wet conifer forests. For a map of sensitive soils see Chapter 4, Soils section.

Old forest is well represented in all habitat types, featuring seral lodgepole when lodgepole is limited in a watershed. High elevation moist lodgepole contains some densely stocked seedling/sapling communities to provide a diversity of age classes.

Grasslands and shrublands

Trees occupy less than 10% of grasslands and shrublands.
Leave 40% biomass at the end of the growing season. This referes to ungulate use and would not be a post-requirement for a period of one year vollowing a prescribed fire.
Maintain healthy, productive soils by incorporating natural processes such as fire where appropriate.
Maintain grass communities within the following conditions:
45-65% in highly productive diverse plant communities that represent late seral conditions;
25-45% in moderately productive diverse plant communities that reflect ungulate grazing while maintaining desirable plant species;
10-20% in lower production plant communities that reflect more intense grazing or lower productivity of soils;
Accept scattered areas with 5 – 10% of undesirable plant communities with low productivity due to grazing, tree encroachment or poor soils;

Specific Conditions by Vegetative Strata

Fire Regime Condition Class provides a framework that is reasonable to use for desired conditions, with the understanding that the reference conditions described for each vegetation type are within the capability of the ecosystem. The conditions are resilient and sustainable, within the context of potentially large changes caused by natural events. There may be large changes in forest structure and age, for example, that are not included in the descriptions for a given vegetation type. The changes are not the desired condition, ie. a condition to be managed for, but are recognized as a naturally occurring state in the ecosystem. The following tables show the reference condition described in the FRCC framework, and are used as general vegetation desired conditions.

Strata 1--Interior West Upper Subalpine Forest (SPFI2)

This strata occupies a very small acreage, approximately 385 acres (1 %) of the National Forest land in the project area. Strata 1 consists of fire group 10, which is primarily dry, upper elevation whitebark pine. The majority of this stratum is found from 6900 to 8000 feet elevation.

Desired and Current Composition

The desired and current composition of stands within this stratum in project area is as follows:

Vegetation Fuel Class	Desired Composition	Current Percent	Current Condition Compared to Desired
Early Seral	20	0	trace
Mid-Seral Closed	25	43	over-represented
Mid-Seral Open	25	0	trace
Late-Seral Open	15	0	trace
Late-Seral Closed	15	57	abundant

This strata is present only in the Tenmile area of the Tenmile EAW area.

The reference fire frequency for this setting was a 143 year mean fire interval; the current frequency is 140 years. The reference severity, which represents the amount of overstory mortality that would occur in a wildfire, is 57% while the current severity is 70%. The fire return interval is not different from the reference but the amount of tree mortality from a wildfire would be greater than what would be expected under reference conditions.

Strata 2-- Ponderosa Pine-Douglas-fir (Inland Northwest) (PPDF1)

This stratum occupies approximately 7363 acres (20%) of the National Forest land in the project area. Strata 2 consists of fire groups 1, 2, and 4, which include ponderosa pine, Douglas fir and limber pine. The majority of this stratum is within the 4800 and 6000 foot elevation and distributed throughout the lower elevations of the analysis area.

Desired and Current Composition

The desired and current composition of stands within this stratum in the project area is as follows:

Vegetation Fuel Class	Desired Composition	Current Percent	Current Condition Compared to Desired
Early Seral	15	13	similar
Mid-Seral Closed	10	24	over-represented
Mid-Seral Open	25	0	trace
Late-Seral Open	40	21	under-represented
Late-Seral Closed	10	41	over-abundant

This forest type tends to be long lived in the landscape. The desired condition for this forest type is to attain an open storied stand structure that will increase the health of remaining trees making them more resilient to pathogens. This open stand structure will also reduce the probability of crown fires by removing ladder fuels and decreasing canopy bulk density to promote the natural fire regime of high frequency, low intensity fire. The target stand identified in the Divide Landscape Analysis was to thin from below retaining larger and older individuals. This setting requires frequent maintenance treatments to ensure that open stand conditions are sustained over time.

The reference fire frequency for this setting was a 22 year mean fire interval; the current frequency is 70 years. The reference severity, which represents the amount of overstory mortality that would occur in a wildfire, was 24% while the current severity is 70%. Both the fire return interval and severity are very different from reference conditions. The amount of tree mortality from a wildfire would be substantially greater than what would be expected under reference conditions.

Strata 3 Douglas-fir Interior Northern and Central Rocky Mountains Biophysical Setting (DFIR2)

This strata occupies approximately 6114 acres (16%) of the National Forest land in the project area. This biophysical setting has been split into two stratas. Strata 3 represents the drier end of the setting, and consists of fire groups 5 and 6D, which is dominated by Douglas fir with lodgepole on the more moist aspects. The majority of this stratum is within the mid elevation zones and occurs on all aspects within the analysis area.

Desired and Current Composition

The current composition of stands within this stratum in project area is as follows:

Vegetation Fuel Class	Desired Composition	Current Percent	Current Condition Compared to Desired
Early Seral	15	3	trace
Mid-Seral Closed	25	23	similar
Mid-Seral Open	20	0	trace
Late-Seral Open	25	12	under-represented
Late-Seral Closed	15	62	over-abundant

This stratum is dominated by Douglas-fir with a mix of other species. Ponderosa pine may occur as an incidental species on some warmer aspects while lodgepole may be present on more moist aspects. When contrasted with the reference condition of the Fire Regime Condition Class, the late seral (ELSC) has substantially higher acreage than would occur historically, while the mid (CMSO) and late seral open (DLSO) have fewer acres. This forest type tends to be long lived in the landscape. “Open” is considered less than 50% canopy cover in this setting.

The desired condition for this forest type is to attain an open storied, patchy stand structure that will increase the health of remaining trees making them more resilient to pathogens. This open stand structure will also reduce the probability of crown fires by removing ladder fuels and decreasing canopy bulk density to promote the natural fire regime of high frequency, low intensity fire. The target stand identified in the Divide Landscape Analysis was to thin from below retaining larger and older individuals.

The reference fire frequency for this setting was a 30 year mean fire interval; the current frequency is 70 years. The reference severity, which represents the amount of overstory mortality that would occur in a wildfire, was 10% while the current severity is 70%. Both the fire return interval and severity are very different from reference conditions. The amount of tree mortality from a wildfire would be substantially greater than what would be expected under reference conditions.

Strata 4 Douglas-fir Interior Northern and Central Rocky Mountains Biophysical Setting (DFIR2)

This strata occupies approximately 4636 acres (12%) of the National Forest land in the project area. Strata 4 represents the more moist conditions in this setting, and consists of fire group 6W, which is primarily Douglas fir and lodgepole pine mixed forests. This strata is distributed throughout the project area, mid to high elevations and all aspects.

Desired and Current Composition

The desired and current composition of stands within this stratum in project area is as follows:

Vegetation Fuel Class	Desired Composition	Current Percent	Current Condition Compared to Desired
Early Seral	15	5	under-represented
Mid-Seral Closed	25	33	similar
Mid-Seral Open	20	< 1	trace
Late-Seral Open	25	< 1	trace
Late-Seral Closed	15	61	over-abundant

This strata represents a transition from the warmer and drier forest types to a cooler climate where lodgepole pine begins to dominate stand composition. This type also represents a transition from frequent lower intensity fires to more infrequent, but higher intensity fire behavior.

This stratum is dominated by lodgepole pine with Douglas-fir intermixed. When contrasted with the reference condition of the Fire Regime Condition Class, the late seral (ELSC) vegetation fuel class has substantially higher acreage than would occur historically, while the mid (CMSO) and late seral open (DLSO) vegetation fuel classes are rare. The early seral stage (AESP) is also rare in this setting. “Open” is considered less than 50% canopy cover in this setting.

The desired condition for this forest type is to attain an open storied, patchy stand structure that will increase the health of remaining trees making them more resilient to pathogens. This open stand structure will also reduce the probability of crown fires by removing ladder fuels and decreasing canopy bulk density to promote the natural fire regime of high frequency, low intensity fire. The target stand identified in the Divide Landscape Analysis was to thin from below retaining larger and older individuals.

The reference fire frequency for this setting was a 30 year mean fire interval; the current frequency is 70 years. The reference severity, which represents the amount of overstory mortality that would occur in a wildfire, was 10% while the current severity is 70%. Both the fire return interval and severity are very different from reference conditions. The amount of tree mortality from a wildfire would be substantially greater than what would be expected under reference conditions.

Strata 5--Interior West Lower Subalpine Forest (SPFI1)

This strata occupies approximately 16,055 acres (43%) of the National Forest land in the project area. This is the dominant setting in the area. Strata 5 consist of fire groups 7, 8, and 9, which is primarily lodgepole pine and subalpine fir/spruce forest. This setting is at higher elevations and occurs on all aspects.

Desired and Current Composition

The desired and current composition of stands within this stratum in project area is as follows:

Vegetation Fuel Class	Desired Composition	Current Percent	Current Condition Compared to Desired
Early Seral	20	8	under-represented
Mid-Seral Closed	35	33	similar
Mid-Seral Open	15	0	trace

Vegetation Fuel Class	Desired Composition	Current Percent	Current Condition Compared to Desired
Late-Seral Open	10	1	trace
Late-Seral Closed	20	57	over- represented

This stratum represents the subalpine fir forest habitat type residing in cooler and more moist climates. Fires tend to be infrequent and high intensity. When contrasted with the reference condition of the Fire Regime Condition Class the landscape contains substantially more acres currently in a late seral closed canopy (ELSC) that should be in a mid or late seral open canopy condition.

Lodgepole pine is a dominant seral species in this forest type, and it would be difficult to maintain this type in a late seral open stand condition due to the tendency of lodgepole pine to naturally regenerate. On a site specific individual tree basis structural diversity will be maintained where appropriate.

The reference fire frequency for this setting was a 111 year mean fire interval; the current frequency is 140 years. The reference severity, which represents the amount of overstory mortality that would occur in a wildfire, was 67% while the current severity is 75%. Neither the frequency nor the severity are substantially different from reference conditions. A wildfire would not behave uncharacteristically due to those factors. The disparity of the vegetation-fuel classes to the reference composition would likely cause greater overstory mortality than under reference composition.

Strata 6-- Mountain Grassland with Shrubs (MGRA3)

This strata is approximately 2771 acres (7%) of the National Forest land in the project area. Strata 6 consists of fire group 20, which is grassland and currently has less than 10% timber canopy. This strata occurs on all elevations, predominantly on warm dry aspects.

Current, Reference and Reference Composition

The current composition of stands within this stratum in project area is as follows:

Vegetation Fuel Class	Desired Composition	Current Percent	Current Condition Compared to Desired
Early Seral	5	0	under-represented
Mid-Seral Closed	90	100	similar
Mid-Seral Open	5	0	
Late-Seral Open	0	0	
Late-Seral Closed	0	0	

There are four different grassland/shrubland types across the mountain range. Sufficient annual biomass will be left on site in all these communities to provide nutrient recycling and soil productivity. Native species of grass are restored to the extent possible and introduced and weedy species are reduced. A mixture of seral communities will be represented across all types. Low productivity and diversity sites will be present but limited on the landscape. Herbaceous biomass production is increased on all grassland sites and under open forest canopies. Grasslands under open forest canopies also have an increase in plant diversity. Emphasis will be placed on managing for those communities that provide for soil desired conditions described above.

The desired condition for these areas is to reclaim the historic boundary between grasslands/shrublands and the conifers, to the boundary which would have been maintained by fire. This boundary is determined for grassland areas by true grassland vegetation and mollic soil horizons. Within the grassland boundaries the desire is to have less than 10% of the area occupied by conifers. These are the most productive grasslands in the area. They tend to occupy the upper one third of the slopes as well as ridgetops, and occur in deeper more productive soil. Rough fescue and bluebunch wheatgrass are the desired species to have dominating these areas. Grasslands in this area are dominantly rough fescue/Idaho fescue, rough fescue/bluebunch wheatgrass and bluebunch wheatgrass habitat types (Mueggler and Stewart, 1980).

Conifer encroachment into historic grasslands changes native plant diversity, soil productivity and herbaceous productivity (ref) by reducing available water, sunlight and nutrients. This has happened throughout the grasslands in this area. Conifer encroachment since the 1930's can be seen using historic aerial photos as well as range mapping shown on 1945 range survey maps. Historically, grasslands had a high frequency fire regime.

Strata 7 Shrubland

This strata occupies a small percentage of the National Forest land in the project area (less than 1%). Strata 7 consists of fire group 30 plus on the ground mapping of existing sagebrush and bitterbrush communities. This strata occurs at all elevations and is found on warm dry aspects. This strata has yet to be identified for site specific location, but it is known to exist on the landscape.

Current and Reference Composition

The current composition of stands within this stratum in project area is as follows:

Vegetation Fuel Class	Reference Percent	Current Percent	Current Status
Early Seral	20	unk	unk
Mid-Seral Closed	35	unk	unk
Mid-Seral Open	15	unk	unk
Late-Seral Open	10	unk	unk
Late-Seral Closed	20	unk	unk

Less than 1% of the analysis area is currently mapped as sagebrush habitat types. The sagebrush habitat types present are mountain big sagebrush (*Artemisia tridentata* var. *vaseyana*)/rough fescue (*Festuca scabrella*) or mountain big sagebrush/bluebunch wheatgrass (*Pseudoroegenaria spicatum)*. This area does not support a thriving sagebrush community so it is important to protect and expand the sagebrush distribution to more closely represent the distribution that is represented on historic maps and photos at a minimum.

Bitterbrush is very limited on the Helena Forest generally and the populations that exist in this area are relatively healthy. The bitterbrush habitat type present is antelope bitterbrush (*Purshia tridentata*)/rough fescue (*Festuca scabrella*) or mountain big sagebrush/bluebunch wheatgrass (*Pseudoroegenaria spicatum)*. The Sweeney creek area supports one of the larger bitterbrush communities on the Forest. Invasion of noxious weeds (spotted knapweed and sulfur cinquefoil) is the biggest threat to these communities.

The shrublands generally occupy the transition zone between the true grasslands and the conifer areas. The areas which this desired condition applies to are those which were occupied by shrubs under a fire regime. The mix of grassland and shrubland occurs as a mosaic. The desired condition is to have an abundance of shrubs such as chokecherry, serviceberry, skunkbush, rabbitbrush, antelope bitterbrush and sagebrush within these areas. Healthy, vigorous native bunchgrasses are interspersed through these shrub communities, providing high soil productivity and protection from erosion. The shrub species have a variety of age classes.

Bare soil is less than 20%, litter is high and the species present are vigorous in both grass and shrub dominated areas.

Shrub components are maintained and enhanced in mesic areas, particularly on warmer aspects. Their composition includes shrubby cinquefoil, willow, dogwood, chokecherry, Rocky Mountain maple and aspen.

Special Plant Species, Plant Communities, Unique Habitats

The desired condition is to restore and maintain an abundant distribution and health of the following species, within the appropriate sites. The appropriate site is determined through a variety of methods: on the ground observations, historic phots or maps, site potential mapping, etc.

Quaking aspen, particularly in riparian areas and near seeps and springs.
Mountain mahogany
Antelope bitterbrush
Sagebrush
Ponderosa pine
Limber pine
Whitebark pine

Restore and maintain an abundant distribution and health of the following communities, within the appropriate sites. The appropriate site is determined through a variety of methods: on the ground observations, historic photos or maps, site potential mapping, etc.

All deciduous vegetation
Wet meadows
Grasslands
Shrublands

Weeds

Noxious weeds are recognized as one of the biggest threats to sustaining native ecosystems that exist today. The desired condition is to confine and reduce the present infestations of noxious weeds in the mountain range. Further infestation will be prevented from occurring or spreading. Ground disturbing activities will be followed with active reseeding efforts and herbicide application of noxious weeds within and as necessary, adjacent to the disturbed area. Integrated pest management which utilizes biological, chemical and mechanical control measures will be utilized as appropriate.

Wildlife

Dry Forests

On slopes less than 40%, the desired condition includes maintaining relatively open stands with fairly evenly spaced trees. Canopy closure will range from 10% to 50%, and older, larger trees will dominate. These sites will have diverse, productive understories with a variety of grasses, forbs, and shrubs. On slopes greater than 40% the desired condition is to maintain large areas not prone to stand replacement fire at one time. Canopy closures are between 10 and 50%. Douglas fir stands occur scattered across these slopes and are composed of different sizes and ages within and between stands.

These conditions are expected to support viable populations of all native and desirable non-native wildlife species endemic to dry forests in the Tenmile analysis area. Particular attention will need to be paid to the habitat needs of species of special concern, priority species, and featured management species to ensure that the particular habitat components they require are in place within this general habitat framework.

Moist Forests

Desired conditions on slopes less than 40%
Single overstory canopies with trees occurring at varying densities. Open parks and meadows are randomly scattered throughout. Snags and downed woody debris are large in diameter and are well represented. Fire is applied to these forests to provide charred wood and scattered stressed trees in order to provide habitat for those species that require those characteristics

Desired conditions on slopes over 40%
Snags exist in smaller patch sizes which occur frequently. Age classes of the overstories are managed in a relatively even flow through time. Snag size and height are generally larger with broken tops. Downed woody debris are available. Tree canopies range from 0-90% closure, providing open areas for foraging and closed areas for cover. Edge habitat is plentiful, but edge is shallow.

Upper Subalpine Forest: Whitebark Pine

Restore and maintain an abundant distribution and health of the whitebark pine within the appropriate site (generally about 7000 feet).

Grasslands

Grasslands are restored to their fire-maintained boundaries. Expansion would result in less competition for available niches. Habitat generalists would lose a competitive edge as habitat specialists are favored. True grassland wildlife species increase in abundance and distribution.

Shrublands

Maintain healthy montane shrubland

Shrublands (e.g. sagebrush, bitterbrush) on gentle to moderate slopes will generally occupy that transition zone between the true grasslands and the conifer areas that were originally maintained under a fire regime. Shrub communities will be interspersed with native bunchgrasses and the shrubs will have a variety of age classes.

Shrublands on steep, loose shale slopes will be abundant and consist of a variety of age classes. Some shrub communities will exist within forested areas to the extent that the canopy closures will permit.

Shrubland Habitat Objectives for Brewer's Sparrow**.**
The species is vulnerable to parasitism by Brown-headed Cowbirds, especially where the sagebrush landscape has been broken up by agriculture and pastures. Reductions in sagebrush cover and vigor from control actions such as burning or herbicides will reduce or eliminate habitat suitability for the species. The long-term viability of the species in Montana will depend on the maintenance of large stands of sagebrush in robust condition throughout the species' range in the state. Wide distribution of suitable habitat is essential, due to their tendency toward site fidelity.

Unmapped Stand Level Habitats

Aspen

Aspen are found, well dispersed, in riparian and other wet areas and they have age and structural diversity.

Riparian Habitat

Riparian areas are maintained or improved to provide a variety of successional stages of vegetation within close proximity of each other sufficient to provide numerous niches for wildlife.

Beaver are an important riparian species in terms of creating diverse habitat within riparian areas. They function as they did historically in designated stream areas. Beaver reintroductions are coordinated with the transportation system and other resources.

Riparian Deciduous Forest (Cottonwood/Aspen)

Wherever possible, maintain the dynamic nature of floodplains to accommodate all successional stages of cottonwood forest. Over time, this will require both protection of existing stands and recruitment of younger trees.

Dead Tree Aggregations

Dead Tree Habitat Objectives for Black-backed Woodpeckers**.**
Mature and old-growth forests containing patches of beetle infested trees may provide adequate habitat to support baseline populations of Black-backed Woodpeckers when burned areas are not available. In mature and old-growth lodgepole pine forests, bark-beetle outbreaks occur every 30-40 years, killing proportionately more large-diameter than small-diameter trees. These trees are likely to be more valuable for black-backed Woodpeckers.

Manage to ensure that fire, insect, or wind are allowed to regularly disturb habitat throughout space and time. Habitats should be protected for at least three years after disturbance occurs.

Salvage logging operations in burned habitats should be managed to provide adequate supplies of l wood-boring beetles.

Dead Tree Habitat Objectives for Three-toed Woodpeckers**.**
This species is dependent on fire and/or insects to provide preferred nesting and feeding habitat.. Mature and over-mature forested stands are important habitats for three-toed woodpeckers because the abundance of wood-boring insects increases with increasing tree size and age.

Dead Tree Habitat Objectives for Townsend's Solitare**.**
This species should be well monitored by count-based monitoring.

Dead Tree Habitat Objectives for Hairy Woodpecker**.**
No specific management recommendations.

- Expand the opportunity for allowing lightning fires to burn or igniting fires when conditions permit.
- Provide a continual supply of burned areas
- Have 1-2% of landscape in recently burned conditions with at least 1% left untreated.

Continental Divide Linkage Zone

The MacDonald Pass area including Tenmile represents an isthmus of public land that is bisected by U.S. Highway 12 and private inholdings. The uncertainty of development on private land in this area accentuates the potential importance of wildlife linkage habitat.

The desired condition for Tenmile would be to continue to provide unimpeded wildlife movement.

CHAPTER FIVE: Individual Resource Area Recommendations

Fire Management

Recommendations

Creating a heterogeneous landscape with a variety of age classes or vegetation-fuel classes that feature the desired species composition remains a goal in creating a fire resilient landscape. In that, regional and national protocols prioritize treatments within the warm, dry forest types or the wildland-urban interface. Treatments within municipal watersheds are also a priority based on HFRA (Healthy Forests Restoration Act). Across all timbered biophysical settings within the Tenmile watershed area, there is a large proportion classified as late seral closed. Not only does this represent a larger percentage in this vegetation-fuel class than was present historically or has been identified for the desired future condition, but contiguous areas of the landscape that are late seral closed represent the potential for large tracts of stand-replacing fire should a start occur. The following recommendations reflect current data for the existing conditions.

<u>Colorado Gulch</u>

Strata 1 does not occur in this HUC.

Strata 2 is mostly represented by the mid-seral closed and late seral closed vegetation-fuel classes. Because this stratum represents 30 percent of the Colorado Gulch HUC and includes ponderosa pine which remains a designated priority species where it occurs, treatments within this stratum should focus on creating open stands by decreasing canopy closure. By opening the canopy the critical surface flamelength and critical surface intensity will be increased, thereby increasing the resistance of these stands to crown fire. The late seral open vegetation-fuel class composes approximately 18 percent of this BpS and should be treated to retain the open character of these late seral stands. This BpS also borders private lands at lower elevations. This stratum is represented by fuel models 1 (1,894 acres) and 2 (407 acres).

Strata 3 composes 24 percent of this HUC and is mostly represented by mid-seral closed and late seral closed vegetation-fuel classes. This biophysical setting is predominantly Douglas-fir. Treatments within this stratum should focus on creating open stands by decreasing canopy closure and removing ladder fuels. By opening the canopy the critical surface flamelength and critical surface intensity will be increased, thereby increasing the resistance of these stands to crown fire. This stratum is represented by fuel models 5 (97 acres) and 8 (1,752 acres).

Strata 4 represents a smaller portion of the HUC at 10 percent. Douglas-fir remains the principal species although lodgepole pine is often present as a codominant. Treatments are similar to those proposed for stratum 3. This stratum is represented by fuel models 8 (245 acres) and 10 (533 acres).

Strata 5 makes up 10 percent of this HUC and is composed of subalpine species including subalpine fir, lodgepole pine, and possibly Engelmann spruce and whitebark pine. This stratum has no acres in early seral and is entirely composed of mid-seral closed and late seral vegetation fuel classes. It is advisable to create more mid-seral open, late seral open, and early seral vegetation-fuel classes on the landscape in order to heighten age class diversity. This mosaic will influence fire behavior by increasing critical surface fire intensity and critical surface fire flamelength which reduces the potential for a surface fire to transition to a crown fire. Heterogeneous stands also limit potential undesirable fire effects to smaller portions of the landscape. This stratum is represented by fuel models 5 (10 acres), 8 (522 acres), and 10 (1,059 acres).

Strata 6 includes mountain grasslands that compose 14 percent of this HUC. Burning within these parks will remove conifer encroachment and rejuvenate graminoid and forb growth. This stratum is represented by fuel model 1 (1,042 acres).

Tenmile Creek

Strata 1 is only slightly represented within the watershed area and only occurs within 2 percent of the Tenmile HUC. It is recommended to move acres from mid-seral closed to mid-seral open and late seral closed to late seral open to protect these stands should a fire occur and increase structural diversity. This stratum is represented by fuel models 8 (166 acres) and 10 (219 acres).

Strata 2 is mostly represented by the late seral closed vegetation-fuel class. Although this stratum represents only 8 percent of the Tenmile HUC, ponderosa pine remains a designated priority species where it occurs. Therefore, treatments within this stratum should focus on creating open stands by decreasing canopy closure and removing ladder fuels. By opening the canopy the critical surface flamelength and critical surface intensity will be increased, thereby increasing the resistance of these stands to crown fire. The late seral open vegetation-fuel class composes approximately 17 percent of this BpS and should be treated to retain the open character of these late seral stands. This BpS also borders private lands at lower elevations. This stratum is represented by fuel models 1 (1,317 acres) and 2 (334 acres).

Strata 3 composes 16 percent of this HUC and is mostly represented by mid-seral closed and late seral closed vegetation-fuel classes. This biophysical setting is predominantly Douglas-fir. Treatments within this stratum should focus on creating open stands by decreasing canopy closure and removing ladder fuels. By opening the canopy the critical surface flamelength and critical surface intensity will be increased, thereby increasing the resistance of these stands to crown fire. The late seral open vegetation-fuel class composes approximately 12 percent of this BpS and should be treated to retain the open character of these late seral stands. This stratum is represented by fuel models 5 (547 acres) and 8 (2,710 acres).

Strata 4 represents a smaller portion of the HUC at 12 percent. Douglas-fir remains the principal species although lodgepole pine may be present as a codominant. Treatments are similar to those proposed for stratum 3 except that this BpS currently lacks late seral open. This stratum is represented by fuel models 2 (152 acres), 8 (664 acres), and 10 (1,472 acres).

Strata 5 is essentially composed of mid-seral closed and late seral closed vegetation fuel classes. It is advisable to create more mid-seral open, late seral open, and early seral vegetation-fuel classes on the landscape in order to heighten age class diversity. This mosaic will influence fire behavior by increasing critical surface fire intensity and critical surface fire flamelength which reduces the potential for a surface fire to transition to a crown fire. Heterogeneous stands also limit potential undesirable fire effects to smaller portions of the landscape. This stratum represents 56 percent of the Tenmile Creek HUC. This stratum is represented by fuel models 5 (774 acres), 8 (3,943 acres), and 10 (6,396 acres).

Strata 6 includes mountain grasslands that compose 6 percent of this HUC. Burning within these parks will remove conifer encroachment and rejuvenate graminoid and forb growth. This stratum is represented by fuel model 1 (1,110 acres).

Walker Gulch

Strata 1 does not occur in this HUC.

Strata 2 is almost equally represented by early seral, mid-seral closed, late seral open, and late seral closed vegetation-fuel classes. Because this strata represents 34 percent of the Walker Gulch HUC and includes ponderosa pine which remains a designated priority species where it occurs, treatments within this stratum should focus on creating and maintaining open stands by decreasing canopy closure and removing ladder fuels. By opening the canopy the critical surface flamelength and critical surface intensity will be increased, thereby increasing the resistance of these stands to crown fire. The late seral open vegetation-fuel class composes approximately 26 percent of this BpS and should be treated to retain the open character of these late seral stands. This BpS also borders private lands at lower elevations. This stratum is represented by fuel models 1 (1,586 acres) and 2 (1,825 acres).

Strata 3 composes 10 percent of this HUC and is mostly represented by late seral open and late seral closed vegetation-fuel classes. This biophysical setting is predominantly Douglas-fir. Treatments within this stratum should focus on creating and maintaining open stands within currently closed stands by decreasing canopy closure and removing ladder fuels. By opening the canopy the critical surface flamelength and critical surface intensity will be increased, thereby increasing the resistance of these stands to crown fire. The late seral open vegetation-fuel class composes approximately 22 percent of this BpS and should be treated to retain the open character of these late seral stands. This stratum is represented by fuel models 5 (252 acres) and 8 (756 acres).

Strata 4 represents a smaller portion of the HUC at 16 percent. Douglas-fir remains the principal species although lodgepole pine may be present as a codominant. Treatments within this stratum should focus on creating open stands by decreasing canopy closure and removing ladder fuels within mid-seral closed and late seral closed vegetation-fuel classes. By opening the canopy the critical surface flamelength and critical surface intensity will be increased, thereby increasing the resistance of these stands to crown fire. This stratum is represented by fuel models 2, (157 acres), 8 (602 acres), and 10 (811 acres).

Strata 5 is composed of early seral, mid-seral closed, and late seral closed vegetation fuel classes. It is advisable to create more mid-seral open and late seral open vegetation fuel classes on the landscape in order to heighten age class diversity. This mosaic will influence fire behavior by increasing critical surface fire intensity and critical surface fire flamelength which reduces the potential for a surface fire to transition to a crown fire. Heterogeneous stands also limit potential undesirable fire effects to smaller portions of the landscape. This stratum represents 34 percent of the Walker Gulch HUC. This stratum is represented by fuel models 5 (762 acres), 8 (906 acres), and 10 (1,683 acres).

Strata 6 includes mountain grasslands that compose 6 percent of this HUC. Burning within these parks will remove conifer encroachment and rejuvenate graminoid and forb growth. This stratum is represented by fuel model 1 (619 acres).

Fire/Fuels Data Needs

Data needed for fire behavior modeling include fuel model, canopy base height, canopy bulk density, stand height, slope, species composition, and canopy closure. This data will provide the necessary inputs to run Behave, Farsite, and FlamMap fire behavior modeling programs plus the Fire and Fuels Extension of the Forest Vegetation Simulator (FVS-FFE). Some of these attributes (slope, vegetation-fuel class as a rough proxy for canopy closure, and strata used as a proxy for species composition) can be queried from the FRCC data for the Tenmile watershed. In addition, a fuel model map is available for the watershed area. The same data are needed for private inholdings in the watershed area in order to model landscape fire behavior. This task would best be accomplished as a photo interpretation exercise by fire personnel with quality assurance/quality control provided by an expert forestry technician.

Systematic Sample

Field data collection for fire/fuels is necessary to gather data and validate existing data within the Tenmile 6th-code HUC (hydrological unit code). The Hawthorne extension was used in ArcMap to apply a 1000m x 1000m grid to the Tenmile HUC. Plot locations on private land were disregarded which resulted in 81 plots located on the HNF, as shown below.

Data collected at each plot will include a plot description and tree data. Plot description data will include GPS coordinates, elevation, GPS error, aspect, slope, fuel model, cover type, canopy closure (%), vertical slope shape, horizontal slope shape, and understory average height and cover. Tree data information will include species, tree status (live, sick, or dead), DBH (in.), height (ft), live crown (%), and crown class. Tree data will be collected on 0.01-ac plots and will include trees greater than the breakpoint diameter of 4 inches. Seedling and sapling counts will be summarized by a range (low = 0-25, moderate = 26-50, high = 51-100, and very high = >100). The summarized data will yield trees per acre, basal area (ft^2/ac), canopy base height, average tree height, and damage by insects or diseases. Canopy bulk density will be determined using the FVS-FFE.

Fuel loading data will be collected for 25 percent of the plots based on modified Brown's planar intercept. A minimum of 3 transects will be installed per plot. The summarized data will yield tons per acre for 1-, 10-, 100-, and 1000-hr timelag fuels, duff, and litter.

Strata, vegetation-fuel class, and fuel model will be verified at each plot. Discrepancies between the modeled and actual values will be rectified utilizing plot data.

Fisheries

There are a number of opportunities to implement actions that will reduce the impacts to fish habitat from past minerals extraction activities, past road construction, and past timber harvest), ongoing actions (dewatering of portions of Tenmile Creek), road maintenance, and to a lesser degree livestock grazing and recreation, or future proposed activities such as fuel treatments, timber harvest, fish/watershed improvements.

The top priority recommendation in the portion of the Tenmile drainage currently under analysis, from a fisheries perspective, would be to have adequate instream flows to support a recreational fishery in lower Tenmile Creek and to work in cooperation with others to decrease the negative effects from past mining.

Reduce the impact of our existing road system on fish habitat by using road segments identified as high and moderate watershed risk in the roads analysis as the means to direct priority for road improvements.

Cooperate with other government agencies, watershed groups, and individual local landowners in partnership efforts of varying types. An example would be developing fish passage for the Moose Creek culvert crossing on Tenmile Creek associated with the Forest Highway to Rimini. Another would be partnership efforts with the city, county and state on mine clean-up actions.

Importantly it should be noted that compared to some other watersheds on the Forest the priority for conducting fish improvements in the Tenmile drainage are relatively low. Desired conditions for fisheries include: maintaining adequate flow in Tenmile Creek to better support a recreational fishery, remove manmade barriers to fish movements, reduce sediment delivery from roads especially the roads that were categorized as high risk during the Forest Roads Analysis, reduce impacts from livestsock grazing on Forest Service administered lands, improve habitat to increase recreational fishing potential. To date the potential for managing for westslope cutthroat trout has not been discussed with the MDFW&P. Clearly within the portion of the Tenmile Creek watershed currently being analyzed the opportunities to manage for cutthroat trout are very limited.

Grazing

The primary recommendation from a grazing standpoint would be to update allotment management plans in the EAWA area. Conifer encroachment should be removed where native grasslands and shrublands are disappearing. Riparian areas should be assessed and protected as needed.

Heritage

The key theme among all DFC objectives was to manage and protect heritage sites for the benefit of the resource alone, rather than simply to facilitate a ground-disturbing project or undertaking. American Indian consultation; public involvement and education; and resource integration were also stressed. Various and quite general management opportunities are listed in the landscape analysis and need not be repeated here. However, included below are more site-specific management opportunities (and task list) for significant heritage properties located on the Helena National Forest lands in the Ten Mile watershed analysis area.

Chessman-City of Helena (CHWD) historic municipal water ditch system (24LC1868)

- Consider effects of all forest, forest-permitted or cooperative projects (i.e., EPA Superfund cleanup; Moose Creek Villa recreation tract analysis; FHA Rimini road paving proposal)
- Conduct ditch-flume restoration as necessary; enlist public volunteers when feasible (i.e., Passport in Time [PIT] program)
- Complete annual inspections and maintenance (i.e., brush removal atop rock walls; restack walls and flume supports)
- Interpret the water system where feasible (consider doing this in conjunction with other Ten Mile sites--a “family of signs” concept)
- Involve private land owners and City of Helena in the protection, preservation and enhancement of this important linear feature
- Nominate the CHWD to the National Register of Historic Places (NRHP)
- Develop a CHWD historic preservation plan (HPP) and follow HPP guidelines

Historic lode mine complexes (various site #s)

- Consider effects of all forest, forest-permitted or cooperative (i.e., EPA) projects
- Complete annual monitoring, structural inspections and critical maintenance at significant properties-structures (i.e., Valley Forge tram towers)
- Integrate historic preservation objectives into mine reclamation projects, with retention as the preferred management option for significant properties
- Implement fuels projects to help protect flammable buildings and structures
- Consider road-trail access to significant mines for public visitation during travel planning (i.e., Beatrice, Valley Forge)
- Conduct ruin stabilization as necessary; enlist public (PIT) volunteers as appropriate
- Interpret (via on- and off-site media) historic lode mine sites and features where appropriate (i.e., Valley Forge tram system and towers near Rimini); incorporate into a Ten Mile family of signs as feasible
- Nominate significant lode mine properties to the NRHP and develop and follow guidelines in an HPP
- Incorporate Rimini mining ruins into local or regional mining interpretation (brochures, auto tours).
- Involve Rimini community and other interested parties in development of mining history opportunities in the Ten Mile watershed

Helena-Red Mountain Branch Line (24LC1268)

- Consider effects for all forest, forest-permitted (i.e., Northwest Energy power line clearing) or cooperative (i.e., EPA Superfund) projects
- Complete annual monitoring and maintenance (i.e., remove brush, saplings growing atop or within the rock walls; remove paint graffiti)

- Conduct ruin (rock wall) stabilization as necessary
- Nominate to NRHP and complete an HPP
- Consider designation of the railroad grade as a forest trail in travel planning; evaluate for non-motorized and motorized recreation use
- Complete on-and off-site interpretation for the historic railroad grade, as appropriate (i.e., in Moose Creek Campground signing; family of signs)
- Work with local residents to preserve and interpret the round-house, station and aerial tram ruins on private land in Rimini

Moose Creek Ranger Station (24LC1608)

- Complete restoration of ranger station (garage, cellar, fence, footbridge)
- Complete fuels reduction (thinning) projects around complex; plant aspen and other vegetation as a road/dust screen
- Insure that EPA restores the site area just north of the cabin which is being used to house trailers and stockpile dirt; include heritage resource concerns in stock pile area restoration plan
- Nominate to NRHP and complete an HPP
- Complete annual monitoring and routine maintenance
- Include in cabin rental program but allow for use as an outdoor education-historic interpretation facility; encourage use by civic and community groups
- Complete on- and off-site interpretation, as appropriate; integrate with other signing (family of signs concept)
- Install potable water supply (well)
- Consider development of trail from ranger station to Colorado Mountain and former lookout site

Moose Creek Villa Recreation Residence Tract & Cabins (various site #s)

- Provide heritage information for recreation residence continuance review (RRCR) process
- Determine National Register-eligibility of tract and component buildings using Regional context
- Complete heritage inventory of residential tract (i.e., determine if archaeological or other sites are present—CMWD is located in tract)
- For historically significant cabins, determine compatibly with site and permit requirements in accordance with the RRCR process
- Encourage permittee (or FS) fuels reduction projects around cabins, as determined appropriate by forest fuels management staff

CCC Camp Rimini-WWII Dog Training Facility (24LC935)

- Consider effects of all forest, forest-permitted or cooperative projects (i.e., snowmobile club use of/projects in parade grounds)
- Complete annual monitoring and maintenance (i.e., remove brush atop building pads, rock walls)
- Nominate to NRHP and develop HPP
- Enhance-stabilize resource as appropriate (i.e., define trails to various building sites that has a designation marker and is keyed to a brochure-map)
- Complete on-and off-site interpretation for facility, as appropriate (i.e., in Moose Creek Campground signing; family of signs)
- Enlist assistance and support of Fort Harrison Military Museum in interpretation of the WWII facility

Hydrology

No specific recommendations were made.

Recreation/Inventoried Roadless/Social

Place Moose Creek cabin on the rental program

Construct a new trail from Moose Creek Cabin to Colorado Mountain

Increase interpretive services and sites

Improve accessibility
Construct bridge to access Switchback Ridge trail

Increase parking areas for heavily used trailheads

Pedestrian bridge from parking area to rental cabin (visit with Carl)

Emphasize administration of special use permits

Provide adequate public access to varied of recreation opportunities

Improve trails to meet established standards

Vegetative management plans should be developed and implemented for developed recreation sites.

Soils

During evaluation of new project proposals, there is need to consider potential for soil cumulative effects and need for Best Management Practices (BMPs) when planning projects that sustain soil productivity.

Soil cumulative effects are possible where new management activities are proposed for the same areas that have been treated in the past. Existing soil conditions should be field validated in such areas. Time for this field evaluation will need to be allocated in the project-planning schedule.

Where potential for cumulative effects is documented through field evaluation of baseline soil conditions in past management activity areas, restoration actions may be warranted. Also, where significant soil cumulative effects are possible, a Categorical Exclusion NEPA process may not be suitable for new project proposals. Thus, an EA or other NEPA analysis process may be needed in these circumstances.

Best Management Practices (BMPs) or special mitigation measures should be prescribed, especially for soil types that are “sensitive” to disturbance, to minimize detrimental soil impacts with proposed management actions. There are 32 soil types in the Ten Mile NFMA analysis area that are “sensitive” to disturbance. These “sensitive” soil types typically require special project design or mitigation measures to minimize detrimental soil effects. “Sensitive” landtypes in the Ten Mile NFMA analysis area fall into 5 categories (Table 2):

1. Landslide soils, and colluvial or moraine deposits
2. Loess surface soils influenced by volcanic ash
3. Granitic soils
4. Wet soils
5. Soils formed on floodplains, stream terraces, and alluvial fans.

Landslide-prone soils may be at risk for landslides following disturbance. Soils formed from colluvial or moraine deposits may be prone to slumping with specific types of disturbance. The risk of landslides or localized slumping following management activities in these areas can be minimized through project / treatment design:

- Retain partial vegetation cover, including tree canopy and understory shrubs, on these soils (i.e. do not remove all vegetation cover);
- Thin trees using full-suspension yarding methods (helicopter);
- Avoid or minimize road construction on these soil types, especially cut and fill or full bench construction methods.

Both loess surface soils that are influenced by volcanic ash and granitic soils can be highly erodible. The Helena Forest Plan directs, "highly sensitive granitic soils…will have first priority for soil erosion control" (page II/26). Erosion can be minimized on these highly erodible soil types by maintaining adequate soil cover following management treatments. As a rough rule of thumb, at least 50% soil cover should be maintained on slopes less than 35%, and greater soil cover should be maintained on steeper slopes. Soil cover includes vegetation, plant litter and duff, rocks (greater than 2 inch diameter), and woody material.

Both loess surface soils that are influenced by volcanic ash and wet soils can be highly vulnerable to compaction, rutting or displacement. The risk of compaction, rutting or displacement can be minimized on these soil types through project / treatment design:

- Conduct vegetation management activities using partial or full-suspension yarding methods (i.e. skyline cable or helicopter yarding);
- When using ground-based equipment, implement vegetation management activities when soils are protected by snow cover and / or are frozen.

Soils formed on floodplains, stream terraces and alluvial fans can be naturally subject to flooding hazards. The risk of confounding this natural hazard with effects of management activities can be minimized through project / treatment design:

- Avoid or minimize construction of roads or log landings in these flood hazard zones;
- Retain partial vegetation cover, especially grasses, forbs and understory shrubs, on these soils (i.e. do not remove all vegetation cover).

To achieve desired conditions for all soil types, BMPs are recommended with specific types of management activities:

- For vegetation management activities in forested ecosystems, retain 5 to 20 tons per acre of coarse woody material (greater than 3-inch diameter) for warm, dry types, and 10 to 20 tons per acre for other types following vegetation treatments (Graham et al. 1994; Brown et al. 2003). The purpose of this BMP is to sustain long-term soil nutrient cycling.

For prescribe fire management activities, design burn prescriptions to achieve low to moderate fire intensity and to burn when the forest floor is moist (USDA Forest Service 1988, page 73; Harvey et al. 1994, page 43). The purpose of these BMPs is to limit severely burned soil areas, and retain adequate soil organic material to sustain long-term nutrient cycling.

Vegetation

Strata 1--Interior West Upper Subalpine Forest (SPFI2)

This strata is This strata occupies a very small acreage, approximately 385 acres (1 %) of the project area. Strata 1 consists of fire group 10, which is primarily dry, upper elevation whitebark pine. The majority of this stratum is found from 6900 to 8000 feet elevation.

1. Develop a strategy to retain whitebark pine on the landscape long term. This would address fuel loading, standing dead and regeneration concerns.
2. Sample this stratum to determine the condition.

3. Increase the amount of open canopy stands, both mid (CMSO) and late seral (DLSO). Remove the Douglas-fir and subalpine fir component from existing whitebark pine stands. Create an open stand condition (less than 40% canopy cover) to more closely represent the reference conditions for this setting.
4. Increase the amount of early seral stands (AESP).
5. Determine whether whitebark pine cone collections should be conducted for rust resistant individuals.
6. Treat rust resistant individuals with anti-aggregate phermone to prevent attack from mountain pine beetle.

Strata 2-- Ponderosa Pine-Douglas-fir (Inland Northwest) (PPDF1)

This stratum occupies approximately 7363 acres (20%) of the project area. Strata 2 consists of fire groups 1, 2, and 4, which include ponderosa pine, Douglas fir and limber pine. The majority of this stratum is within the 4800 and 6000 foot elevation and distributed throughout the lower elevations of the analysis area.

1. Move BMSC and ELSC vegetation fuel classes to CMSO and DLSO to reflect the reference composition.
2. Reintroduce fire to this setting on a large scale.
3. Develop a strategy to maintain and improve existing stand health and vigor.
4. Monitor areas with Douglas-fir and evaluate insect and disease infestation and risk.

Strata 3 Douglas-fir Interior Northern and Central Rocky Mountains Biophysical Setting (DFIR2)

This strata occupies approximately 6114 acres (16%) of the project area. This biophysical setting has been split into two stratas. Strata 3 represents the drier end of the setting, and consists of fire groups 5 and 6D, which is dominated by Douglas fir with lodgepole on the more moist aspects. The majority of this stratum is within the mid elevation zones and occurs on all aspects within the analysis area.

1. Move BMSC and ELSC to CMSO and DLSO fuel class to reflect the desired composition.
2. Maintain open canopy in CMSO and DLSO.
3. Reintroduce fire to this setting on a large scale.
4. Develop a strategy to maintain, improve existing stand health and vigor.
5. Increase the amount of early seral (AESP) vegetation fuel class.
6. Monitor areas with Douglas fir and evaluate insect and disease infestation and risk.

Strata 4 Douglas-fir Interior Northern and Central Rocky Mountains Biophysical Setting (DFIR2)

This strata occupies approximately 4636 acres (12%) of the project area. Strata 4 represents the more moist conditions in this setting, and consists of fire group 6W, which is primarily Douglas fir and lodgepole pine mixed forests. This strata is distributed throughout the project area, mid to high elevations and all aspects.

1. Move ELSC to CMSO and DLSO fuel class to reflect the desired composition.
2. Maintain open canopy in CMSO and DLSO.
3. Reintroduce fire to this setting on a large scale.
4. Increase the amount of early seral (AESP) vegetation fuel class.
5. Develop a strategy to maintain, improve existing stand health and vigor.
6. Monitor areas with Douglas fir and evaluate insect and disease infestation and risk.

Strata 5--Interior West Lower Subalpine Forest (SPFI1)

This strata occupies approximately 16,055 acres (43%) of the project area. This is the dominant setting in the area. Strata 5 consist of fire groups 7, 8, and 9, which is primarily lodgepole pine and subalpine fir/spruce forest. This setting is at higher elevations and occurs on all aspects.

1. Move ELSC to CMSO and DLSO vegetation fuel class to reflect the reference composition.
2. Create more early seral (AESP) vegetation fuel class by removing the overstory of ELSC through harvest or fire.
3. Develop a strategy to maintain, improve existing stand health and vigor.
4. Monitor areas with Douglas fir and lodgepole pine and evaluate insect and disease infestation and risk.

Strata 6-- Mountain Grassland with Shrubs (MGRA3)

This strata is approximately 2771 acres (7%) of the project area. Strata 6 consists of fire group 20, which is grassland and currently has less than 10% timber canopy. This strata occurs on all elevations, predominantly on warm dry aspects.

1. Reintroduce fire into historical grasslands and shrublands as an important ecological process.
2. Improve grassland health by reducing conifer canopies to less than 10% in current and historic grasslands.
3. Re-establish a historic mix of grasslands and shrublands based on soils and historic photography and maps.
4. Improve grassland seral condition where necessary. See livestock grazing report for specific recommendations.

Strata 7 Shrub Communities

This strata occupies a small percentage of the project area (less than 1%). Strata 7 consists of fire group 30 plus on the ground mapping of existing sagebrush and bitterbrush communities. This strata occurs at all elevations and is found on warm dry aspects. This strata has yet to be identified for site specific location, but it is known to exist on the landscape.

1. Contain the noxious weed populations in these communities using biological and herbicide methods.
2. Reintroduce fire to these communities.
3. Move ELSC to AESP fuel class to reflect the reference composition. The amount of AESP needs to provide for the AESP as well as the BMSC fuel classes.
4. Maintain or improve existing sagebrush and bitterbrush health and vigor.
5. Develop a strategy to reclaim the historic extent.

Special Plant Species, Plant Communities, Unique Habitats

Whitebark pine is being affected by white pine blister rust, advancing forest succession and mountain pine beetle. Extensive stands of whitebark pine occur at upper elevations in the northern portion of the project area. Aspen and riparian communities are limited in extent and in decline due to advancing forest succession. Feature this community where present.

1. Restore and maintain an abundant distribution and health of the following species: quaking aspen (particularly in riparian areas and near seeps and springs), mountain mahogany, antelope bitterbrush, sagebrush, ponderosa pine, limber pine and whitebark.
2. Develop a strategy to reclaim the historic extent using the 1945 range maps.

Weeds

Map and treat noxious weed populations throughout the analysis area. Herbicide and biological control methods will be emphasized as appropriate.

Wildlife

Restoration activities in dry forest habitats in the Tenmile analysis area are important because of the dramatic changes in tree species composition and stand structure that have affected most dry forest habitat in the Divide landscape and in western North America in general.

Habitat Objectives for Dry Forest

- Retain all current old-growth stands that meet minimum regional old-growth characteristics (See table). Restore historic structural characteristics with no elimination of large trees or snags.

Minimum values of old-growth characteristics, Dry forest habitats (ponderosa pine and Douglas-fir), USFS Region 1 (Green et al. 1992)		
Forest Types	**Ave. Age of Large Trees**	**# Large Trees**
Warm, dry ponderosa pine (east side)	180 yr	4 trees/ac $\geq$ 17 in dbh
Cool, dry Douglas-fir (east side)	200 yr	5 trees/ac $\geq$ 19 in dbh

- Manage for the long-term maintenance of 25% of dry forest habitat (per 4^{th} order watershed or other applicable scale) as old growth based on mean values of regional old-growth characteristics (See table). Values for old-growth characteristics should be no lower than 25% below mean values; and 50% of old-growth stands should meet or exceed regional mean values for old-growth elements.

Mean values of old-growth characteristics, Dry forest habitats (ponderosa pine and Douglas-fir), USFS Region 1 (Green et al. 1992)			
Forest Type	**Ave. Age of Large Trees**	**# of Large Trees**	**# Standing Dead Trees**
Warm, dry ponderosa pine (east side)	215 yr	24 trees/ac $\geq$ 17 in dbh	7 trees/ac $\geq$ 9 in dbh
Cool, dry Douglas-fir (east side)	229 yr	31 trees/ac $\geq$ 17 in dbh	10 trees/ac $\geq$ 9 in dbh

- Restore the role of fire, and use thinning as necessary, to restore historic conditions.
- Retain all snags and broken-top trees $\geq$ 9 in dbh and all large trees $\geq$ 17 in dbh in harvest units.
- Manage for single- and double-storied stands with open conditions (<50% cover) in dry forest habitat of all age classes.
- Manage for a variety of habitat conditions at the landscape level, particularly varied understory conditions:

Priority Species Objectives

The Montana Bird Conservation Plan (Partners in Flight, 2000) identifies a number of "priority species" associated with dry conifer forests, all of which are in need of monitoring and some of which may require special conservation measures. Five of these species are known to be present in Tenmile area dry forests.

Flammulated Owl

The Helena National Forest surveyed specifically for this species during the spring and summer of 2005. Flammulated owls were found to be distributed widely in dry forested habitats, but in very low numbers. Of the 5 priority species, this is the one with obvious viability problems. Its preference for mature, open, dry forests means that populations have undoubtedly declined precipitously since the late 19^{th} century as suitable habitat has shrunk to small fragmented patches. Restoration of open-grown old-growth ponderosa pine with inclusion of denser roosting sites will go a long way to elevating the viability status of flammulated owls [see more detailed recommendations below].

In a number of studies, the Flammulated Owl has demonstrated a clustered distribution on the landscape. The provision of large, continuous blocks of open, mature and old-growth habitat on the landscape could potentially accommodate multiple Flammulated Owl home range areas.

Wherever possible, management of dry forest sites should address the needs of flammulated owls by incorporating structural and component complexity at the microhabitat and home-range scale in the form of suitable nest snags and trees; open, mature vegetation around the nest site; small clearings; and roost sites in relatively close proximity to each other.

- Maintain all existing large snags and broken-top trees $\geq$ 12 in dbh for current and future nesting purposes.
- Within blocks, provide thickets of sapling/pole tree regeneration for roosting purposes; thickets within 100 m of, but not directly adjacent to, potential nest sites.
- Within blocks, provide open understory conditions immediately surrounding nest tree or potential nest tree sites.
- Provide foraging habitat of large blocks of grasslands adjacent to home range habitat.

Cassin's Finch

Trend data for Cassin's finch are inconclusive, but Hutto and Young (1999) have identified it as one of several species for which an attraction to managed forest stands may be leading it into ecological traps or population sinks. Because of its apparent tolerance for a variety of habitat conditions, specific management recommendations are difficult to develop. It may well be accommodated by coarse filter habitat management, but population monitoring in dry forest habitats should be pursued.

Red Crossbill

The nomadic nature of this species makes it hard to monitor and to manage for. Any silvicultural treatments that emphasize seed production in conifers are likely to improve habitat suitability. In dry forest, retention of Douglas-fir is important to maintaining a supply of smaller seeds as well as preferred nesting sites.

Chipping Sparrow

This is an example of an abundant species that is nonetheless declining regionally, as well as in Montana. Chipping sparrows are likely to have been particularly abundant in open, pre-settlement ponderosa pine forests and to have declined along with that habitat formation. Restoration of open-grown, old-growth ponderosa pine will certainly benefit chipping sparrows, particularly where understory heterogeneity can be maintained.

Blue Grouse

This game bird is associated with dry, open coniferous forest during the breeding season (moving up to denser fir forests in winter). Blue grouse populations have been declining in the northern Rockies, and this trend may be tied to the loss of open-grown forest formations. Nest failure is usually the result of predation. Open-canopied forest with robust ground vegetation, including deciduous shrubs, is likely to provide the best combination of food and cover to protect young during their first summer. These relationships need to be investigated further.

Nest failure is usually the direct of predation. Mammals are the most likely cause of nest predation followed by other birds. The reverse is true of predation on the young of the year. In this case, raptors may cause up to 75% of the loss where as mammals cause 25%. Better monitoring is needed to determine population trends in the state.

Special Considerations for Cavity Dwellers.

The absence of suitable nest sites is usually considered the limiting factor for cavity-nesting species (Thomas et al.1975). Retention of all existing large snags and broken-top trees, and management for adequate numbers over the landscape is critical. The retention of all snags and broken-top trees ≥ 9 in. dbh and all large trees ≥ 17 in. dbh in harvest units would help meet the current and future needs of all cavity-nesting species in dry forests.

Special Considerations for Flammulated Owls.

In a number of studies, the flammulated owl has demonstrated a clustered distribution on the landscape (Howie and Ritcey 1987; Atkinson and Atkinson 1990; Reynolds and Linkhart 1992; Wright 1996). The provision of large, continuous blocks of open, mature and old-growth habitat could potentially accommodate multiple flammulated owl home range areas.

Wherever possible, management of dry forest sites should address the needs of flammulated owls by incorporating structural and component complexity at the microhabitat and home-range scale in the form of suitable nest snags and live trees, open mature vegetation around the nest site, small clearings, and denser roost sites in relatively close proximity to each other.

- Maintain all existing large snags and broken-top trees ≥ 12 in dbh for current and future nesting purposes.
- Within blocks, provide thickets of sapling/pole tree regeneration for roosting purposes; thickets within 100 m of, but not directly adjacent to, potential nest sites.
- Within blocks, provide open understory conditions immediately surrounding nest tree or potential nest tree sites.
- Provide foraging habitat of large blocks of grasslands adjacent to home range habitat.

Species of Special Concern

Northern Goshawk

Goshawks are territorial and maintain large home ranges (up to 6000 ac). Thus, they are uncommon. They require dense forest stands for nesting and fledging young but are able to forage successfully in a variety of forest formations, as well as a few non-forest habitats. Prey density, rather than specific forest configuration, appears to be the key to viable foraging range. Suitable goshawk habitat in dry forests requires several dense nesting and post-fledging stands (generally greater than 70 acres) dispersed throughout a variety of more open stands within each 6,000 acre range (Wiens *et al.* 2006). Prescriptions for generating open-canopied forest may increase goshawk prey density, but they make sense only if dense-forest requirements for nesting and survival of young birds are provided as well.

Pileated Woodpecker

Pileated woodpeckers are not common in dry forests in the Tenmile analysis area, but they are present. They are highly dependent on large trees (generally >15 inches dbh) for foraging, nesting, and roosting. Large logs also serve as foraging sites. In the Divide landscape, dry forests serve as suitable habitats wherever the supply of large trees and logs is adequate: Old-growth stands (either open or closed canopy) and younger forests with large older trees scattered throughout. Pileated woodpeckers are capable of excavating solid living tree trunks, but a variety of softer substrates is important as well. In particular, all large snags, broken topped trees, and dying trees need to be retained in thinning projects. Decaying wood and areas of denser canopy are important to maintaining more vigorous populations of carpenter ants—a preferred food source (Bonar 2001). Converting mature dry forest stands from closed- to open-canopied structure will not prove detrimental to pileated woodpeckers as long as large-diameter trees remain dominant and some denser stands (>60% canopy closure) are retained and well-distributed throughout the dry forest landscape.

Gray Wolf

The northern segment of the Tenmile analysis area (north of U.S. Highway 12) falls within the normal home range of a small wolf pack (the "Great Northern " pack) that has been centered in the vicinity of the Mullan tunnel for the past 4 years. These, as well as other wolves moving south through the Continental Divide linkage zone, may occasionally be found in the analysis area south of Highway 12. Wolves will settle into dry forest environments as readily as any other habitat if suitable prey is present and isolated den and rendezvous sites can be found. Wolves may be particularly attracted to areas where these forests are interspersed across big game winter range. No special management is needed other than to monitor any wolves present and maintain a ½ mile buffer around active den and rendezvous sites.

Western Toad

Adult western (boreal) toads are quite versatile, and they make use of a variety of upland habitats, including dry ponderosa pine and Douglas-fir forests, both open and closed. The key habitat components that need to be protected are the aquatic and riparian sites that the toads use for breeding and to which the young are restricted. It would be beneficial to leave a buffer of denser, unthinned forest around these wet sites where they occur within dry forest stands.

Flammulated Owl is discussed above.

Featured Management Species

Elk

Approximately ¾ of the dry forest habitat is located in the northern half of the analysis area (north of Minnehaha Creek and Colorado Mountain) and has been mapped as elk winter range by Montana Fish, Wildlife and Parks. On winter range, blocks of dry forest are intermixed with extensive mountain grasslands. General habitat objectives for elk in these areas are to maintain a broad array of open-canopied, forage-rich stands interspersed with a variety of denser, more complex stands that serve to moderate snow depth and provide forested forage in winter. Dry Douglas-fir forest in the southern half of the analysis area is concentrated near the bottom of Tenmile Creek and up the east side of the drainage. This is elk summer/fall range, and creation of some open-canopied forest blocks amidst the current mass of dense Douglas-fir forest would enhance the cover/forage mosaic.

<u>Mule Deer</u>

In general, dry forest recommendations for elk apply to mule deer as well. However, mule deer will require patches of dense over-storied forest on winter range (for thermal cover and effective snow interception) that will be less useful to elk. Cover/forage mosaic patterns created by thinning of dry forests on both winter and summer range will enhance habitat for mule deer.

<u>Moose</u>

Dry forests are generally not primary moose habitats, except where they are intermixed with riparian vegetation and aspen or where deciduous browse species are concentrated in early seral stages or in the understories of open-grown old-growth stands. Moose frequently travel through and rest in dry forests while moving between fragmented key habitat sites (such as riparian areas or aspen stands). Thinning projects that encourage development of deciduous shrubs in forest understories will benefit moose.

<u>Ruffed Grouse</u>

Ruffed grouse make use of dry forest habitats wherever dense ground-level regeneration provides cover or where aspen or riparian habitats are intermixed. Thinning in ponderosa pine and dry Douglas-fir stands that generates shrub and aspen growth will expand habitat components for ruffed grouse.

Evaluation of Habitat Objectives

The maintenance of 25% of dry forest habitat in an old-growth condition (in sustainable open-grown stands) would represent approximately half of historic old-growth levels. This is an achievable goal that provides significantly more habitat for old-growth associated wildlife species than currently exists, and still permits a sustained timber harvest over time. Stands that meet minimum age characteristics for old growth do not necessarily contain old-growth conditions or conditions capable of supporting old-growth species populations; tying age standards to prescribed levels of old-growth elements assures that: 1) a stand is truly in old-growth condition, and 2) management emphasizes quality old-growth (that is, not managing merely for minimum characteristics).

Assumptions

- Restoration of dry forest habitat will meet associated bird species needs. "Ecological trap" issues (species are differentially attracted to restored areas but reproductive success and/or survival are low) are generally not a concern.
- Measurable objectives will meet priority bird species needs.
- Historic dry forest age-class structure estimations are reasonably accurate to be used in the development of habitat objectives.
- Estimates of the historic physical structure of stands are reasonably accurate.

Monitoring Needs

- How well do restored sites meet needs of associated bird species? Need presence/absence data from comparative studies of treated and control sites, and from sites before and after restoration.
- Presence and distribution of Flammulated Owls should be determined through the implementation of stratified callback surveys in potential habitat statewide.

- Goshawk use of open-canopied dry forest habitats needs to be systematically observed, documented, and characterized. What ratio of open- to closed-canopied stands will allow goshawks to remain on their home ranges and successfully fledge young?
- Annual point-count surveys of bird populations in both thinned and unthinned dry forest stands are needed to gauge local populations of priority bird species.
- Changes in big game use when closed-canopied stands are converted to open-canopied habitats.

Moist Forests

Habitat Objectives and Recommendations

Old Growth Objectives

- Existing old-growth stands should be retained whenever possible, especially in areas that are in likely refugia from stand-replacement.
- Maintain mature or overmature stands for recruitment, toward goal of 20% of the habitat type; which should be located in likely refugia from fire or in areas providing connectivity to isolated old-growth stands.
- Abnormally dense young and mature stands surrounding old growth could be targets for forest health treatment (thin-from-below or partial cut) to reduce the risk of fire spread into old-growth stands.

Timber Harvest Objectives

- Retain snags in all silvicultural treatments
- Vary timber harvest methods, using more even-age prescriptions in mesic sites that would have historically had stand-replacement fires regimes.
- Consider burning after partial cutting, to further mimic mixed-severity fires and recruit snags.

Prescribed Fire Objectives

- Expand the opportunity for allowing lightning fires to burn.
- Re-ignite suppressed lightning fires when conditions come back into prescription
- Use broadcast burning to restore normal fuel conditions so that lightning fires can be allowed to burn.

Priority Species Objectives

The following have been identified as priority species associated with moist conifer forests, all of which are in need of monitoring and some of which may require special conservation measures to ensure population viability:

Northern Goshawk

Goshawks are territorial and maintain large home ranges. As a result, they are spread thinly across the landscape. They require dense forest stands for nesting and fledging young but are able to forage successfully in a variety of forest formations, as well as in some non-forested habitats (wet meadows, shrubland edges, burns). Prey density, rather than specific forest configuration, appears to be the key to viable foraging range. In the Tenmile analysis area, moist forests dominated by over-abundant late-seral stages provide an abundance of nesting and fledging sites. In some areas, extensive swaths of uniform, closed canopied forest may limit prey abundance. In these cases, vegetation management that generates a variety of openings, open-canopied forest, and complex edge is likely to elevate diversity and abundance of suitable prey. As long as nesting and fledging stands remain numerous and connected by forested environment, such management can enhance goshawk habitat.

Pileated Woodpecker

Pileated woodpeckers are highly dependent on large trees, living and dead, for foraging, nesting, and roosting. The supply of such trees (generally >15 inches dbh) in the moist forests of the Tenmile area is limited: most stands were logged or burned by wildfire in the latter half of the 19th century, and few stands are more than 125 years old. Many of the forests in old-growth status are seral lodgepole stands where the largest trees are in the 12-15 inch dbh range—marginal for pileated woodpeckers. The birds are able to find suitable habitat by moving among scattered old-forest remnants with large trees (primarily Douglas-fir) that pre-date the 19th century. Some protected drainage bottoms and wet sites retain large Engelmann spruce, subalpine fir, and Douglas-fir. These larger trees scattered individually and in limited groupings through younger forest provide adequate habitat for a few pileated woodpeckers. Husbanding of sustainable stands capable of eventually generating large trees is the key to improving conditions for pileated woodpeckers in this analysis area.

American Marten

Marten are relatively common in mature, moist forest habitats in Montana (Foresman 2003). An abundance of snags, broken-topped trees, and large woody debris is particularly important. Productive and structurally diverse habitat fosters high prey density, provides nooks for denning and resting, and serves as a scaffolding for the subnivean (under-snow) environment in winter. The entire landscape need not be dominated by these conditions in order for marten to thrive, but such sites should be well distributed—in draws, along streams, in drainage-head basins, on north slopes, in areas of insect infestation, and so on. Such habitat is not easily created by active vegetation management. The key is to retain sufficient cluttered old-forest habitat, interconnected by younger, healthier interior forest stands to allow marten to move easily between the key sites.

Fisher

Fisher are probably present in the Tenmile analysis area in very low numbers—either as residents or transients. Key habitats are late-seral forests, particularly in riparian areas. Complex habitat structure—large logs and snags, broken-topped trees, irregular tree formations (witches brooms, mistletoe deformations, etc.)—provides suitable denning and resting sites and enhances prey density. For the most part, such sites are fragmented within the less complex forest structure of the Tenmile drainage; but as these forests age, structurally complex habitat favored by fishers is becoming more common. Forest management aimed at simplifying forest structure in order to reduce fuel concentrations needs to preserve the network of complex places and the forest framework that connects them (neither fisher nor marten like to cross large treeless openings). This does not require continuous coverage of dense-canopied stands, but it does require that openings and open-canopied stands not be so extensive that viable connection between key sites is severed.

Canada Lynx

Most of the Tenmile analysis area (all but Colorado Gulch) falls within Lynx analysis unit (LAU) DI-05. This LAU encompasses about 37,440 acres—about 48% of which qualifies as potential lynx habitat. It is considered to be functioning at a relatively "high" level in terms of its capacity to support lynx. Lynx have been observed on the fringes of the analysis area, but whether or not any are resident is unknown. Virtually all of the suitable lynx habitat falls within the moist conifer forest regime above 5,500 ft. Lynx are highly dependent on snowshoe hares as primary prey, and the hares, in turn, are highly dependent on thickets of dense deciduous shrubs or regenerating conifers for food and cover. In many areas of Montana, early-seral habitats (created historically by stand-replacing fire, more recently by clearcutting) provide the dense young conifer/shrub growth that the hares require. However, early seral habitats are uncommon in the moist forests of the Tenmile area. Extensive field surveys in the summer of 2002 indicate that most snowshoe hare habitat in the Tenmile drainage is provided by seedling and sapling

Douglas-fir and subalpine fir (and occasionally Engelmann spruce) growing in the understories of late-seral forest stands. This understory formation is often patchy and fragmented, and whether it provides sufficient habitat for a lynx-sustaining hare population is unknown. Any timber harvest aimed at creating early-seral snowshoe hare habitat should avoid sites where productive understory growth is already providing that environment. Such harvest should also avoid late-seral stands with abundant woody debris that has potential serve as lynx denning habitat.

Special Considerations for Lynx

Based on conservation measures in the *Canada Lynx Conservation Assessment and Strategy* (Ruediger *et al.* 2000), the following management direction applies:

- Pre-commercial thinning will be allowed only when stands no longer provide snowshoe hare habitat. This is not much of a problem in the Tenmile area currently because there is so little early seral hare habitat.
- The overall objective is a mosaic of forest successional stages. This is the primary challenge in this analysis area: to substantially improve habitat diversity through vegetation manipulation without compromising key lynx denning and foraging sites or forest connections between them.
- Winter recreation should be minimized in suitable lynx habitat so as to reduce access by competing predators along packed snowmobile routes. In the Tenmile drainage, snowmobile routes have been long established, and there has been little public pressure to add to the system. The primary challenge is in the MacDonald Pass area, where expansion of winter recreation opportunities and related developments are being proposed.
- Disturbance around known denning habitat should be minimized from May to August. Special restrictions may need to be applied if denning lynx are discovered in the analysis area—primarily a function of diligent monitoring.
- Grazing (livestock and ungulate) should be managed to allow regeneration of aspen clones and to minimize impact to riparian areas within lynx habitat. Currently there is relatively little cattle grazing in the analysis area because of the limited distribution of native grassland. Elk, moose, and deer browsing is likely to be a problem around vegetation projects designed to enhance aspen and riparian shrub associations, and mitigation (often, fencing) will probably be needed.

Objectives for Species of Special Concern

The northern goshawk, pileated woodpecker, lynx, and fisher have been discussed in the previous section. This section deals with the grizzly bear, wolf, wolverine, and western toad.

<u>Grizzly Bear</u>

The only reports of grizzly bears in the Tenmile analysis area in recent years have come from the vicinity of MacDonald Pass and upper Sweeney Creek, north of Highway 12. There have been no reports from the Tenmile drainage south of the highway, but this area does lie within the Continental Divide wildlife linkage zone. The analysis area lies just south of the recently-delineated grizzly bear “distribution area”—that is, the area outside the Northern Continental Divide Recovery Zone that is now regularly occupied (at least part of the year) by grizzlies. Moist forests in the Tenmile area provide habitat components useful to grizzlies—forested travel routes, dense-canopied forest for daybeds, abundant escape cover, productive local sites for foraging. But, because of its overly-extensive mature forest, lack of large productive feeding areas, sizable private inholdings, and local road networks, it is an unlikely locale for establishing a long-term sub-population of resident bears. The objective should be to manage it as a linkage zone to accommodate bears moving through and as a complement to adjacent areas more conducive to long-term grizzly bear occupancy (upper Little Blackfoot, Boulder River drainages). The retention of unroaded areas, restriction (as much as possible) of development on isolated Forest inholdings, thinning projects to improve forested forage, and enhancement of productive wet sites (as for elk, deer, and moose) within the moist forest should work to this end.

Gray Wolf

The northern segment of the Tenmile analysis area (north of U.S. Highway 12) falls within the normal home range of a small wolf pack that has been centered in the vicinity of the Mullan tunnel since 2002. Some of this area falls within the moist coniferous forest zone. Other wolves moving south through the Continental Divide linkage zone will also be making use of these habitats for travel, resting, concealment, hunting, and possibly denning. No special management is needed for wolves in these habitat strata other than to monitor animals known to be present and maintain a ½ mile buffer around active den or rendezvous sites.

Wolverine

Wolverines have been observed in drainages immediately east, south, and west of the Tenmile analysis area, so it is likely that they can be found here as well—as transients, if not as residents. Wolverines maintain very large home ranges (averaging about 260 mi² for males and 240 mi² for females in Montana) (Hornocker and Hash 1981). So the Tenmile analysis area (about 70 mi²) provides less than 30% of what the average wolverine requires in the way of habitat acreage. Wolverines move through a variety of habitats ranging from dense subalpine fir forest to wide-open big game winter range in search of carrion and small-midsize prey. They are wary of human presence and spend much time in areas where roads are sparse or non-existent. Denning sites are often above or near timberline where rocky basins and tangled avalanche chutes provide local hideouts for protecting young. Primary human activities that present problems for wolverines are roading, off-road vehicle use, increased settlement in the urban interface (especially on isolated Forest inholdings), and escalating winter recreation. All of these factors increase the likelihood of negative contact with humans. In particular, snowmobiling in mountain basins and around timberline can disrupt wolverine denning. Vegetation manipulation designed to generate diversity in the forest landscape is unlikely to have measurable negative impact unless it is accompanied by permanent new roads.

Western Toad: Adult western toads make use of a variety of upland habitats, including moist coniferous forests. Protection of aquatic and riparian breeding sites (including surrounding forest vegetation) within this habitat regime is the primary management consideration.

Objectives for Featured Management Species

Elk

Moist forest environments in the Tenmile analysis area provide summer and transitional range (areas used in moving between summer and winter range) for elk. General habitat objectives for elk in the region dominated by these forests are to (1) maintain the integrity of unroaded *security areas* (expanding them if necessary to approach the 30% security level); (2) keep motorized routes at a level that will produce a summer range *habitat effectiveness* of at least 50%; (3) protect and enhance the effectiveness of key habitat sites (usually wet areas) on summer range; (4) identify and retain local blocks of hiding, screening, and summer thermal cover important to elk; and (5) expand viable foraging opportunities for elk amidst the dense late-seral forest continuum (by creating small openings, generating high quality forested forage, and expanding aspen habitats). Of these objectives, the first three are primarily a function of motorized trail and road patterns; the last two relate to vegetation management. Elk are probably the most prominent "featured species" in the Tenmile area, and their needs will be a major factor in driving the pattern of vegetation and road management.

Mule Deer

In general, moist forest recommendations for elk apply also to mule deer—in particular, the objectives to enhance key habitat sites (which are important to a variety of wildlife), to retain local blocks of cover, and to enhance foraging opportunities.

<u>Moose</u>

Moist forests are a major component of moose habitat, particularly where they encompass wet sites or lie adjacent to larger riparian areas. Moose are averse to high daytime temperatures in summer and spend considerable time in the timber, alternately bedded and searching for forage. Forested stream bottoms, seeps, and other productive, shaded sites are key to this behavior pattern. Moist forests also provide secure travel routes and refugia from human interference. In fall, many moose are more at risk from hunting (both legal and illegal) than elk because of their proclivity to feed in the open, often near roads. In these cases, management for strategic local hiding cover is a worthwhile exercise. General management objectives for moose in moist forests are to (1) create a tight mosaic of forested cover and open foraging sites; (2) maintain or enhance small productive foraging sites within forest stands used in summer; (3) generate useful forested forage over larger areas on selected sites by thinning overstories to allow understory browse to develop; and (4) retain or develop blocks of local hiding cover adjacent to more open foraging sites near roads.

<u>Ruffed Grouse</u>

Ruffed grouse will make use of moist forest environments where they are interspersed with openings or with patches of aspen, where early seral conifer regeneration is well developed, or where riparian habitats are adjacent. Creating early-seral openings in the mature forest continuum should be useful in this regard. Ruffed grouse are not found in large blocks of interior forest habitat.

Upper Subalpine Forest: Whitebark Pine

<u>Habitat Objectives and Recommendations</u>

The following habitat objectives are based on the table in the section **Relationships of priority species to vegetative structural components** and are designed to encompass a range of seral stages to meet habitat needs of the identified priority species.

- Maintain existing and reestablish pure and mixed stands of whitebark pine dominated by blister rust resistant trees with reduced potential of stand-replacement fire.
- Efforts should be made to maintain and reestablish whitebark pine communities throughout the geographical and elevational range inhabited in the naturally functioning system prior to the introduction of blister rust.
- Adjacent habitat conditions that facilitate mountain pine beetle and blister rust should be reduced where possible to maintain existing stands.
- Whitebark pine should exist in a variety of life forms and in a variety of settings; habitats should range from islands of pure whitebark pine to mixed stands of whitebark pine, spruce, and subalpine fir.
- Develop and implement approaches to reintroduce natural fire regimes into whitebark pine systems.
- Develop methods to minimize or eliminate the impacts of livestock grazing on whitebark pine regeneration.
- Silvicultural methods that achieve the above include include clearcutting, tractor piling, burning, and planting. Use artificial regeneration to accelerate establishment.
- Due to the high unit costs associated with whitebark pine restoration, a stewardship project would be a perfect fit.
- Dead whitebark pine needs to be removed to reduce catastrophic fire risks. Habitat communities at lower elevations will be managed to reduce risk of wildfire spread into the whitebark pine.
- Create a mixture of seral stages.

Whitebark Pine Habitat Objectives for Clark's Nutcracker

Habitat objectives developed for whitebark pine should benefit Clark's Nutcrackers. Due to the wide ranging nature of Clark's Nutcrackers, landscape configurations appear to have limited impact, and concerns regarding adjacent habitats are minimal, other than in their potential to facilitate disturbance (fire and disease) in whitebark stands.

Whitebark Pine Habitat Objectives for Grizzly Bears

Whitebark pine sees are a high quality bear food due to their high energy content and the fact that they usually mature in August and are available until bears hibernate. This corresponds with the critical hypophaegia stage during which bears accumulate fat.

Low pine production seems to be positively correlated with high grizzly mortality due to increases in human/bear conflicts. Create site and stand conditions that optimize the area for bears.

Bears appear to retrieve the pine seeds from squirrel middens. Management that affects red squirrel densities therefore will affect bears.

Assumptions

- Maintaining whitebark pine could avoid the possibility of future declines in Clark's nutcracker, while providing values to other bird species that utilize whitebark pine seeds.
- If whitebark pine is eliminated from the ecosystem, Clark's nutcrackers will not be able to readily shift their foraging to other sources for food and the structure provided by whitebark pine will not be readily replaced by another tree species.
- It will be possible to develop management programs to enhance rust resistance and reduce fire risks so that the vigor and longevity of existing whitebark pine stands can be improved and the range can be expanded with reintroduced stands of whitebark pine.

Monitoring Needs

Prior to whitebark pine restoration, a monitoring strategy should be developed to determine the efficacy of restoration. The Clark's nutcracker would be a meaningful barometer of treatments due to its close association with whitebark pine. Point counts could be established pre- and post-treatment according the existing protocols.

Grasslands

Habitat Objectives and Recommendations

- Maintain existing tracts of grasslands.
- Prevent the introduction and spread of noxious weeds on existing on existing grasslands.
- Prevent invasion of woody plants especially coniferous trees. Reestablish fire regime.
- Maintain the appropriate species composition, vertical and horizontal structure on existing tracts by developing appropriate grazing strategies.
- Develop and maintain large tracts of grasslands.
- Provide large blocks in a diverse mosaic of habitats
- Protect existing blocks
- Restore highly erodible lands to grassland habitats
- Control noxious weeds
- Limit woody encroachment
- Manage grasslands to maintain required cover conditions- dense cover for this type
    - Rotate management techniques so that suitable blocks are available in all areas

- Implement techniques to maintain characteristics for vegetative structure
  - use a light grazing system-rest rotation or deferred rotation
  - limit grazing on public lands in some areas
  - restore the historic fire regime (for areas of overly dense vegetation)
    - implement before or after breeding season
    - use a regional rotation sequence to ensure habitat is present
    - use infrequently (five year basis) to allow re-establishment and occupation by birds.
  - Implement mowing
    - occasional mowing may be used to reduce amounts of litter
    - mowing should be restricted to after breeding period (July 15)

Grassland Habitat Objectives for Northern Harrier*.*

- Only light grazing that maintains the vegetative structure is recommended.
- Maintain a mosaic of grasslands and wetlands so that while some units are being treated to halt succession, other units are available.
- Treated units should be small (100-200 ha) to minimize the number of displaced nesting harriers. Nearby untreated units should be large enough to meet the requirements of multiple female Harriers during the nesting season.
- Periodically mow, burn, or graze to maintain the 2-5 yr old accumulations of residual vegetation. Mowing, burning, or grazing is recommended every 3-5 yr to maintain habitat for small mammal prey.
- Provide large areas (> 100 ha) of idle prairie with patches of woody plants, such as western snowberry.
- Minimize human disturbance near nests.
- Do not use chemical pesticides in habitats used by harriers.

Shrublands

Habitat Objectives and Recommendations

- Maintain healthy montane and sagebrush communities within site potential. As a general guideline, communities should provide a minimum sagebrush canopy 10-15%, representing 20-30% of the plant composition, with an average sagebrush plant height greater than 12 inches.
- Understory herbaceous compositions should be diverse with approximately 40% forbs, dependent on site potential. Sagebrush age classes and structure should be fairly homogenous in individual stands.
- Manage livestock grazing to allow no more than 35% herbaceous utilization (by weight), and defer use, particularly by sheep, until after June 10 to avoid nest trampling.
- Provide an extensive interspersion of sagebrush communities with diverse plant compositions and stand structures in association with wet meadows and riparian areas.
- Over time, maintain at least 50% of existing sagebrush stands 30 years of age or older.
- Provide >300 feet of healthy sagebrush habitat at habitat type edges around meadows and riparian habitat
- Maintain a minimum 15% sagebrush canopy in sagebrush communities in shallow drainages and on productive sites to provide crucial foraging and thermal cover on winter habitat where snow depths exceed twelve inches.
- Identify and maintain sagebrush communities that provide travel corridors between winter/breeding and summer habitats.
- Manage adjoining habitats to maintain healthy, natural plant communities
- Maintain diverse habitat structure, including mature stands of sagebrush, throughout the known range of the priority species in the state.

- Maintain dense clumps of tall, big sagebrush shrubs with other shrubs, grasses and forbs beneath the canopy for nesting habitat.
- Sagebrush shrubs should be at least 50 cm in height with high foliage density and branches within 30 cm of the ground.
- Maintain patches of 'openness' by promoting and retaining native grasses and bare ground interspersed within sagebrush stands for foraging habitat.
- Promote grazing plans that encourage a mosaic of sagebrush, native grasses and forbs.

Assumptions

- Management of sagebrush communities to provide wildlife habitat will be emphasized through landscape/ecosystem planning on all land ownerships.
- Distribution of sagebrush communities will be maintained at the landscape level.
- Natural events and human activities that alter stand characteristics and influence patchiness will continue or increase.
- Improving altered sagebrush habitat and conserving existing sagebrush habitat will aid in maintaining current, stable sage thrasher populations.
- Evaluation of suitable habitat and breeding bird surveys will provide baseline data from which managers can monitor changes in sage thrasher populations.

Monitoring Needs

- Investigate methods and products that may modify sagebrush canopy without reducing herbaceous composition and distribution.
- Evaluate suitability of stands for sage thrasher nesting habitat.
- Study the effects of livestock grazing and subsequent vegetational changes on shrubsteppe bird communities.
- Identify priority areas for restoration.
- Collect data on habitat use, nest success, and territory size of breeding sage thrashers.
- Implement within- and among-habitat monitoring to provide better population trend data, and demographic monitoring in a variety of occupied habitats, to better delineate factors affecting nest success of priority species.

Cliffs, Rock Outcrops, Caves and Scree

Habitat Objectives and Recommendations

- Implement inventory and monitoring strategies to detect the presence and locations of species dependent on this habitat type.
- Bat strategies will proceed according to the draft regional protocol.
- Coordinate with Montana Fish, Wildlife, and Parks to determine the distribution of mountain goats and bighorn sheep.

Unmapped Stand-Level Habitats

Aspen

Habitat Objectives and Recommendations

Maintain natural disturbance regimes and the dynamic nature of aspen communities at the landscape level. Where fire cannot be used, mechanical treatment should mimic natural fire conditions. Treat sufficient areas to ensure that regeneration will be adequate to overcome grazing by livestock and big game.

- Double the acreage of aspen where it presently occurs
- Maintain 20% aspen stands in decadent condition
- Use fire and log cutting to regenerate aspen that exceeds decadent guidelines
- Develop treatment schedules to achieve equal acres of all age classes of aspen over each 4th order watershed.
- Give priority to regeneration in areas where aspen are in jeopardy of being lost in conifer types
- Regenerate older stands that have sufficient vigor to develop young stands.

Regenerate entire aspen clones where aspen occurs as aspen/grass, aspen/forb or aspen/shrub complexes.

Riparian Habitat

Riparian Deciduous Forest (Cottonwood/Aspen)

Habitat Objectives and Recommendations - Riparian Deciduous Forest

Wherever possible, maintain the dynamic nature of floodplains to accommodate all successional stages of cottonwood forest. Over time, this will require both protection of existing stands and recruitment of younger trees.

- Cottonwood forests should be managed to preserve mature trees and snags; such management may involve substrate-scouring using periodic floods or mechanical disturbance, limiting grazing, and increasing levels of water flow (Tobalske 1997, from review).

Protect late successional forest stages (decadent trees, snags, lots of large downed material, wide tree spacing). In many instances, the chance to restore historical levels of riparian forest has passed. Steps should be taken to protect the best of what remains in each major drainage in the state.

- Encourage a policy of no net loss for mature cottonwood forests.
- Identify and survey intact blocks of mature cottonwood forest, using agency or citizen scientists.
- Protect, reclaim, or re-create oxbow sloughs, braided stream reaches and backwater areas.
- Strive to incorporate and implement appropriate management guidelines for snags, decadent trees, downed trees, shrub cover, ratios of successional stages and other habitat variables that include consideration of:
    - Large, decadent and dead trees:
    - Gravel bars
    - Mature live trees
    - Dense tall-shrub understory
    - Spatial heterogeneity
    - Multi-stored, multi-aged canopy

Assumptions – Riparian Deciduous Forest

- A natural flow regime will maintain habitat quality for high priority species.
- Larger stands support more species than smaller stands.

- In lieu of direct action, continued development, fragmentation and incompatible management activities will further reduce both the quantity and quality of riparian deciduous forest habitat.

Monitoring Needs – Riparian Deciduous Forest

- Implement special riparian monitoring (count) techniques to provide trend data for riparian deciduous forest species.
- Determine what mitigation measures are most effective at replicating the effects of natural flows (scouring, planting, water diversion).

Riparian Deciduous Habitat Objectives for Ruffed Grouse

No standardized monitoring is currently in place for this gamebird species. This should be the first priority for its conservation.

Riparian Deciduous Habitat Objectives for Downy Woodpecker

Although no specific conservation actions are proposed for this species, their needs could be addressed by protecting snags of all sizes (no minimum) in riparian systems.

Riparian Shrubland

Habitat Objectives and Recommendations - Riparian Shrub

- Riparian shrublands would be an integrated component of any riparian deciduous forest stands targeted for conservation efforts.
- Grazing should be managed or excluded as needed to provide and maintain the structure of riparian shrubland at all elevations.

Monitoring Needs – Riparian Shrub

- Implement special riparian monitoring (count) techniques to provide trend data for riparian deciduous forest species.

Riparian Shrub Habitat Objectives for Willow Flycatcher

Increased parasitism in fragmented habitat is probably the greatest threat to the species. Populations have increased in response to reductions in cattle grazing and willow control in riparian areas.

Riparian Shrub Habitat Objectives for Sharp-shinned Hawk

No specific management recommendations were developed for the Sharp-shinned Hawk.

Riparian – Woody Draws

Habitat Objectives and Recommendations – Woody Draws

- Hardwood draws across the analysis area should have all size/age classes of trees and shrubs represented to mimic the diversity resulting from natural disturbances.
- Late seral stands should have a relatively uniform canopy cover of at least 75% with an understory of tall shrubs (dbh> 2.5 cm) at an average of about 390 stems/acre.

- Early to mid seral stands should have canopy cover of 35 to 60% respectively, and tall shrub stem densities from 50 to 150 stems/acre, respectively.
- Grazing in hardwood draws on public lands should be restricted when restoration is necessary to maintain the integrity of the plant community.
- Grazing should use management strategies such as rest-rotation, deferred rotation, off-site watering, fencing, and riparian pasture to promote desired objectives for seral condition in hardwood draws.
- Road building and logging within hardwood draws should follow state Best Management Practices.
- Overstory removal of trees (including logging and firewood cutting) should only occur in instances where understory is established and recruitment into overstory is possible.
- Prescribed burning should be considered as a management tool for restoration of hardwood draws.
- Hardwood draws should be managed on a landscape level with all adjacent habitats included in landscape matrix: addressing all management problems.

Assumptions – Woody Draws

- Managing grazing and logging better, and using prescribed fire will improve or restore hardwood draw habitat for birds.
- Managing these stands for the full range of seral classes based on historic conditions on public lands will increase and maintain bird.
- Distribution of deciduous vegetation is related to available soil moisture in upland areas.
- Better grazing management will increase cover and meet species requirements.

Monitoring Needs – Woody Draws

- Investigate the effects of different grazing strategies and prescribed burning on hardwood draw vegetation and response by breeding birds.
- Monitoring of landscape level management is needed to determine benefits to breeding birds in hardwood draws.

<u>Riparian – Conifer Forest</u>

Habitat Objectives and Recommendations – Riparian Conifer Forest

- All habitat types should be represented by the full range of seral conditions following natural disturbance regimes.
- Manage coniferous riparian forest stands so as to preserve old-growth characteristics wherever possible, with a goal of 50% of remaining mid- to upper elevation stands in mature to old-growth condition.
- Select lower elevation stands for restoration aimed at moving them into later seral conditions, while emphasizing maintenance of understory shrub cover and tree recruitment into the overstory. This may involve removal of livestock.
- Manage lower elevation riparian stands to achieve a goal of 25 % in mature to old-growth condition, with the remainder spread among other seral stages, particularly aspen, cottonwood, and birch elements.

Assumptions – Riparian Conifer Forest

- Both flooding and fire played a significant historical role in coniferous riparian systems.
- Mimicking natural disturbance patterns will provide the full range of seral conditions and structural attributes for the greatest number of bird species.

- Old growth coniferous riparian forests are limited by past and current human activities.

Monitoring Needs – Riparian Conifer Forest

- What silvicultural methods are appropriate for mimicking natural disturbances, and what are their effects on birds?
- How wide a buffer strip is needed to protect riparian habitat and bird use in various landscape contexts?
- How does bird species diversity and productivity differ along elevational and moisture gradients in Montana's riparian conifer types?
- What patch size is required by priority species?

Dead Tree Aggregations

Habitat Objectives and Recommendations

- Expand the opportunity for allowing lightning fires to burn or igniting fires when conditions permit.
- Provide a continual supply of burned areas
- Have 1-2% of landscape in recently burned conditions with at least 1% left untreated.
  - Leave large portions unlogged in each burn
  - Leave large snags throughout, even in the logged portions
  - Preference should be to leave mature or older stands of ponderosa pine or Douglas-fir unsalvaged.
- Determine the historic extent habitat type of burned landscapes.

Continental Divide Linkage Zone

Habitat Objectives/Recommendations

Habitat objectives and recommendations for maintaining an effective corridor in the Divide ecosystem is best addressed via road management and consideration of species requirements such as patch size and connectedness of patches. This is best achieved through project level analyses such as travel planning and specific vegetation management.

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