Chapter 3
Affected Environment

Introduction

Chapter 3 contains a description of the physical, biological, cultural, economic and social conditions of the HiLine planning area. The Affected Environment serves as the baseline of existing conditions from which the impacts of the alternatives may be analyzed. In order to improve the readability of this document and to enable the reader to easily locate referenced tables/sections, the resource discussions are organized alphabetically. The resource sections are noted in the document footers, along with the chapter and page numbers.

Air Resources and Climate Change

Regional air resources are influenced by the interaction of several factors, including weather, climate, the magnitude and spatial distribution of local and regional air pollutant sources, and the chemical properties of emitted air pollutants. Air resources include air quality and air quality related values (AQRVs), which include visibility and acid deposition to soils and lakes.

Regional Winds

Wind is a critical component of ambient air quality because it disperses pollutants and transports them away from the point of origin. The prevailing wind direction for Great Falls, Montana is out of the southwest, with the exception of May to July, when wind typically comes from the north, as shown in Table 3.1. Winter conditions may produce moderate winds with individual days generating strong winds.

Table 3.1
Prevailing Wind Directions and Average Speeds (mph) for Great Falls, Montana

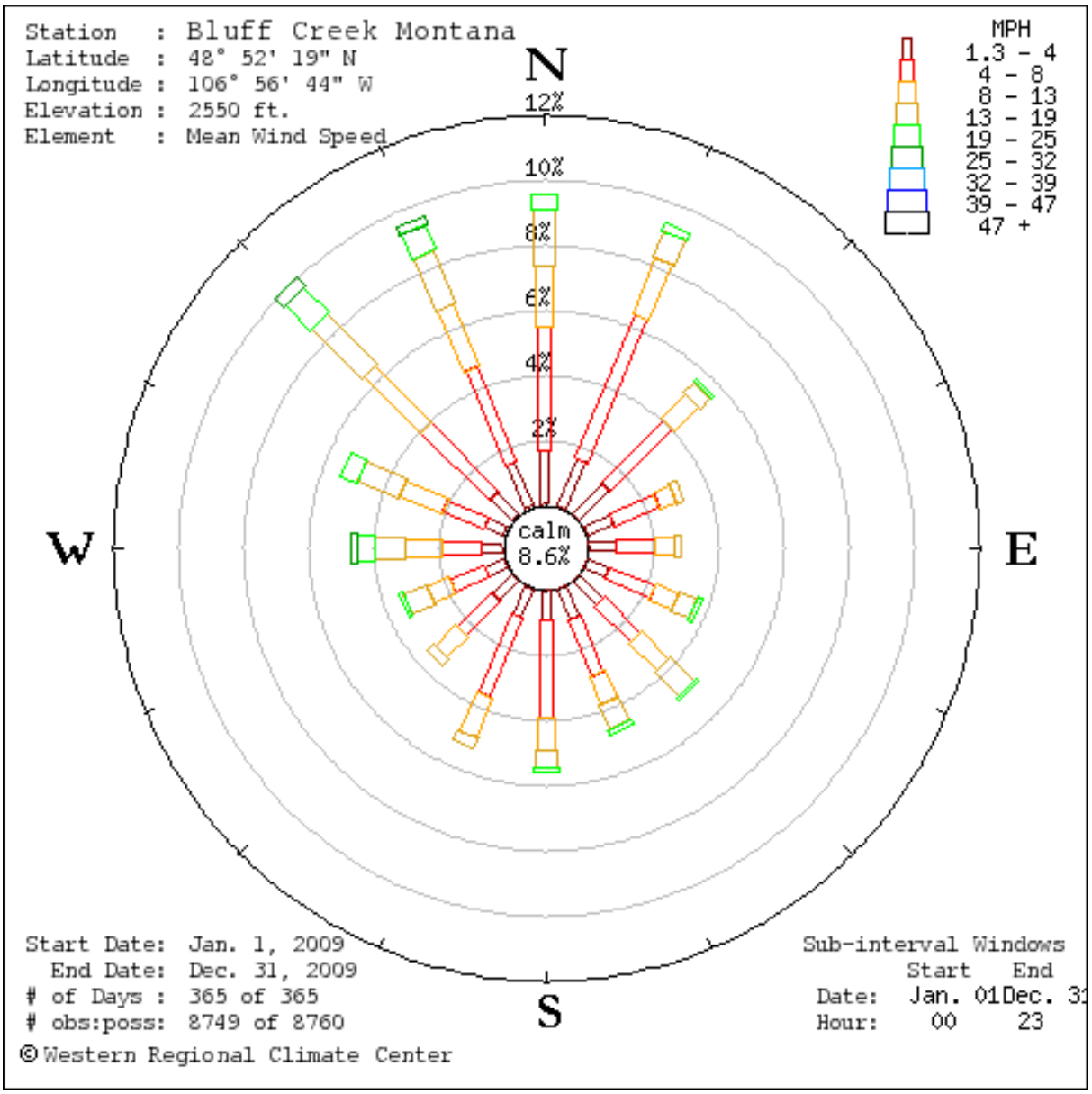
Jan	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sept*	*Oct*	*Nov*	*Dec*	*Annual*
SW	SW	SW	SW	N	N	N	SW	SW	SW	SW	SW	SW
13.3	12.3	11.8	11.2	11.3	10.2	9.6	9.2	10.4	11.9	13.2	13.8	11.5

Source: WRCC 2011a.

Wind varies considerably from one location to another. A wind rose for the Bluff Creek Remote Automated Weather Station (RAWS) in the northern portion of Valley County (northwest of Fort Peck Indian Reservation) indicates more northerly winds at this location. The 16 arms in Figure 3.1 indicate the frequency of wind blowing from the indicated direction. Longer arms indicate that the wind more frequently originates from the illustrated direction. Colored bands within each arm indicate the proportion of time that the wind blows with a given speed.

Sand Creek Area, Blaine and Chouteau Counties Photo by Kathy Tribby

Figure 3.1
Wind Rose for Bluff Creek, Montana (2009)



Source: WRCC 2011b.

Criteria Air Pollutants

Criteria air pollutants are substances for which the US Environmental Protection Agency (EPA) established national health-based concentration standards under the National Ambient Air Quality Standards (NAAQS) program. Criteria air pollutants include carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), particulate matter with a diameter greater than or equal to 10 micrometers (PM_{10}), particulate matter with a diameter greater than or equal to 2.5 micrometers ($PM_{2.5}$), and sulfur dioxide (SO_2). Criteria air pollutant concentrations are compared to NAAQS and Montana Ambient Air Quality Standards (MAAQS). The NAAQS include both primary and secondary standards, as shown in Table 3.2. Primary standards protect public health, including the health of sensitive populations such as asthmatics, children, and the elderly. Secondary standards protect public welfare by preventing damage to buildings, infrastructure, and vegetation.

Table 3.2
Federal and State Ambient Air Quality Standards

	Federal NAAQS[1]			***State MAAQS[2]***
Pollutant	***Averaging Time***	***Level***	***Standard Type***	***Level***
Carbon Monoxide (CO)	8-hour	9 ppm [3]	Primary	9 ppm [12]
	1-hour	35 ppm [3]	Primary	23 ppm [12]
Fluoride in Forage	Monthly	N/A	N/A	50 µg/g
	Grazing Season	N/A	N/A	35 µg/g
Hydrogen Sulfide	1-hour	N/A	N/A	0.05 ppm [12]
Lead (Pb)	3-month (rolling)	0.15 µg/m^3 [4]	Primary, Secondary	N/A
	90-day	N/A	N/A	1.5 µg/g [4]
Nitrogen Dioxide (NO_2)	Annual	0.053 ppm [4]	Primary, Secondary	0.05 ppm [13]
	1-hour	0.100 ppm [5]	Primary	0.30 ppm [12]
Fine Particulate Matter ($PM_{2.5}$)	Annual	12 µg/m^3 [6,7]	Primary	N/A
	Annual	15.0 µg/m^3, [14]	Secondary	N/A
	24 hour	35 µg/m^3 [5]	Primary, Secondary [8]	N/A
Particulate Matter (PM_{10})	Annual	N/A	N/A	50 µg/m^3 [14]
	24-hour	150 µg/m^3 [9]	Primary, Secondary	150 µg/m^3
Settleable Particulate	30-day	N/A	N/A	10 g/m^2
Ozone (O_3)	8-hour	0.075 ppm [10]	Primary, Secondary	N/A
	1-hour	N/A	N/A	0.10 ppm [12]
Sulfur Dioxide (SO_2)	Annual	0.030 ppm [4]	Primary	0.02 ppm [13]
	24-hour	0.14 ppm [3]	Primary	0.10 ppm [12]
	3-hour	0.5 ppm [3]	Secondary	N/A
	1-hour	0.075 ppm [11]	Primary	0.50 ppm [15]
Visibility	Annual	N/A	N/A	3 x 10^{-5}/m [16]

[1] NAAQS are codified in Title 40 of the Code of Federal Regulations (CFR), Part 50.
[2] MAAQS are codified in Title 17, Chapter 8, Subchapter 2 of the Ambient Air Quality standards in the Administrative Rules of Montana (ARM).
[3] Not to be exceeded more than once per calendar year.
[4] Not to be exceeded.
[5] Based on a 3-year average of the 98th percentile of the daily maximum concentrations.
[6] Based on a 3-year average of the weighted annual mean from one or more community monitors.
[7] EPA proposed to revise the annual primary $PM_{2.5}$ standard to within a range of 12–13 µg/m^3.
[8] EPA proposed a new secondary standard for $PM_{2.5}$ visibility of 28 or 30 deciviews (equivalent to 24 or 19 kilometers [15 or 12 miles] standard visual range).
[9] Not to be exceeded more than once per calendar year, based on a 3-year average of maximum 24-hour values.
[10] Based on the 3-year average of the fourth-highest daily maximum 8-hour concentrations per calendar year.
[11] Based on a 3-year average of the 99th percentile of the daily maximum concentrations.
[12] Not to be exceeded more than once over any 12 consecutive months.
[13] Arithmetic average not to be exceeded more than once over any 4 consecutive quarters.
[14] Not to be exceeded more than once per year on average over 3 years.
[15] Not to be exceeded more than 18 times in any 12 consecutive months.
[16] This standard applies only in certain Class I areas (Table 3.5).

Areas that do not meet federal standards are designated as nonattainment areas. Air quality within the planning area is good and all areas are designated as attainment areas that meet the NAAQS or as unclassifiable areas that are presumed to meet the NAAQS.

Air Quality Monitoring

The Montana Department of Environmental Quality (MDEQ) performs regulatory monitoring of NO_2, ozone, SO_2, PM_{10}, and $PM_{2.5}$ in order to determine compliance with NAAQS and MAAQS. Air pollutant concentration monitoring networks in Montana include the State and Local Air Monitoring Stations (SLAMS), a National Core (NCore) monitoring site, tribal monitoring networks, and the Clean Air Status and Trends Network (CASTNet). SLAMS are usually located in urban areas and measure criteria pollutants and the NCore site to determine long-term trends in a relatively pristine area. The MDEQ operates the SLAMS network within Montana to determine compliance with regulatory concentration standards. CASTNet and NCore stations are located in remote areas and measure concentrations of compounds that are of interest to ecosystem health. Air pollutant concentrations are usually reported on a volume basis as parts per million (ppm) or parts per billion (ppb) for gaseous substances and on a mass basis as micrograms per cubic meter ($\mu g/m^3$) for solid substances such as PM_{10} and $PM_{2.5}$.

Monitors that provide information on AQRVs include the National Acid Deposition Program (NADP) network and the Interagency Monitoring of Protected Visual Environments (IMPROVE) network. A list of monitoring stations near the planning area is provided in Table 3.3.

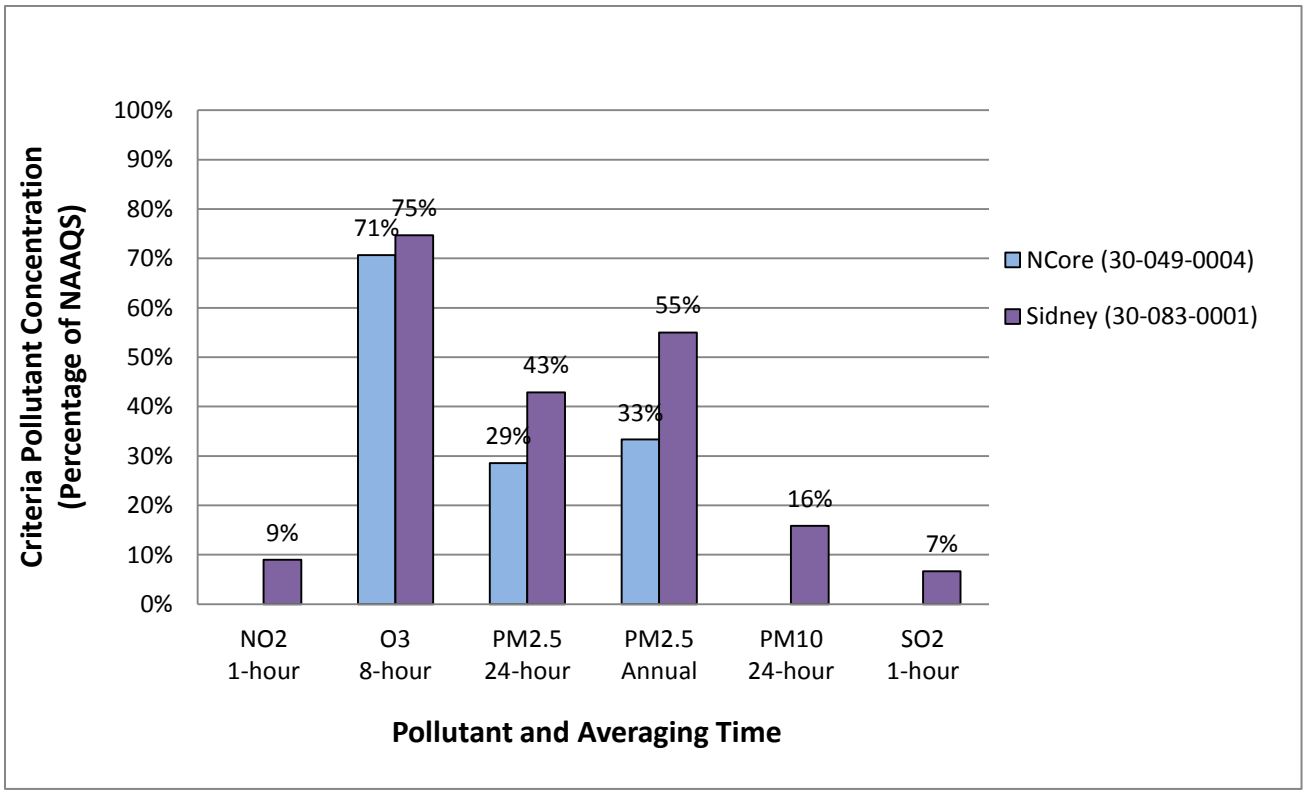
Table 3.3
Air Quality Monitoring Stations In or Near the Planning Area

Monitoring System	*Station Identifier*	*Pollutant or AQRV*	*Location*	*Latitude*	*Longitude*
SLAMS	30-029-8001	O_3	Glacier National Park	48.5103	-113.9956
	30-083-0001	NO, NO_2, NO_x, PM_{10}, $PM_{2.5}$, SO_2	Sidney[1]	47.8034	-104.4856
NCore	30-049-0004	CO, NO, NO_y, O_3, SO_2, $PM_{2.5}$, PM_{Course}	Sieben's Flat	46.8505	-111.9872
CASTNET	THR422	O_3, SO_2, Deposition	Theodore Roosevelt National Park (North Dakota)	46.8947	-103.3778
	GLR468	O_3, SO_2, Deposition	Glacier National Park	48.5103	-113.9956
NADP	MT98	Wet Deposition	Havre	48.5007	-109.798
	MT96	Wet Deposition	Poplar River	48.3149	-105.144
	MT05	Wet Deposition	Glacier National Park	48.5102	-113.997
IMPROVE	FOPE1	Visibility	Fort Peck Indian Reservation	48.308	-105.102
	MELA1	Visibility	Medicine Lakes Wilderness	48.487	-104.476
	ULBE1	Visibility	UL Bend	47.5823	-108.72
	GLAC1	Visibility	Glacier National Park	48.511	-113.997

Sources: MDEQ 2013; EPA 2012.
[1] On April 8, 2013, the EPA approved MDEQ's request to redesignate the Sidney monitor as a special purpose monitor producing non-regulatory data for PM_{10} due to monitor siting near a gravel road. The location of this monitor does not meet monitor siting requirements for PM_{10}.

The sources and effects of each criteria pollutant are explained below. Recent ambient air quality monitoring data are shown as the percentage of the monitored concentration compared to the NAAQS in Figure 3.2. Values shown in Figure 3.2 are based on the format of the NAAQS. For example, when a NAAQS allows one exceedance of a standard per year, the second highest monitored value is reported for comparison to the NAAQS. MDEQ-operated monitoring sites with three years of data are located outside of the planning area at Sidney and Sieben's Flat. In August 2012, new monitoring stations began operating near Malta within the planning area and south of the planning area in Lewistown. Due to insufficient operating time, data from these monitors are not reported.

Figure 3.2
Representative Air Pollutant Concentrations Near the HiLine Planning Area (2010-2012)



Source: MDEQ 2013.

NO_2 1-hour: 3-year average of 98th percentile

O_3 8-hour: 3-year average of 4th highest daily maximum 8-hour average

$PM_{2.5}$ 24-hour: 3-year average of 98th percentile)
Annual: 3 year average weighted mean

PM_{10} 24-hour: 3-year average of 2nd maximum

SO_2 1-hour: 3-year average of the 99th percentile of 1-hour daily maximum concentrations

Carbon Monoxide

CO can have significant effects on human health because it combines readily with hemoglobin and consequently reduces the amount of oxygen transported in the bloodstream. Effects on humans from exposure to high CO concentrations can include slight headaches, nausea, or death.

Motor vehicles and other internal combustion engines are the dominant source of CO emissions in most areas. High CO levels develop primarily during winter when periods of light winds combine with ground-level temperature inversions (typically from the evening through early morning). These conditions result in reduced dispersion of vehicle emissions. CO is also created during refuse, agricultural, and wood-stove burning and through some industrial processes.

Carbon monoxide is not monitored within the planning area or in urban areas within Montana. Monitoring in prior years indicated extremely low CO concentrations and was discontinued by the MDEQ at its SLAMS monitors.

Lead

The primary historical sources of lead emissions have been certain types of industrial sources and lead in gasoline and diesel fuel. However, since lead in fuels has decreased substantially, processing of metals containing trace amounts of lead is now the primary source of lead emissions. The highest levels of lead in air are generally found near lead smelters.

Other stationary sources include waste incinerators, utilities, and lead-acid battery manufacturing plants. The effects of lead exposure include brain and other nervous system damage; children exposed to lead are particularly at risk. Due to the lack of large lead emission sources, lead levels in the planning area are expected to be well below the NAAQS and MAAQS. No data are available to determine the trend in lead concentrations. However, decreasing lead levels in gasoline and diesel fuel indicate a likely decrease in lead levels within the planning area.

Nitrogen Dioxide

Nitrogen oxides (NO_x), including nitric oxide (NO) and NO_2, are formed when naturally occurring atmospheric nitrogen and oxygen are combusted with fuel in automobiles, power plants, industrial processes, and home and office heating. At high exposures, NO_2 causes respiratory system damage of various types, including bronchial damage. Its effects are exhibited by increased susceptibility to respiratory infection and changes in lung function. Within the atmosphere, NO_2 contributes to visibility impacts and may be visible as reddish-brown haze. NO_2 and other forms of NO_x form nitric acid (HNO_3), a component of atmospheric deposition (e.g., acid rain).

Hourly NO_2 concentrations from the rural Sidney monitor within Richland County are provided in Figure 3.2. This monitor is located in an oil and gas activity area east of the planning area. Monitored 1-hour concentrations were 9% of the NAAQS during 2010-2012.

Ozone

Ozone is not emitted directly into the atmosphere. Instead, it is formed by a photochemical reaction of precursor air pollutants, including volatile organic compounds (VOCs) and NO_x. These precursors are emitted by mobile sources, stationary combustion equipment, and other industrial sources. Ozone is produced year-round, but due to greater sunlight and air temperatures, urban ozone concentrations are generally greatest during the summer. Elevated ozone concentrations may also occur during winter in snow-covered rural areas, particularly in areas with deep valleys.

Ozone is a severe eye, nose, and throat irritant. A potent oxidant, it increases susceptibility to respiratory infections and may cause substantial damage to vegetation (leaf discoloration and cell damage) and other materials (attacking synthetic rubber, textiles, paints, and other substances).

The 3-year averages of the fourth highest 8-hour ozone concentrations were 0.053 ppm at the NCore monitor and 0.056 ppm at the Sidney monitor during 2010-2012. These measured concentrations were 71% and 75% of the 8-hour 2008 primary and secondary NAAQS of 0.075 ppm.

Particulate Matter

Particulate matter includes PM_{10} and $PM_{2.5}$. PM_{10} impacts include health effects (because PM_{10} is small enough to reach the lungs when inhaled), deposition on plants and surfaces (including soiling of snow which can contribute to climate change), localized reductions in visibility, and potential corrosion. PM_{10} emissions are generated by a variety of sources including agricultural activities, industrial emissions, and road dust re-suspended by vehicle traffic. Within the planning area, primary sources of PM_{10} include smoke from wildland fire, residential wood burning, street sand, physically disturbed soils, and dust from unpaved roads.

$PM_{2.5}$ poses greater health concerns than PM_{10} because it can pass through the nose and throat and be trapped deep in the lungs. Fine particulate also contributes to reduced visibility in nationally important areas such as national parks and wilderness areas. $PM_{2.5}$ emissions are primarily generated by internal combustion diesel engines, soils with high silt and clay content, and secondary aerosols formed by chemical reactions in the atmosphere.

The three-year average second highest 24-hour PM_{10} concentration was 23.8 $\mu g/m^3$ or 16% of the corresponding primary and secondary NAAQS in Sidney. The 3-year average 98th percentile 24-hour $PM_{2.5}$ concentration at the same location was15.0 $\mu g/m^3$, which was 43% of the corresponding primary and secondary NAAQS. The 3-year average weighted mean $PM_{2.5}$ annual concentrations at Sidney was 6.6 $\mu g/m^3$, or approximately 55% of the corresponding primary NAAQS. $PM_{2.5}$ concentrations at the NCore monitor were less than those at Sidney.

Sulfur Dioxide

SO_2 is a colorless gas with a pungent odor. Prolonged exposure to high levels of SO_2 can lead to respiratory failure, and SO_2 plays an important role in the aggravation of chronic respiratory illnesses such as asthma. SO_2 is emitted primarily from stationary sources that burn fossil fuels (i.e., coal and oil) containing trace amounts of elemental sulfur. Other human-caused sources of SO_2 include metal smelters and petroleum refineries. In the atmosphere, SO_2 converts to sulfuric acid, a component of atmospheric deposition (acid rain), and forms secondary aerosols, subsequently contributing to visibility impacts in nationally important areas.

The 3-year average 99th percentile 1-hour SO_2 concentration was 5.0 ppb at the Sidney monitor from 2010-2012. This concentration was 7% of the corresponding primary 75 ppb NAAQS.

VOCs

VOCs include a variety of chemicals, some of which have adverse health effects. Concentrations of many VOCs are consistently higher indoors than outdoors. VOCs are emitted from equipment such as organic liquid storage tanks, leaking equipment, and from engines and other combustion equipment. In addition, thousands of products emit VOCs, including paints, cleaning supplies, pesticides, building materials, office equipment, glues, and permanent markers. VOCs are not subject to a NAAQS. However, since they react with NO_x to form ground-level ozone, VOCs are a precursor to ozone and VOC emissions are regulated by EPA.

Hazardous Air Pollutants

Hazardous air pollutants (HAPs) are pollutants that are known or suspected to cause cancer or other serious health problems, which include chronic respiratory disease, reproductive disorders, or birth defects. Of the 187 regulated HAPs, several are commonly emitted from planning area engines and other sources. Engine-emitted HAPs include formaldehyde, benzene, toluene, ethyl benzene, xylenes, and hexane (i.e., n-hexane). Potential concentrations of HAPs are compared to health-based thresholds to estimate the risk of health effects.

Mercury is a HAP whose emissions are largely associated with large coal-burning facilities, such as electric utilities. Ambient concentrations of mercury are not monitored within the planning area. During 2010, the average mercury concentration was 5.9 nanograms per liter (ng/L) in Glacier National Park. Total mercury deposition was approximately 91 ng per square meter (NADP 2011a). Mercury concentrations and total deposition at Glacier National Park are low compared to deposition in most other areas of the nation.

Other Pollutants

Other air pollutants of interest include nitrogen and sulfur compounds because they contribute to acid deposition and regional haze. Nitrogen compounds include particulate nitrate (NO_3^-), nitric acid, and ammonium (NH_4^+), while sulfur compounds include particulate sulfate (SO_4^{-2}) and SO_2. Concentrations of HNO_3, SO_2, NH_4^+, NO_3^-, and SO_4^{-2} within the planning area are low relative to concentrations across the United States (NADP 2011b).

Criteria Pollutant Emissions

Current air quality reflects the impacts of emissions of existing sources of air pollution. Table 3.4 provides an EPA estimate of recent emissions within the planning area based on the 2008 National Emission Inventory (NEI). Emissions of greenhouse gases (GHGs) are not included in Table 3.4 because these emissions were not reported to EPA and the MDEQ for calendar year 2008. Due to recent implementation of a new federal air quality rule, many facilities within the planning area began reporting GHG emissions to EPA after 2010.

Table 3.4
HiLine Planning Area Criteria Pollutant Emissions by County

	Emissions (tons/year)					
County	***CO***	***NO_X***	***PM_{10}***	***$PM_{2.5}$***	***VOC***	***SO_2***
Blaine	2,922	2,722	3,696	460	456	23
Chouteau	2,831	1,189	2,985	404	413	27
Glacier	3,281	1,840	4,787	583	583	24
Hill	4,045	2,060	4,151	552	637	31
Liberty	1,404	987	1,277	188	269	16
Phillips	2,104	1,271	2,783	347	443	18
Toole	3,593	1,831	1,319	217	544	23
Valley	3,286	2,018	2,712	385	612	31
Total	23,466	13,918	23,710	3,136	3,957	193

Source: EPA 2011a.

Air Quality Related Values

AQRVs include visibility or a specific scenic, cultural, physical, biological, ecological, or recreational resource identified for a particular area. Air pollution can impact AQRVs through ambient exposure to elevated atmospheric concentrations, such as ozone effects to vegetation, through impairment of scenic views by pollution particles in the atmosphere, and through deposition of air pollutants, such as sulfur and nitrogen compounds, on the earth's surface through precipitation or dry deposition. AQRVs on federal lands are identified and managed within the respective jurisdictions of several land management agencies, including the US Forest Service (USFS), National Park Service (NPS), US Fish and Wildlife Service (USFWS), and the BLM. Class I areas are afforded specific AQRV protection under the Clean Air Act. Under NEPA, Class II areas may be analyzed to assess AQRV impacts if they are identified as sensitive Class II areas.

Table 3.5 summarizes Class I and sensitive Class II areas in or near the planning area. Portions of Glacier National Park and the UL Bend Wilderness are Class I areas located within the planning area. The Fort Peck Indian Reservation is adjacent to the eastern boundary of the planning area, while the Medicine Lake Wilderness is approximately 100 km east of the planning area and the Great Bear Wilderness is near the southwest corner of the planning area. Sensitive Class II areas include two Indian Reservations within the planning area and the Bear Paw Battlefield and several National Wildlife Refuges (NWRs).

Table 3.5
Class I and Sensitive Class II Areas In or Near the HiLine Planning Area

Area Name	***Jurisdictional Agency***
Class I Areas	
Glacier National Park	NPS
UL Bend Wilderness	USFWS
Great Bear Wilderness	USFS
Fort Peck Indian Reservation	Tribal
Medicine Lake Wilderness	USFWS
Sensitive Class II Areas	
Bear Paw Battlefield	NPS
Bowdoin NWR	USFWS
Charles M. Russell NWR	USFWS
Creedman Coulee NWR	USFWS
Fort Belknap Indian Reservation	Tribal
Lake Thibadeau NWR	USFWS
Medicine Lake NWR	USFWS
Rocky Boys Indian Reservation	Tribal
U.L. Bend NWR	USFWS

NWR = National Wildlife Refuge.

Deposition

Atmospheric deposition refers to the processes by which air pollutants are removed from the atmosphere and deposited on terrestrial and aquatic ecosystems. Deposition is reported as the mass of material deposited on an area in a given period (e.g., kilogram per hectare per year [kg/ha-yr]). Wet deposition refers to air pollutants deposited by precipitation, such as rain and snow. One expression of wet deposition is precipitation pH, a measure of the acidity or alkalinity of the precipitation. Dry deposition refers to gravitational settling of particles and adherence of gaseous pollutants to soil, water, and vegetation. Total deposition refers to the sum of airborne material transferred to the Earth's surface by both wet and dry deposition. Total nitrogen deposition is calculated by summing the nitrogen portion of wet and dry deposition of nitrogen compounds, and total sulfur deposition is calculated by summing the sulfur portion of wet and dry deposition of sulfur compounds.

The normal range of precipitation pH is 5.0–5.6 (Seinfeld 1986). At the Havre Agricultural Research Station, 2010 annual average precipitation pH was approximately 5.49 (NADP 2011a). The planning area has low nitrate wet deposition (2 kg/ha kilograms per hectare [kg/ha]) and ammonium wet deposition (0.9 kg/ha) compared to the rest of the United States, which has nitrate deposition values from 1–12 kg/ha and ammonium deposition values of 0.2–7.1 kg/ha (NADP 2011b).

Total nitrogen deposition at the Glacier National Park station was 1.67 kg/ha-yr in 2009 (CASTNet 2011). The planning area has low nitrate and ammonium deposition compared to the rest of the United States (NADP 2011b). With regard to total sulfur deposition, approximately 0.8 kg/ha-yr of sulfate was deposited at Glacier National Park during 2009 (CASTNet 2011). High elevation ecosystems in the park are particularly sensitive to nitrogen deposition because high elevation areas receive greater amounts of snow and rain and short growing seasons and shallow soils limit the capacity of soils and plants to absorb nitrogen. Nitrogen deposition can also contribute to nitrogen enrichment, which can potentially change the species composition of sensitive terrestrial and aquatic communities.

Atmospheric deposition can also cause acidification of lakes and streams. One expression of lake acidification is the change in acid neutralizing capacity, the lake's capacity to resist acidification from atmospheric deposition. Acid neutralizing capacity is expressed in units of micro-equivalents per liter (μeq/L). Lakes with acid neutralizing capacity values of between 25 to 100 μeq/L are considered to be sensitive to atmospheric deposition, lakes with acid neutralizing capacity values of between 10 to 25 μeq/L are considered to be very sensitive, and lakes with acid neutralizing capacity values of less than 10 are considered to be extremely sensitive (Fox, et al. 1989).

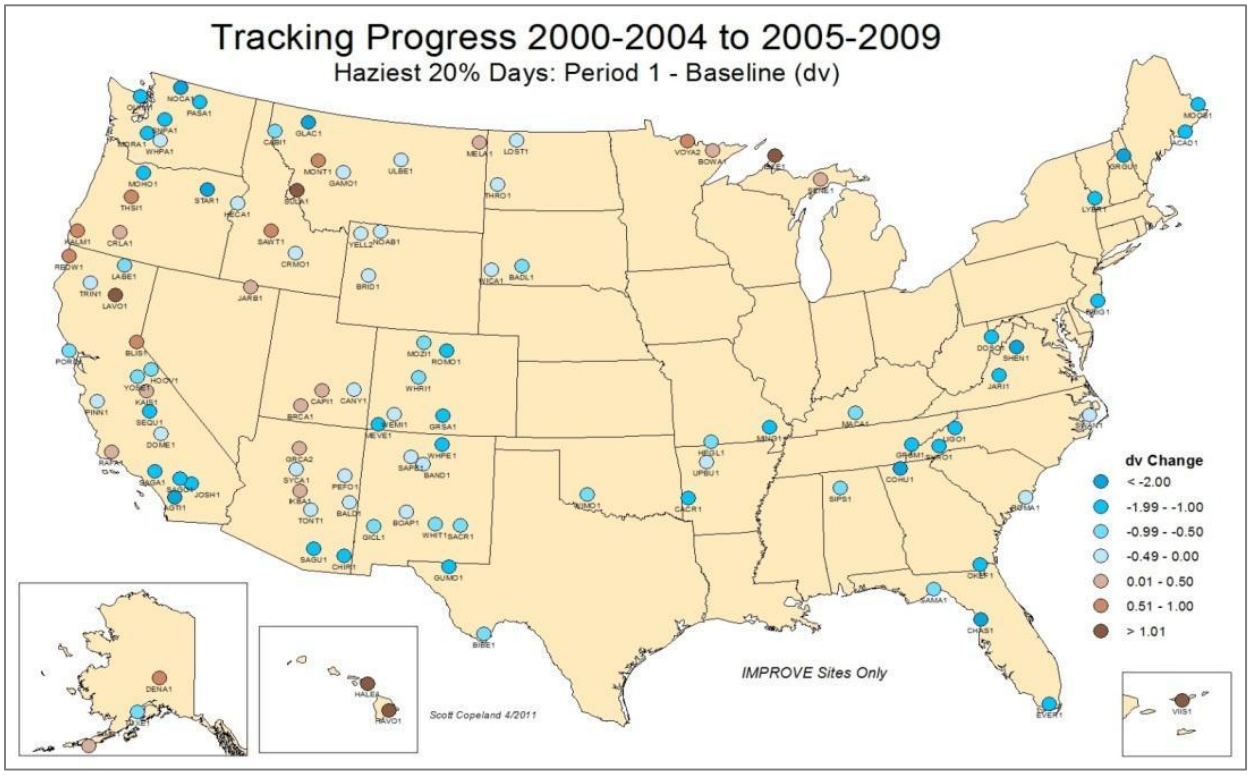
Visibility

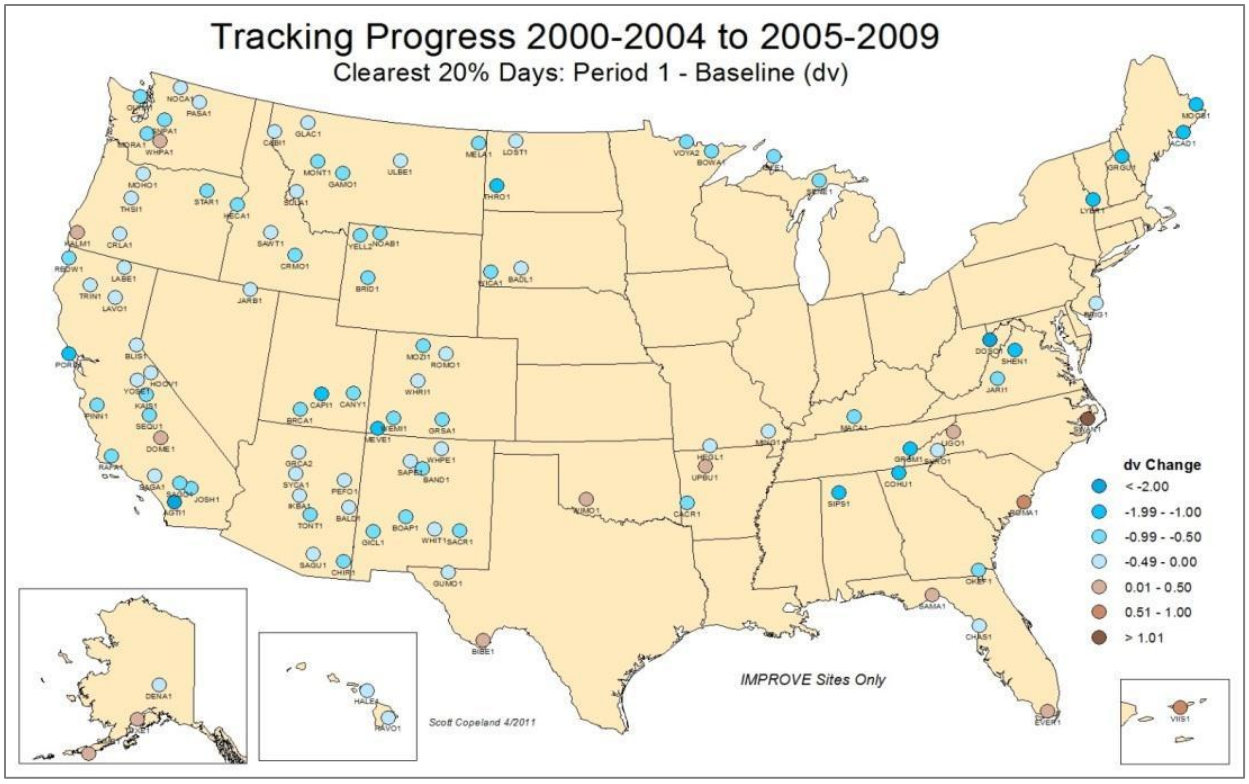
Visibility is a measure of how far and how well an observer can see a distant and varied scene. Pollutant particles in the atmosphere can impair scenic views, degrading the contrast, colors and distance an observer is able to see. Light extinction is used as a measure of visibility and is calculated from the monitored components of fine particle mass (aerosols) and relative humidity. Light extinction is expressed in terms of deciviews, a measure for describing perceived changes in visibility. One deciview is defined as a change in visibility that is just perceptible to an average person, which is approximately a 10-percent change in light extinction. To estimate potential visibility impairment, monitored aerosol concentrations are used to estimate visibility conditions for each monitored day. Aerosol species affecting visual range include ammonium sulfate, ammonium nitrate, organic mass, elemental carbon, soil elements, and coarse mass.

Daily visibility values are ranked from clearest to haziest and divided into three categories to indicate the mean visibility for all days (average), the 20% of days with the clearest visibility (20% clearest), and the 20% of days with the worst visibility (20% haziest). Visibility can also be defined by standard visual range (SVR), which is the farthest distance at which an observer can see a black object viewed against the sky above the horizon; the larger the SVR, the cleaner the air. Since 1980, the Interagency Monitoring of Protected Visual Environments (IMPROVE) network has measured visibility in national parks and wilderness areas.

Visibility trends at Class I areas in or near the planning area are shown in Figure 3.3. On the 20% worst visibility days, visibility improved significantly at Glacier National Park, improved slightly at UL Bend Wilderness, and degraded slightly at Medicine Lakes Wilderness. When the 20% best visibility days are considered, visibility improved slightly to moderately at all three sites.

Figure 3.3
Visibility Trends on Haziest and Clearest Visibility Days (2005-2009)





Source: IMPROVE 2011.

Smoke Management

Smoke contains large quantities of CO and particulate matter. The MDEQ regulates prescribed fire activity under the authority of the Montana Open Burning Regulations (ARM Title 17, Section 8, Subchapter 6). The MDEQ issues open burn permits and, along with several counties, operates a Major and Minor Open Burning Smoke Management Program under the authority of MDEQ's Open Burning Regulations. In cooperation with the MDEQ, smoke management for prescribed fire activity is managed by the Montana/Idaho Airshed Group. Prescribed burns would be completed in a manner that is consistent with procedures established by the Montana/Idaho Airshed Group and the associated permit conditions of the Major Open Burning Permit and the rules addressing Minor Open Burning pursuant to the MDEQ Open Burning Regulations.

Climate

The topography of the state plays an important role in Montana's climate and creates a variable climate in the planning area. The Continental Divide exerts a marked influence on the climate of adjacent areas. West of the Divide the climate might be termed a modified northern Pacific coast type, while to the east, climatic characteristics are decidedly continental and much of the planning area is in the rain shadow of the Rocky Mountains. The continental climate of northcentral and northeastern Montana is characterized by light precipitation totals, abundant sunshine, low relative humidity, and a relatively large annual and diurnal temperature range. A climate summary for Havre, Montana is presented in Table 3.6.

Table 3.6
Monthly Climate Summary for Havre, Montana

Period of Record: 2/1/1961 to 12/31/2008

	Jan	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*July*	*Aug*	*Sept*	*Oct*	*Nov*	*Dec*	*Annual*
Average Max. Temperature (F)	25.6	33	43.3	57.2	67.9	76.5	85.3	84.1	71.5	59.1	41.5	29.9	56.2
Average Min. Temperature (F)	4.2	10.7	19.8	30.7	41	49.2	53.8	52.2	41.8	31	18.4	7.9	30.1
Average Total Precipitation (in.)	0.45	0.33	0.56	0.92	1.67	2.14	1.48	1.12	1.06	0.56	0.4	0.45	11.14
Average Total Snow Fall (in.)	8.5	5.9	6.8	5.3	1.1	0	0	0	0.3	1.7	4.8	7.3	41.7
Average Snow Depth (in.)	4	3	1	0	0	0	0	0	0	0	1	2	1

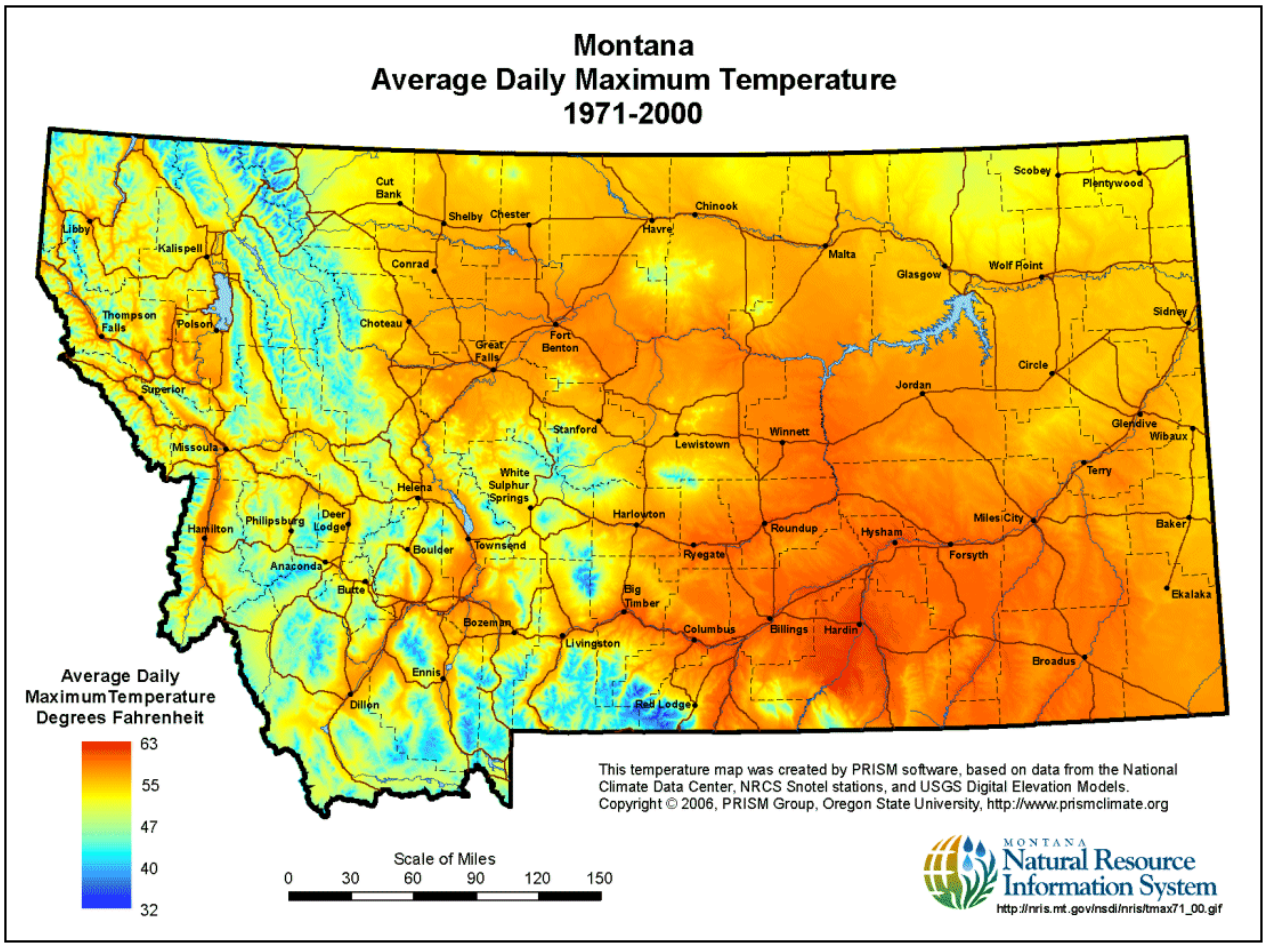
Source: Western Regional Climate Center, 2010.

Temperature

January is also the coldest month, with average daytime high temperatures in the mid to low 20s, and average night time low temperatures near zero. Overnight lows below zero are common during winter, and record low temperatures for all six of the cooler season months from October through March are below 0°F.

During the summer, hot weather occurs fairly often in northern Montana. July and August are the warmest months with average daytime highs in the mid-80s. This midsummer warmth is fairly steady, seldom severe, and is tempered by normal night time temperatures in the 50s. Generally, adequate moisture permits rapid plant and crop development during most growing seasons. Figure 3.4 shows statewide average daily maximum temperature.

Figure 3.4
Montana Average Daily Maximum Temperature



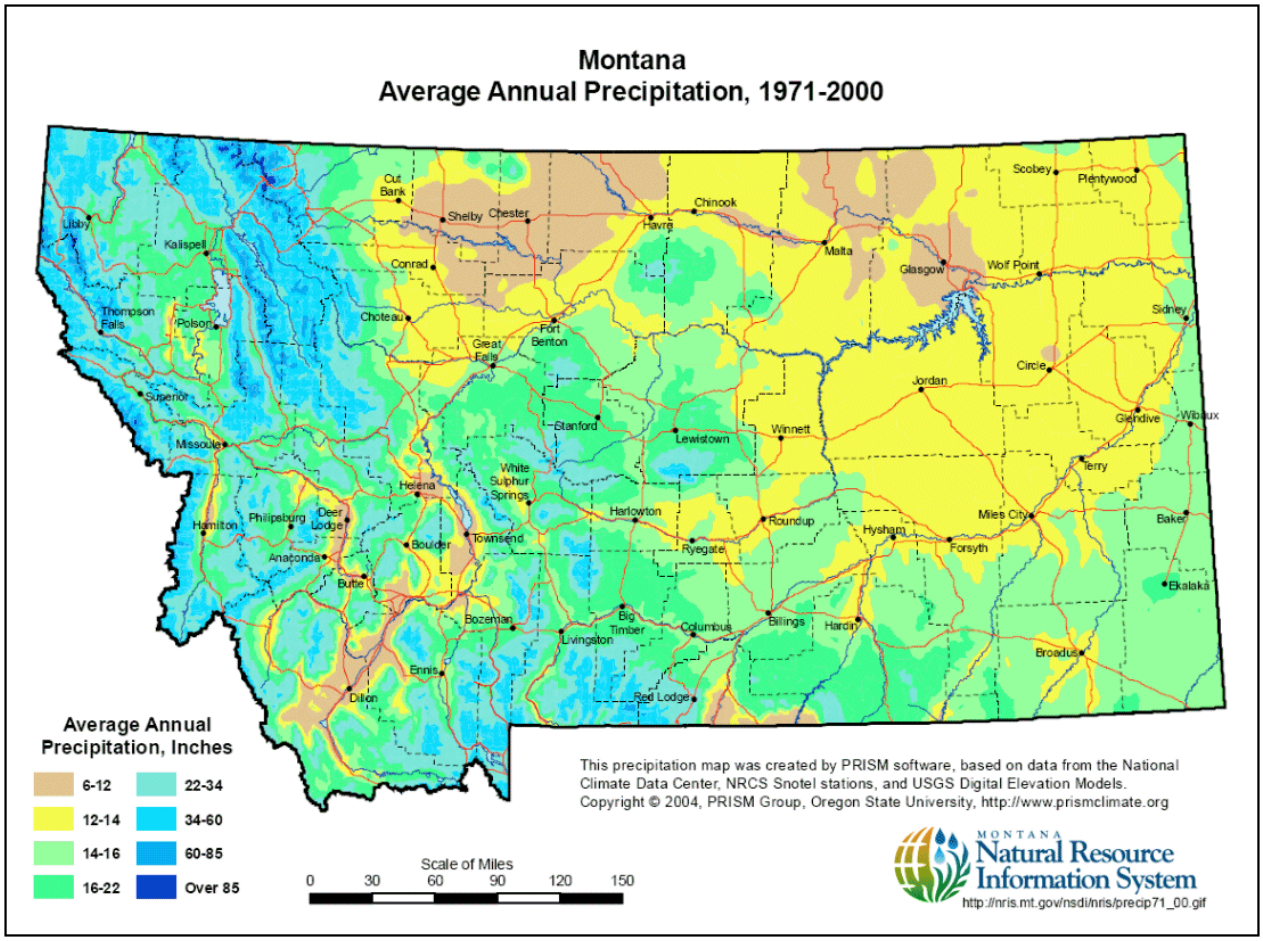
Source: NRIS 2011.

Precipitation

Precipitation varies widely and seasonally, and over the mountainous areas depends largely on topographic influences. Areas on the windward side of mountain ranges are generally the wettest. In the planning area, May and June are the two rainiest months. Most annual precipitation comes as rain, and daily total precipitation seldom exceeds one inch. During the spring, precipitation events are associated with larger scale weather systems that bring widespread snow and rain to the eastern plains. Summer rains fall almost entirely during brief, but frequently intense thunderstorms. Figure 3.5 depicts the statewide average annual precipitation.

Annual snowfall is approximately 25 inches in Malta and Glasgow and 42 inches in Havre. Most snow falls during November through April. The greatest volume of flow of Montana's rivers occurs during the spring and early summer months with the winter snowpack melt. Heavy rains falling during the spring thaw can constitute a serious flood threat. Ice jams may occur during the spring breakup, usually in March, and cause backwater flooding. Flash floods, although restricted in scope, are probably the most numerous and result from locally heavy rainstorms in the spring and summer.

Figure 3.5
Montana Average Annual Precipitation



Source: NRIS 2011.

Other Climatic Features

Severe storms of various types occur in northern Montana; however the most troublesome are hailstorms that cause crop and property damage. Tornadoes develop infrequently (approximately two per year) and occur more frequently in the eastern part of the planning area. Local but severe windstorms can occur from a few to several times a year. Drought in its most severe form is not common, but dry years do occur. All parts of the state rarely suffer from dryness at the same time.

In spite of figures that indicate cold winters, growing seasons (freeze-free periods) are four months or more in much of the agricultural area. In lower elevation areas of the planning area, the freeze-free period is 115-140 days, allowing time for growing many crops (MSU 2011).

Climate Change

Climate is the combination of temperature, humidity, atmospheric pressure, wind, rainfall, sunshine, cloudiness, and other meteorological characteristics in a given region over a long period of time. Climate differs from weather, which is the present condition of these characteristics and their variations over shorter periods. Climate change involves long-term trends indicating a noticeable shift in climate.

Primary climate indicators that can be monitored include ambient air temperature, atmospheric pressure, wind, relative humidity, precipitation amounts and timing, annual snow pack levels, stream flow volume and timing, and solar radiation.

The Intergovernmental Panel on Climate Change (IPCC) concluded "warming of the climate system is unequivocal" and "most of the observed increase in globally average temperatures since the mid-20th century is very *likely* due to the observed increase in anthropogenic greenhouse gas concentrations." Chapter 9 of Working Group I of the 2007 IPCC Report (IPCC 2007) addressed the causes of climate change. Some of the conclusions included: 1) human-induced warming of the climate system is widespread, 2) "it is *likely*" that there has been a substantial anthropogenic contribution to surface temperature increases since the mid-20th century, and 3) surface temperature extremes have "*likely*" been affected by anthropogenic forcing. As with any field of scientific study, there are uncertainties associated with the science of climate change. This does not imply that scientists do not have confidence in many aspects of climate change science. Some aspects of the science are known with virtual certainty because they are based on well-known physical laws and document trends (EPA 2008).

The temperature of the planet's atmosphere is determined by the amount of solar radiation absorbed by the earth and its atmosphere. GHGs (primarily carbon dioxide [CO_2], methane, and nitrous oxide [N_2O]) increase the earth's temperature by reducing the amount of solar energy that re-radiates back into space. In other words, more heat is trapped in the earth's atmosphere when atmospheric concentrations of GHGs are greater. While GHG emissions have occurred naturally for millennia and are necessary for life on earth, increased atmospheric concentrations of GHGs as well as land use changes are contributing to an increase in average global temperature. This warming is associated with climatic variability that exceeds the historic norm and is known as climate change. Extensive explanations of climate change causes and effects are provided in the *Climate Change Supplementary Information Report: Montana, North Dakota, and South Dakota Bureau of Land Management* (BLM 2010a), IPCC Fourth Assessment (IPCC 2007), *Climate Change Indicators in the United States* (EPA 2011b), and *Global Climate Change Impacts in the United States* (USGCRP 2009).

Annual GHG emissions for Montana, the United States, and the world are summarized in Table 3.7. Annual emissions of GHGs are usually quantified in units of metric tons (mt). A metric ton is equivalent to approximately 2,005 pounds (1.102 short tons). The combined effect of emissions of multiple GHGs is reported in terms of carbon dioxide equivalent (CO_2e), which is calculated by multiplying emissions by a global warming potential (GWP) number that takes into account each gas' atmospheric longevity and its heat-trapping capability. The GWP of CO_2 is set at 1. EPA determined other GHGs' relative climate change potentials over a 100-year time period. In EPA regulations effective as of November 1, 2013, global warming potentials for methane and nitrous oxide are 21 and 310, respectively. The EPA proposed to revised these global warming potentials to 25 (methane) and 298 (nitrous oxide). CO_2e emissions given in this document are based on global warming potential values of 21 and 310 because data referenced for comparison purposes are based on these values.

Table 3.7
Estimated Annual GHG Emissions [1]

Entity	*Data Year*	*CO_2e Emissions (10^6 mt)*
Montana[2]	2007	50.4
United States[3]	2011	6,702
Global[4]	2004	49,000

[1] Emissions exclude GHG emissions and sequestration due to land use and land use changes.
[2] World Resources Institute Climate Analysis Tool (WRI 2011).
[3] Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2013 (EPA 2013a).
[4] Climate Change 2007: Synthesis Report (IPCC 2007).

Other organizations, such as the IPCC, have set different GWPs and these vary depending on the time frame being analyzed. For example, estimates of methane's global warming potential over a 20-year period range from 72 to 105. The BLM uses the methane global warming potentials that are specified in EPA regulations and are used for GHG emission reporting under 40 *Code of Federal Regulations* Part 98 as of November 1, 2013. This approach allows for consistent comparisons with state and national GHG emission inventories. The BLM also provides estimated methane and nitrous oxide emission quantities in Chapter 4, which allow the public to use other global warming potentials to calculate CO_2e, if desired.

GHG emission sources within the planning area include combustion equipment such as heaters and engines, oil and gas development and production, coal mining, fire events, motorized vehicle use (construction equipment, cars and trucks, and off-highway vehicles), livestock grazing, facilities development, and other equipment exhaust and fugitive emissions. Contributions to climate change also result from land use changes (conversion of land to less reflective surfaces that absorb heat, such as concrete or pavement), changes in vegetation, and soil erosion (which can reduce snow's solar reflectivity and contribute to faster snowmelt). Emission controls on some sources can reduce GHG emissions.

Global atmospheric concentrations of GHGs are determined by the quantity of GHGs emitted to and removed from the atmosphere. Global concentrations of CO_2, methane, and N_2O in 2009 were 387 parts per million (ppm), 1,744 parts per billion (ppb), and 323 ppb, respectively (EPA 2011b). More recently, the CO_2 concentration monitored at the Manua Loa Observatory in Hawaii surpassed 400 ppm for the first time in May 2013. Atmospheric concentrations of CO_2 can be reduced by carbon storage in forests, woodlands, and rangelands, as well as in underground carbon sequestration projects. Vegetation management can provide a source of CO_2 (e.g., prescribed burns) or it can provide a sink of CO_2 through vegetation growth. The net storage or loss of carbon on rangelands and grasslands in northern Montana is generally small and difficult to estimate or measure. Most soils within the northern Montana contain relatively little organic matter compared to forest soils and forests and woodlands make up approximately 7% of the total acres on public lands in the planning area.

Climate Change Trends

Climate change trends include two types of trends: historic and predicted. Historic trends describe climate changes that have already been observed. Predicted climate change indicates modeled future changes based on assumptions of future global GHG emissions and resulting environmental effects. Climate change will continue into the future even if GHG emissions remain at current levels or decrease. Long lag times are associated with the massive thermal energy stored in oceans, which can take decades, or even centuries, to adjust to climate changes (EPA 2010b). In addition, the long lifetimes of many GHGs contribute to committed climate change. For example, CO_2 typically remains in the atmosphere for 50–200 years, depending on how long it takes CO_2 molecules to be absorbed by plants, land, or the ocean. N_2O is also long-lived; it remains in the atmosphere for approximately 120 years. In contrast, methane has a shorter lifetime and remains in the atmosphere for approximately 12 years (EPA 2010b). Additional types of GHGs also contribute to climate change, but their impact is substantially less due to their relatively small concentrations in the atmosphere.

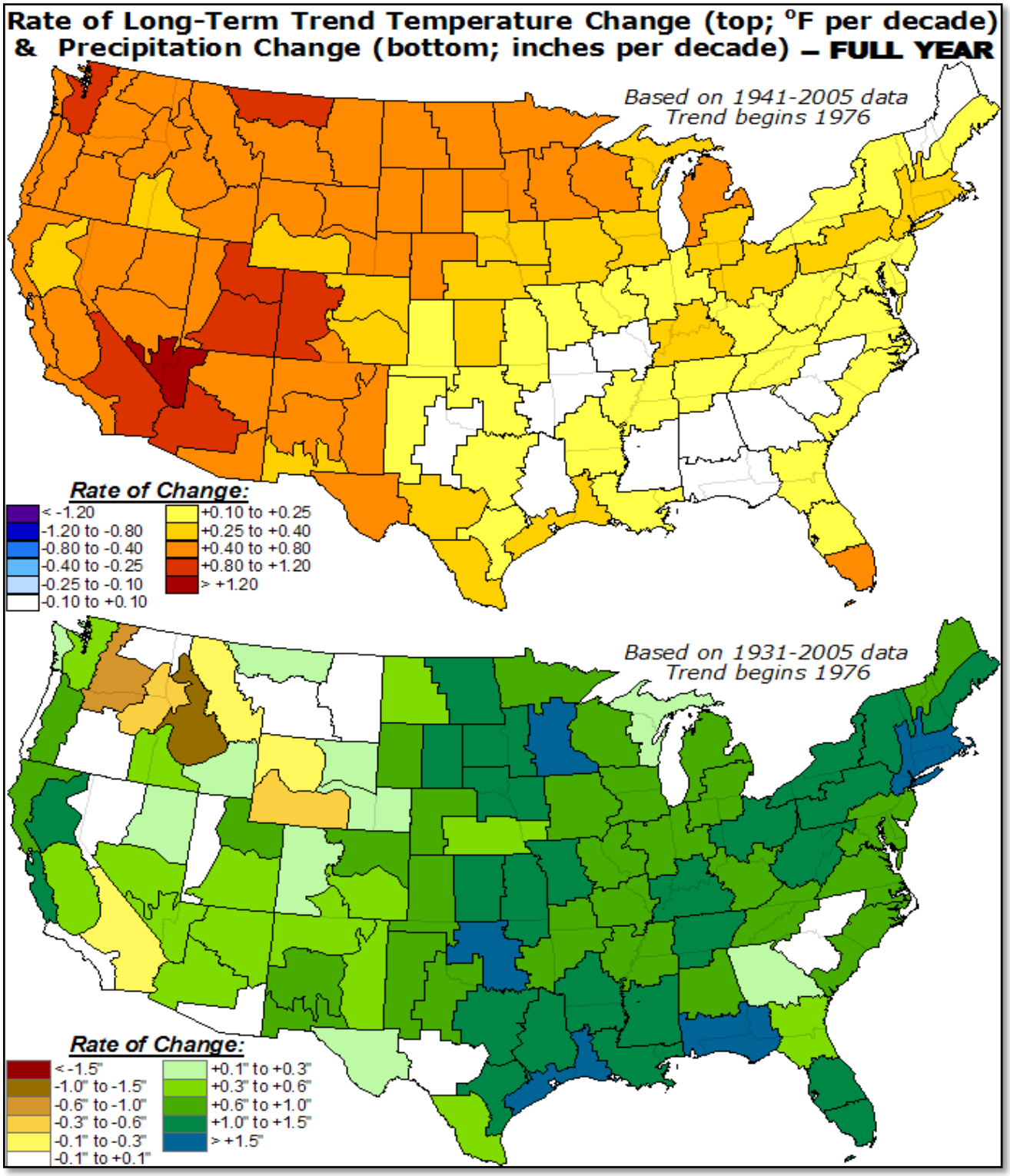
Temperature and Precipitation

Historical global mean surface temperatures have increased nearly 1.3°F from 1906 through 2008 (GISS and Sato 2010). Northern latitudes (above 23.6 through 90.0° N) have exhibited greater temperature increases of nearly 2.1°F since 1900, with nearly a 1.8 °F increase since 1970 alone (GISS and Sato 2010). In northern Montana, data from 1941 through 2005 indicate a long-term temperature increase between 0.40–1.20 °F per decade since 1976, as shown in Figure 3.6. With regard to precipitation, data from 1931 through 2005 indicate little change or up to a 0.3" inch increase in total annual precipitation in northern Montana since 1976.

Predictions of future temperature changes compared to a 1961–1979 baseline indicate that temperatures in northern Montana may increase 2–3°F by 2010–2029, as shown in Figure 3.7. Along with generally increasing temperatures, more days are predicted to have maximum temperatures greater than 100°F (USGCRP 2009). Computer model predictions indicate that increases in temperature will not be equally distributed, but are likely to be accentuated at higher latitudes. Warming during the winter months is expected to be greater than during the summer, and increases in daily minimum temperatures is more likely than increases in daily maximum temperatures. Rising temperatures would increase water vapor in the atmosphere, and reduce soil moisture, increasing generalized drought conditions, while at the same time enhancing heavy storm events.

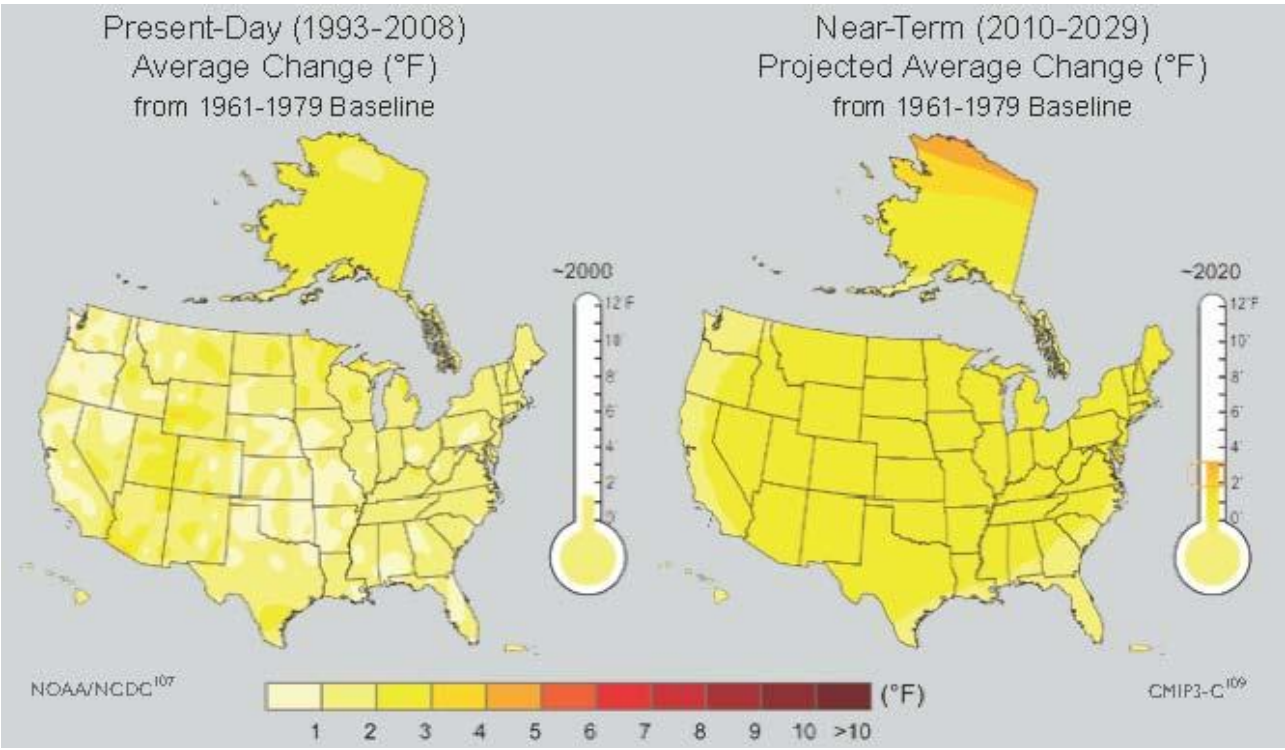
In addition to temperature and total precipitation changes, predicted climate changes include changes in precipitation timing by season and an increase in extreme rainfall events and other extreme weather events. Due to warming temperatures melting glaciers and thermal expansion within the seawater, ocean levels are expected to rise. These changes will affect a broad array of ecosystems and affect food supplies and human health.

Figure 3.6
Long-Term Historical Temperature and Precipitation Trends



Source: NOAA, 2011.

Figure 3.7
Near-Term Predicted Temperature Increases



Source: USGCRP 2009.

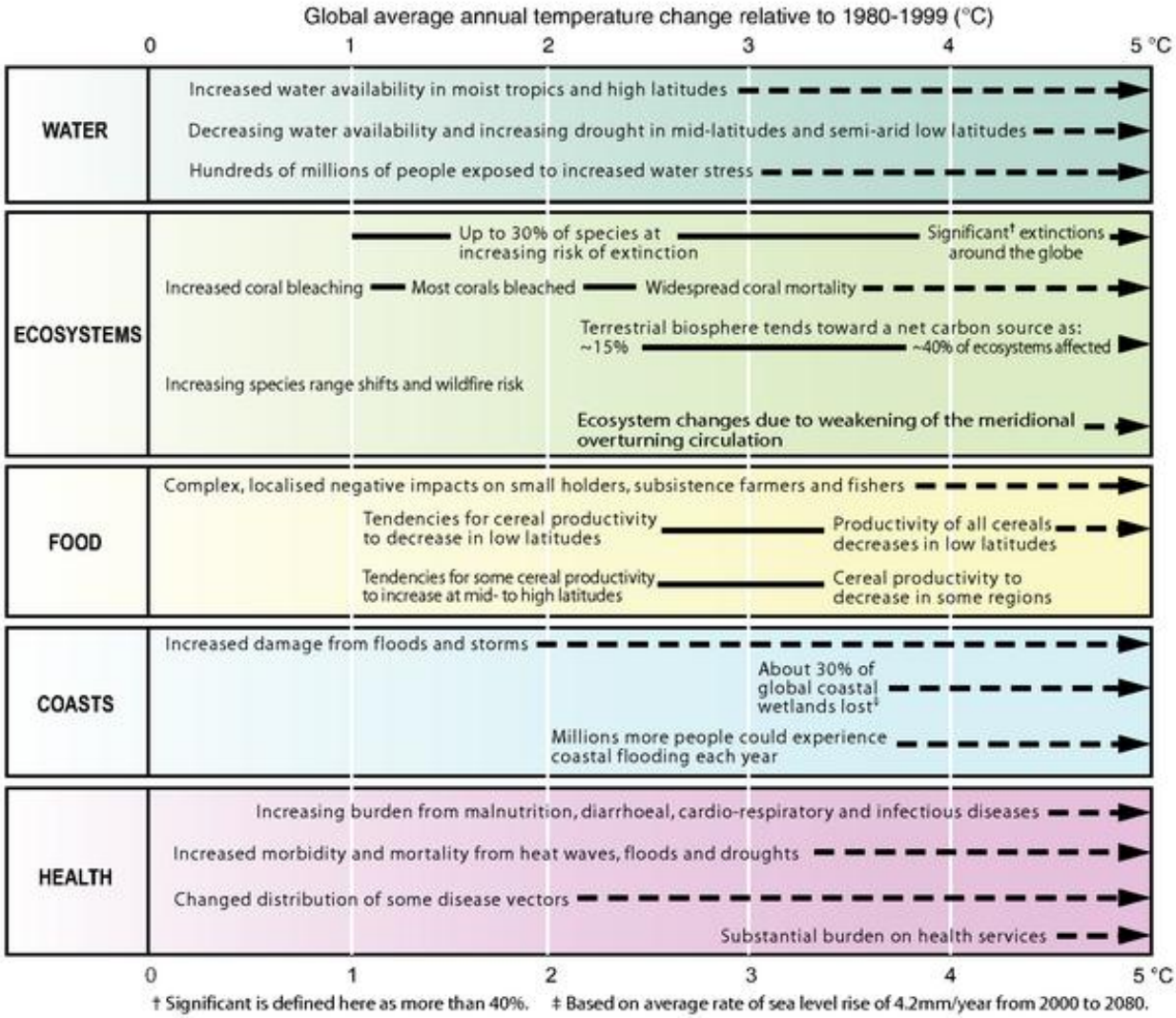
Climate Change Effects on Resources

Climate change affects nearly all resources at local, regional, and global levels. The effects of climate change are so widespread that they cannot all be described in this RMP. To illustrate the effects of global temperature change, Figure 3.8 provides broad examples of climate change impacts. As global temperatures increase, effects on resources become more significant.

Temperature and precipitation changes could directly affect air quality. Air quality would be improved if increased precipitation reduces wind-blown dust, but would be degraded if dry periods cause increased particulate emissions. Ground-level ozone may also be affected. High temperatures are a contributing factor in ground-level ozone formation, which is also highly dependent on NO_x and VOC concentrations.

Climate change will affect water quality in northern Montana. Increasing temperatures are likely to contribute to increased evaporation, drought frequencies, and declining water quantity. The warming of lakes and rivers will adversely affect the thermal structure and water quality of hydrological systems, which will add more stress to water resources in the region (IPCC 2007). Northern Montana depends on temperature-sensitive springtime snowpack to meet demand for water from municipal, industrial, agricultural, recreational uses and BLM-authorized activities. The USGS notes that mountain ecosystems in the western United States are particularly sensitive to climate change. Higher elevations, where much of the snowpack occurs, have experienced three times the global average temperature increase over the past century (USGS 2010). Higher temperatures are causing more winter precipitation to fall as rain rather than snow, which contributes to earlier snowmelt. Additional declines in snowmelt associated with climate change are projected, which would reduce the amount of water available during summer (USGCRP 2009). Rapid spring snowmelt due to sudden and unseasonal temperature increases can also lead to greater erosive events and unstable soil conditions.

Figure 3.8
Examples of Resource Impacts Due to Climate Change



Source: IPCC, 2007, Summary for Policy Makers

Increases in average summer temperatures and earlier spring snowmelt in northern Montana are expected to increase the risk of wildfires by increasing summer moisture deficits (USGCRP 2009). Studies have shown that earlier snowmelts can lead to a longer dry season, which increases the incidence of catastrophic fire (Westerling, et al. 2006). Together with historic changes in land use, climate change is anticipated to increase the occurrence of wildfire throughout the western United States. Predicted climate change impacts to wildfires show large increases in the annual average acreage burned. Based on modeling that assumed a 1°C (1.8°F) increase in global average temperature, a 393% increase in acreage burned in wildfires is predicted in northern Montana (NRC 2011). Air quality, ecosystem, and economic impacts from wildfires are extensive. Wildfires also release large quantities of CO_2 that would increase atmospheric GHG concentrations.

There is evidence that recent warming is affecting terrestrial and aquatic biological systems (IPCC 2007). Warming temperatures are leading to earlier timing of spring events such as leaf unfolding, bird migration, and egg-laying (IPCC 2007). The range of many plant and animal species has shifted poleward and to higher elevation, as the climate of these species' traditional habitat changes. As future changes in climate are predicted to be even greater than past changes, there will likely be even larger range shifts in the coming decades (Lawler, et al. 2009). Warming temperatures are also

linked to earlier vegetation growth in the spring and longer thermal growing seasons (IPCC 2007). In aquatic habitats, increases in algal abundance in high-altitude lakes have been linked to warmer temperatures, while range changes and earlier fish migrations in rivers have also been observed (IPCC 2007). Climate change is likely to combine with other human-induced stress to further increase the vulnerability of ecosystems to additional pests, additional invasive species, and loss of native species. Climate change is likely to affect breeding patterns, water and food supply, and habitat availability to some degree. Sensitive species in the planning area, such as the Greater Sage-Grouse, which are already stressed by declining habitat, increased development, and other factors, could experience additional pressures due to climate change.

More frequent flooding events, erosion, wildfires, and hotter temperatures pose increased threats to cultural and paleontological sites and artifacts. Heat from wildfires, suppression activities and equipment, as well as greater ambient daytime heat can damage sensitive cultural resources. Similarly, flooding and erosion can wash away artifacts and damage cultural and paleontological sites. However, these same events may also uncover and lead to discoveries of new cultural and paleontological localities.

Climate change also poses challenges for many resource uses on BLM-administered land. Increased temperatures, drought, and evaporation may reduce seasonal water supplies for livestock and could impact forage availability. However, in non-drought years, longer growing seasons resulting from thermal increases may increase forage availability throughout the year. Shifts in wildlife habitat due to climate change may influence hunting and fishing activities, and early snowmelt may affect winter and water-based recreational activities. Drought and resulting stress on vegetation is likely to increase the frequency and intensity of mountain bark beetle and other insect infestations, which further increases the risk of fire and reduces the potential for sale of forest products on BLM-administered lands.

National Actions to Reduce GHGs

United States GHG emissions are expected to decline due to EPA's listing of GHGs as a regulated air pollutant and implementation of several recent GHG regulatory programs. Facilities with large emissions of GHGs must report these emissions to EPA and new facilities with large expected GHG emissions must obtain air quality permits and potentially limit GHG emissions. With regard to oil and gas activities, EPA regulations in 40 *Code of Federal Regulations (CFR)* Part 60, Subpart OOOO require emission controls or reductions on hydraulically fractured gas wells, oil and condensate storage tanks, gas venting, and equipment leaks that are predicted to reduce national methane emissions by 1 million tons per year. These regulations became effective on October 15, 2012.

The EPA also requires facilities that emit more than 25,000 metric tons per year (mtpy) of CO_2e to report emissions on an annual basis. Regulations for this reporting program were promulgated under the Greenhouse Gas Mandatory Reporting Rule in 40 *CFR* Part 98. While most types of sources began reporting emissions for calendar year 2010, onshore oil and gas sources began reporting emissions for calendar year 2011. The EPA's Facility Level Information on GreenHouse Gases Tool (FLIGHT) website provides public access to the data and became operational in April 2013 (EPA 2013a). The BLM obtained data in June and September 2013 and assessed emissions and emission sources for calendar year 2011.

No coal mines on BLM surface or mineral estate within the planning area reported GHG emissions under the EPA Mandatory Reporting Rule (EPA 2013a). Because only underground mines are required to report, it is possible that some surface mines could have had emissions exceeding 25,000 mtpy CO_2e and were not required to report.

One oil and gas company reported activities within the planning area that contributed to emissions exceeding the 25,000 mtpy reporting threshold (EPA 2013b). EPA regulations require that onshore oil and gas facilities report total GHG emissions for each oil and gas basin in which they operate. Based on EPA's FLIGHT map, the western portion of the Williston Basin included Valley and Phillips counties within the planning area. No companies reported emissions within other portions of the planning area. The company reporting emissions in Phillips and Valley County also included emissions from operations in the Miles City Field Office (MCFO) and in North Dakota. A method to separate HiLine-specific emissions from MCFO and North Dakota emissions was not available.

Within the Williston Basin as a whole, including the planning area and portions of the MCFO, North Dakota, and South Dakota, CO_2 accounted for 85 percent of CO_2e emissions, while methane accounted for 15 percent of CO_2e emissions. Table 3.8 provides a summary of the largest source types for CO_2 and methane emissions.

Table 3.8
Oil and Gas Greenhouse Gas Emission Sources within the Williston Basin

Oil and Gas Source Type	*Percentage of Total CH_4 Emissions*	*Percentage of Total CO_2 Emissions*	*Percentage of Total CO_2e Emissions*	*Is Source Subject to Regulation That Will Reduce Future CH_4 Emissions?*
Associated gas venting and flaring	28%	38%	37%	Yes
Gas well completions and workovers	27%	2%	6%	Yes
Gas from produced oil sent to atmospheric tanks	19%	10%	12%	Yes
Other equipment leaks	9%	<0.1%	1%	Yes
Natural gas pneumatic devices	6%	<0.1%	1%	Yes
Flare stacks	6%	24%	21%	No
Other sources	3%	4%	1%	---
Natural gas distribution combustion equipment	2%	24%	21%	No
Total	100%	100%	100%	

Source: Derived from GHG emissions reported for calendar year 2011 under the EPA GHG Mandatory Reporting Rule for the entire Williston Basin. Reported emissions include oil and gas companies with 25,000 mtpy or more CO_2e emissions within the Williston Basin. (EPA 2013a).

The following types of oil and gas methane emission sources accounted for less than 1 percent of CO_2e emissions based on Williston Basin FLIGHT data (EPA 2013a):

- acid gas removal (zero methane emissions);
- blowdown vent stacks (zero methane emissions);
- centrifugal compressors (zero methane emissions);
- dehydrators;
- enhanced oil recovery injection pump blowdown (zero methane emissions);
- flare stacks;
- natural gas pneumatic pumps;
- natural gas pneumatic devices;
- reciprocating compressors;
- transmission tanks (zero methane emissions);
- well testing venting and flaring; and
- well venting and liquids unloading.

A trade-off exists between methane and CO_2 emissions. Combustion of methane contained in natural gas decreases methane emissions while increasing CO_2 emissions. Flaring of natural gas is an example of this trade-off. Natural gas produced during oil production is known as associated gas. Flaring and venting of associated gas is the largest source of methane emissions in the oil-producing portions of the Williston Basin. Much of this gas can be captured and sold if infrastructure, such as pipelines, is available to transport the gas to natural gas plants and end users. Due to rapid development in the Williston Basin and long distances to areas with large populations, pipelines and other infrastructure have not kept pace with associated gas produced from oil wells in the Bakken Field within the Williston area. Slower oil and gas development rates within the HiLine, primary natural gas production, and availability of established pipelines mean that associated gas flaring and venting would be less frequent within the planning area than in eastern portions of the Williston Basin.

Within the U.S. Department of the Interior (USDI), several initiatives have been launched to improve the ability to understand, predict, and adapt to the challenges of climate change. The Secretary of the Interior signed Secretarial Order 3289 on February 22, 2010, establishing a Department-wide, scientific-based approach to increase understanding of climate change and to coordinate an effective response to impacts on managed resources. The order reiterated the importance of analyzing potential climate change impacts when undertaking long-range planning issues, and also established several initiatives including the development of eight Regional Climate Science Centers. Regional Climate

Science Centers would provide scientific information and tools that land and resource managers can apply to monitor and adapt to climate changes at regional and local scales (USDI 2010). The North Central Climate Science Center, which includes the planning area, was established in 2011.

Given the broad spatial influence of climate change, which requires response at the landscape-level, the USDI also established Landscape Conservation Cooperatives, which are management-science partnerships that help to inform management actions addressing climate change across landscapes. These Cooperatives are formed and directed by land, water, wildlife and cultural resource managers and interested public and private organizations, designed to increase the scope of climate change response beyond federal lands.

Rapid ecoregional assessments are one of the tools the BLM uses to monitor and respond to the effects of climate change. Ecoregional assessments are geospatial landscape evaluations that are designed to identify areas of high ecological value within an ecoregion that may warrant conservation, adaptation, or restoration. These assessments can help to identify resources that are being impacted by climate change and provide information to facilitate the subsequent development of an ecoregional conservation strategy for plants, wildlife and fish communities on public lands. Ecoregional assessments can identify areas, species, and ecological features and services that are sensitive to ecosystem instability and changes in climatic conditions. One of the objectives of the BLM rapid ecoregional assessments is to provide guidance for adaptation and mitigation planning in response to climate change.

In addition to efforts being undertaken to better respond and adapt to climate change, other federal initiatives are being implemented to mitigate climate change. The Carbon Storage Project was implemented to develop carbon sequestration methodologies for geological (i.e., underground) and biological (e.g., forests and rangelands) carbon storage. The project is a collaboration of federal agency and external stakeholders to enhance carbon storage in geologic formations and in plants and soils in an environmentally responsible manner. The Carbon Footprint Project is a project to develop a unified GHG emission reduction program for the USDI, including setting a baseline and reduction goal for the Department's GHG emissions and energy use. More information about USDI's efforts to respond to climate change is available from http://www.doi.gov/whatwedo/climate/cop15/index.cfm.

Cultural Resources

Cultural and archaeological resources in the planning area consist of artifacts, features, spiritual and ceremonial areas, and sites representing occupation of the area by Native Americans and early Euro-Americans.

Introduction and Overview

As of July 2007, a total of 9,827 cultural sites were recorded in the planning area; of those sites, 7,689 were prehistoric sites and 2,138 were historic sites (Walker-Kuntz and Walker-Kuntz 2007, 47). Evidence indicates that occupation of the area began with Ice Age hunters approximately 12,000 years ago, but most of the prehistoric aboriginal remains date from the last 3,000 years. Tipi rings, cairns (stone piles), lithics (stone tools), buffalo jumps, and other features related to subsistence or religious activities are typical prehistoric remains. Among these recorded sites are the locations that tribes consider to be Traditional Cultural Properties (TCPs). TCP sites are significant both culturally and historically to a community. The sites are considered important to contemporary Indian religious beliefs and several are located within the planning area. Other sensitive locations are burial sites and historic trails (e.g., the Nez Perce Trail).

The historic period begins with early 19th century explorers and fur trappers who explored along the Missouri and Marias Rivers. Several fur trade posts were built along the Missouri River and steamboats operated on the river somewhat later. During the 1800s, development was influenced by a variety of occupations (e.g., gold seekers, fur traders, settlers, and businessmen). The area was also influenced by several historically important events such as the Indian conflicts, construction of a railroad, and the discovery of oil. In the late 1880s, the construction of the Great Northern Railway from Minot, North Dakota, to Helena, Montana, changed the entire character of the study area. Many new communities sprang up along the railroad line. The railroad also paved the way for the homestead boom. Most of the historic remains originate from the homesteading period of 1910-1925.

Prehistoric Overview

Based on archaeological evidence from the surrounding Northwestern Plains, it is believed that Ice Age hunters arrived in the region approximately 12,000 years ago in search of big game such as mammoth and giant bison. The hunter's chief weapon was a thrusting spear tipped with a large stone point. Approximately 4,000 years later (8,000 years ago) the hunting technology had changed and their descendants were using an atlatl, a lever device and a short spear tipped with a smaller stone point. Big game animals were still hunted, but the species were modern in appearance by then. Wild plant foods such as roots and berries were also harvested. Approximately 1,500 years ago, the hunting technology changed again and the inhabitants of the region were using bows and arrows in their hunting practices.

Most groups were organized into small bands of hunters and gatherers who were heavily dependent upon the naturally occurring resources in their environment. Subsistence was based on resource availability and campsites were generally located near important, exploitable resources. For the Plains tribes, the most important resource was the bison. The subsistence practices and settlement patterns of these tribes tended to reflect the nomadic nature of the bison.

Horses were acquired by the native inhabitants of the region around A.D. 1700-1750. The acquisition of the horse radically changed the life ways of the region's inhabitants. No longer was survival dependent on the immediate territory in which they lived; the horse allowed them the mobility to efficiently exploit new territories. Thus, even the hunting and gathering cultures evolved into specialized bison hunters by A.D. 1800.

When the first Europeans arrived in the study area, they encountered a variety of indigenous communities that shared many cultural characteristics, including a subsistence based primarily on bison hunting, nomadic settlement patterns, tribal organization, and a standardized sign language. The native groups inhabiting the region during the 19th century include the Piegan (Blackfeet), Atsina (Gros Ventre), River Crow, Sioux, and Assiniboine. Frequent visitors to the study area were the Mountain Crow, Shoshoni, Flathead, and Nez Perce; most of the visits were for hunting. From the late 1700s until the early 1880s, the Metis culture regularly crossed the Canadian border along a corridor between the present day towns of Malta and Chinook on their annual southward trek in pursuit of buffalo.

Prehistoric Site Types

The prehistoric sites in the planning area are classified into four functional types – habitation, procurement, industrial, and ritual – as determined from features, artifacts, and other cultural remains present.

Habitation sites consist of features/materials which indicate everyday domestic activities including, but not limited to, clothing construction and food preparation. Examples of such sites are debris scatters (middens or trash scatters), hearths, cairns (stone piles), and tipi rings.

Procurement sites consist of features representing specific subsistence activities such as hunting bison, deer, or pronghorn, and gathering wild plants. Buffalo jumps, traps, and impoundments (with associated processing areas) are the most common procurement sites in the resource area. Such sites are characterized by large deposits of bones at the base of bluffs and cliffs or in steep coulees.

Industrial sites are generally represented by scatters of stone waste debris (debitage), hammer stones, rough or damaged tools, and chunks of fine-grained stone and quartzite. The best source material can be found in Valley and Phillips Counties.

Ritual or ceremonial sites include rock art panels, burials, medicine wheels, intaglios, cairns, and rock or wooden vision quest structures.

Archaeological Site Density and Distribution

The average site density for prehistoric sites in the study area has been calculated at one site per 66 acres (Walker-Kuntz and Walker-Kuntz 2007, 49). This site density figure is misleading because the sites are not randomly distributed across the landscape, but are more numerous in some areas than in others. Furthermore, the term "site" is ambiguous in the glaciated prairie region because it does not specify site size or the number of features in an average site. This

complicates distributional analyses because the sites in certain areas (along the Milk River and in glacial moraine or pothole areas) can be exceedingly large and complex, and thus difficult to define boundaries. The practice of either lumping several small sites over a rather wide area to create one large site, or splitting up features that are relatively close to accommodate a project within a given area, further complicates distributional analyses. The splitting of features into two or more sites is very apparent in the existing inventory records.

The archaeological site distribution pattern of the glaciated prairie in Phillips and Valley Counties is considered quasi-random in nature; that is, sites are distributed randomly across large portions of the landscape, without regard to general landform types or environmental zones, but there are also certain areas where sites are concentrated. The random distribution pattern occurs in the undifferentiated uplands of the glaciated prairie or rolling hinterlands; the sites found here are invariably small habitation and industrial types (tipi rings, cairns, and lithic scatters).

The concentrated pattern occurs along the principal drainages or in moraine areas; these areas contain large numbers of small and large habitation sites, as well as most procurement and ritual/ceremonial sites. Also, site densities appear to vary with respect to ecological zones (sagebrush/grass plains, river breaks, forested escarpments and plains, and forested mountains and foothills), and sites tend to be concentrated on major topographical features (ridges, buttes, escarpments, stream terraces, toe slopes, etc.)

Historic Overview

Recorded history in the study area begins with the written records of early 19th century Euro-American explorers. The Lewis and Clark Expedition camped at numerous locations along the Missouri River in 1805 and 1806. Part of the expedition’s mission was to identify the plants and animals found along their journey and expedition members were responsible for naming many of the landforms and features in the area.

Fur Trade

In the early 1800s, organized fur trade enterprises such as the Rocky Mountain Fur Company, American Fur Company, and smaller companies followed the Lewis and Clark Expedition into the Missouri River country. The Hudson’s Bay Company undoubtedly had operated in the study area prior to this time, but there are no known records of its exploits. After 1829, the year the American Fur Company established Fort Union at the mouth of the Yellowstone River, several trading posts or "forts" were built in or near the study area, including Fort Piegan and Fort McKenzie near the mouth of the Marias River, and Fort Campbell and Fort Lewis near the present city of Fort Benton. Competition and Indian conflicts often required the posts to be relocated to more favorable locations.

By the 1850s, the heyday of the fur trade was beginning to wane due to changes in international textile markets and near extirpation of many fur-bearing animals in western North America. Buffalo hides, whiskey, and Indian annuities soon replaced beaver skins as the main items of trade on the Upper Missouri. In addition to the American Fur Company, several other trading companies began operating out of Fort Benton during this time.

In 1865, the firm of Smith, Hubbell, and Hawley bought the American Fur Company from Pierre Chouteau, Jr. Through its western affiliate, Durfee and Peck, the new company established a number of small trading posts in the region soon afterward. These included Fort Peck near the mouth of the Milk River, Fort Hawley near the mouth of the Musselshell River, Fort Turnay (Janeaux's Post) on upper Frenchman Creek, and Fort Browning on the Milk River near Dodson. Several smaller companies had trading posts along the Milk River in Valley County (e.g., Hammell's houses near Vandalia and Tom Campbell's houses near Hinsdale).

Military Posts and the Indian Conflict

With the influx of fur traders, hide hunters, gold seekers, businessmen, and settlers into the region, conflicts arose with the native tribes. During the mid-1800s, Blackfeet, Gros Ventre, and Sioux war parties raided outlying settlements and wagon trains with considerable frequency. In order to quell the white settlers' fears about Indian attacks, military posts were established throughout Montana. In 1879, Fort Assiniboine, located near Havre, was the largest fort in the area. Army garrisons were also occasionally stationed at Indian agencies, trading posts, and steamboat landings.

In 1876, the Sioux and Cheyenne tribes that participated in the Battle of the Little Bighorn crossed the Missouri River near Fort Peck on their way to Canada. In September-October 1877, the Nez Perce under Chief Joseph were defeated by troops under the command of Colonel Nelson Miles at the Battle of the Bear Paw Mountains, near present-day Chinook, ending their epic 1,500 mile attempted retreat to Canada. Following the battle nearly 300 Nez Perce managed to escape and make their way 40 miles north into Canada where they joined Sitting Bull near Fort Walsh. In 1879, a party of Sitting Bull's Sioux followers left their temporary home in Canada and engaged a cavalry unit near the Milk River and present-day Saco. The conflict continued between Native Americans and the Euro-American settlers in northern Montana until 1882, when army troops concluded a campaign to remove Canadian Indians and Metis from U.S. soil.

Northern Montana held the last of America's large buffalo herds. After reducing the buffalo populations in Texas and other southern states/territories, market hunters turned their attention to the northern herd during the years 1876 to 1883. After the decimation of the buffalo, trade with the Indians abruptly ceased. The trading companies then shifted their focus to supplying military posts, mining camps, and ranching communities both in and adjacent to the region.

Native American Treaties and Tribal Lands

Beginning in the middle of the 19th century, the U.S. Government initiated the first of several treaties with the Plains Indians, first to facilitate exploration and trading by delineating tribal territories and discouraging intertribal warfare, and later to open up former tribal lands to settlement for purposes of farming, ranching, and mining. The Fort Laramie Treaty of 1851 gathered all the Plains tribes together and "mapped out the domain of each tribe and obligated each tribe to respect the lands of its neighbors" (Malone and Roeder 1976). The Blackfeet and Gros Ventre were recognized as the occupants of the northcentral region of Montana, east of the continental divide. The Fort Laramie treaty served as the first in a series of negotiations which included the 1855 Blackfeet Treaty Council. The 1855 Council included representatives from Piegan, Blood, Blackfeet, Gros Ventre, Flathead (Salish), Upper Pend d' Oreille, Kootenai, Nez Perce, and Cree Tribes. During the negotiations intertribal warfare was declared illegal and the Blackfeet and Gros Ventre were restricted to the northcentral region of Montana. The remaining tribes were granted access to the common bison hunting grounds east of the Rocky Mountain front (Walter 1982). As a direct result of the efforts of then Superintendent of Indian Affairs Isaac I. Stevens a vast Indian reserve was created.

In 1887, the Northwest Commissioners negotiated the formation of separate Blackfeet, Fort Belknap, and Fort Peck Reservations for the region's Indian inhabitants. This was in large part based upon Agent W. L. Lincoln's perception that the Indian Reserve established in 1855 was too large for its Indian proprietors, and pressure from white miners, ranchers, and businessmen to open the northern part of the Reserve to white settlement. The Gros Ventre and Assiniboine insisted that the Little Rocky Mountains remain within their boundaries.

BLM lands within the HiLine District are aboriginal lands that have been ceded back to the Government by the tribal groups in the area through various treaties. These treaties reserved rights to the tribes. These rights consist of the use of the ceded lands to hunt, fish, gather plants and for religious/ceremonial use. Areas specifically used for religious purposes are the Sweet Grass Hills and the Little Rocky Mountains. The BLM will continue to consult with tribal groups to identify areas of importance and access to them.

Transportation Industry

Steamboats, which had been in use on the Lower Missouri River for 28 years, were finally able to reach Fort Benton in 1859, due to the development of shallow draft vessels. Although not actually in the planning area, the establishment of a port at Fort Benton was one of the most important historic events for central and northern Montana because almost all immigration, commerce, and communication to and from the outside world came through there (Malone, Roeder, and Lang 1991). The last steamboat traffic between Bismarck, North Dakota and Fort Benton occurred in 1891.

In 1887, the construction of James J. Hill's St. Paul, Minneapolis, and Manitoba Railroad across the HiLine changed the entire character of the region. With the railroad came new settlements like Malta, Glasgow, Saco, Hinsdale, and Vandalia, as well as cheaper and more efficient transportation of products and supplies. The completion of the Montana Central Railroad and its subsequent merger with Hill's company to form the Great Northern Railway in 1889 virtually eliminated steamboat traffic on the Missouri River. Subsequently, the towns along the river like Carroll, Rocky Point,

and Kerchival were abandoned. A branch line of the Great Northern Railway was completed from Saco to Whitewater, Loring, Chapman, Turner, and Hogeland in 1928.

Farming and Ranching

Although the northern portion of the study area was officially Indian reservation land, a number of adjoining ranches grazed sheep and cattle there during the late 1870s and early 1880s. The big cattle outfits trailing their cattle through the Milk River country at this time were the Neidringhaus Brothers from Canada; the Davis, Hauser, and Stuart Ranch (DHS) from the Judith Basin; Harry Rutter from Hinsdale; and Conrad Kohrs from the Sun River country.

The practice of grazing very large cattle herds on the open range worked well enough during a period of abundant rainfall and relatively mild winters. The "Hard Winter" of 1886-1887 proved disastrous to the open range cattle industry and alternative methods of raising cattle had to be developed. Since extended grazing was not legal on the reservation, the cattlemen sent T.C. Power and Joseph K. Toole to Washington to lobby Congress to open the reservation lands to settlement. The 1888 Act of Congress created three smaller reservations (Blackfeet, Fort Belknap, and Fort Peck) for the region's Indian inhabitants and ceded 17.5 million acres back to the U.S. Government. Shortly afterward, ranchers moved into the more productive areas like the Milk River bottoms.

A number of developments followed the completion of the railroad and ushered in the Homestead Boom of 1910-1918. These developments included the availability of larger homestead tracts, the development of new dryland farming techniques, the production of new mechanized farm equipment, and the creation of the Milk River Irrigation Project. Homesteaders came by the thousands and the region was quickly settled by Germans and Scandinavians from the Midwest, as well as by eastern European immigrants. Times were good during the boom period because the climate was abnormally favorable and the war in Europe kept the demand and prices for farm products high. By the end of World War I, a severe drought had begun and food prices had fallen drastically. These conditions lasted for several years. By 1925, one out of every two homesteaders had lost or abandoned his farm and half the banks in the region had failed. Many of the homestead lands in the study area fell into disuse and disrepair.

Energy Development

The search for oil and gas began shortly after Euro-Americans moved into Montana. Some of the earliest energy development activity began between the late 1880s and early 1900s in the Flathead-Glacier Park area (Passmann 1992). Oil was noted in the Kevin Rim area in 1912, when oil was found during water well drilling on the Miller Ranch (Passmann 1992). Drilling began in 1921, but did not result in a producing well until June 1922. The Kevin-Sunburst oil field created opportunities for locals and non-locals alike, and at one point, the towns of Kevin and Sunburst were relatively bustling. However, the decline began in the 1930s due to new conservation measures that were implemented by the federal government. These conservation measures made it more difficult for the oilmen to get their product to market (Passmann 1992). The oil field itself has become an historic property, as some of the equipment and infrastructure are still standing.

Oil and gas development occurred similarly in the eastern part of the planning area. The Bowdoin Gas Field near Malta was producing gas for Saco by 1916, and upon completion of a pipeline, for Malta and Glasgow by 1929.

The Great Depression and Federal Relief Programs

During the Great Depression, the federal government implemented work relief programs all over the country. The Works Progress Administration, Civilian Conservation Corps, Resettlement Administration, and a variety of other programs provided relief to people/families who had been hit hardest by the Great Depression. These programs provided a stipend of food, clothing, shelter, and medical care in exchange for hard work. The stipend was typically divided so that some went home to the worker's family and the worker retained a small percentage, thus allowing the worker to support his family. Many of the national parks, forests, and rangelands have these federal works programs to thank for their infrastructure and administrative sites.

In 1936, the Works Progress Administration began constructing the Fort Peck Dam. At the same time, the Resettlement Administration initiated the Malta Plan to move destitute upland farmers to irrigated lands in the Milk River Valley. The lands acquired by the Resettlement Administration would eventually be managed for grazing.

The Taylor Grazing Act of 1934 was the first federal effort to regulate grazing on federal public lands. It establishes grazing districts and a permitting system to manage livestock grazing in the districts to improve rangeland conditions and regulate their use. In 1937, Congress passed the Bankhead-Jones Act, which authorized the government to buy homesteaded lands and rehabilitate them for grazing use; these are now called land utilization or "LU" lands and are managed by the BLM.

Historic Site Types and Distribution

Historic sites in the study area consist primarily of structural remains from the homesteading period from 1910 to 1925. Historic sites are classified into homesteads or farmsteads, town sites, railroad sidings, rural schools, and rural churches. Other related features are refuse dumps, fences, field clearings, corrals, wells, and graffiti. Historic sites may contain stone, wood, and concrete buildings in various states of preservation; rectangular stone, concrete, and earthen foundations; cellars, outhouses, cisterns, and well depressions; and other manufactured materials. Standing structures are rare on LU lands since one of the provisions of the Bankhead-Jones Act required all improvements to be removed prior to government acquisition.

The area also contains historic sites from the early 1800s, but most are located on private lands or other federal and state lands. These include Lewis and Clark campsites, trading posts, military posts, steamboat landings and woodhawk cabins, U.S. Army and Indian battle sites, old and new Indian agencies, gold mines and associated features, mining town sites, and early ranching sites.

Sweet Grass Hills Photo by Kathy Tribby

Historic trails once passed through the area, including the Carroll Trail, the North Overland Road, and the Nez Perce National Historic Trail. Most of the historic sites and trails are noted mainly in the historical literature; few have ever been documented and evaluated on the ground. Other historic sites likely to be found on BLM lands in the planning area are those related to gold mining, notably in the Little Rocky Mountains. These sites consist of the remnants of mines, adits, tramways, kilns, cabins, dumps, and equipment. The larger sites, such as mills and mining towns (Zortman and Landusky) are located on private land.

A total of 284 historic sites (13.3% of the currently recorded sites) are located in the Glasgow Field Office area, 611 historic sites (28.6%) in the Malta Field Office area, and 1,243 historic sites (58.1%) in the Havre Field Office area (Walker-Kuntz and Walker-Kuntz 2007, 47). The variation in the number of sites primarily reflects the amount of inventory conducted in the field office management areas.

The distribution of historic sites on BLM lands coincides primarily with the distribution of LU lands in the planning area. Since the LU lands are formerly homestead lands, the overwhelming majority of historic sites on LU lands are homestead-related. Homestead sites are also located on public domain lands, due to the failure of some homesteaders to "prove up," but they are few in number.

As mentioned previously, the homestead sites consist mainly of foundations and depressions which are the remnants of land restoration practices related to the Bankhead-Jones Act. Because of their poor condition, most of these sites are not considered significant. The Malta and Glasgow Field Office areas have considerable quantities of LU lands; however, most of those in the Glasgow Field Office management area are located north of the Milk River.

Gold mining in the Little Rocky Mountains began in 1884, when Pike Landusky developed the first placer mines and founded the town of Landusky. He and others patented the richest mine, the August, in 1893. With other patents, mining in the Little Rocky Mountains expanded. By 1903, the town of Zortman was established with a cyanide mill in Alder Gulch. Mining in the Little Rocky Mountains continued on and off over the decades until 1979, when a modern surface mining operation opened. The Zortman/Landusky Mine continued to operate until the late 1990s and is now being reclaimed.

Mining also occurred in the Sweet Grass Hills in the past, but was sporadic and not as intensive as in the Little Rocky Mountains.

LU/Public Domain Lands

LU Lands (also referred to as Acquired Lands or Bankhead-Jones Lands): Under Title III of the Bankhead-Jones Farm Tenant Act of July 22, 1937, the Department of Agriculture was authorized to purchase submarginal farm lands in the Great Plains region for purposes of reclamation, conservation, etc. Approximately two million acres were acquired and are termed "Bankhead-Jones Lands." These lands are now under the administration of the BLM, are in the class of federal lands called "acquired lands" and are not subject to entry or disposal under the general public land laws.

Public Domain Lands: Vacant, unappropriated, and unreserved public lands, or public lands withdrawn by Executive Order 6910 of November 26, 1934, as amended, or Executive Order 6964 of February 5, 1935, as amended, and not otherwise withdrawn or reserved, or public lands within grazing districts established under Section 1 of the Act of June 28, 1934 (45 Stat. 1269), as amended, and not otherwise withdrawn or reserved.

Cultural Resources of Special Importance or Concern

Four locations in the planning area are important due to either the density and significance of their archaeological sites or their traditional cultural and religious significance to the tribes. These locations are the Big Bend of the Milk River Area of Critical Environmental Concern (ACEC), Sweet Grass Hills ACEC, Lonesome Lake, and the Kevin Rim ACEC.

The Big Bend of the Milk River ACEC contains an abundance of archaeological sites with unique characteristics and scientific values which warrant special attention. The ACEC consists of two large sites adjacent to the Milk River and includes the Henry Smith and Beaucoup site complexes, both of which contain bison kills and ceremonial and habitation sites. Both complexes are characterized by unique stone surface features and multiple occupation episodes. Other important, but lesser known sites nearby are unnamed bison kills, drive lines, meat processing sites, petroglyph boulders, and tipi ring concentrations.

The Sweet Grass Hills ACEC is located in the northwestern portion of the study area. The Sweet Grass Hills were accorded ACEC status because of their unique cultural resources and their cultural/historical significance to the tribes.

The ACEC is part of a larger study area which has been determined eligible for the National Register of Historic Places as a Traditional Cultural Property (Figure 2.1 in Chapter 2), based on "significance derived from the role the property plays in a community's historically rooted beliefs, customs, and practices."

Lonesome Lake contains over 1,000 stone circles along with other stone features and prehistoric sites. Based on this and other inventory information, the Lonesome Lake Complex has been evaluated as an Archaeological District, eligible for entry on the National Register of Historic Places.

The Kevin Rim ACEC has recently undergone a Class III Cultural Resource Inventory. Seventy-one new sites were recorded in the ACEC; and five sites and one historic district were previously recorded. These sites reflect an extensive representation of stone feature sites as well as a historic oil drilling district.

Other important cultural sites on BLM lands include the Beaver Creek bison kill sites (24PH1206 and 1324, 24PH8), and the Indian Lake Medicine Rock (24PH1005). These sites have been recorded, but have not been thoroughly researched. Each site may provide further information about past life ways.

Tipi Ring on Kevin Rim Photo by Josh Chase

Traditional Cultural Properties

The Little Rocky Mountains and the Sweet Grass Hills have been determined eligible for the National Register of Historic Places because each location is associated with the traditional beliefs of a Native American group about its origins, cultural history, and the nature of the world; a location where Native American religious practitioners have historically gone and are known to go today to perform ceremonial activities in accordance with traditional cultural rules of practice; and a location where an identifiable community has carried out economic, artistic, and other cultural practices important in maintaining its historical identity.

The Little Rocky Mountains were designated a Traditional Cultural Property (TCP) in 1994 through a Memorandum of Understanding with the BLM, Bureau of Indian Affairs, and Fort Belknap Community Council. The TCP was designated to protect cultural resources and values located in the Little Rocky Mountains and is shown on Figure 2.1 in Chapter 2.

The Sweet Grass Hills were designated a TCP in 1995 by the BLM in consultation with the Montana State Historic Preservation Office, and the Assiniboine, Blackfeet, Chippewa-Cree, and Gros Ventre Tribes and the Confederated Salish and Kootenai Tribes of the Flathead Nation. The TCP was designated to protect cultural resources and values located in the Sweet Grass Hills and is shown on Figure 2.1 in Chapter 2.

Current Demand and Use of Cultural Resources

The demand for cultural resources derives from two sources: The public is interested in protecting and interpreting cultural resources as reminders of its heritage; and scientists, teachers, and/or academic institutions utilize cultural resources for research and educational purposes. Currently, the BLM has the resources to adequately meet the demand from both sources.

At the present time, very little active use of cultural resources is occurring in the planning area. Occasionally, BLM personnel will provide educational field trips to selected sites for school children or professional societies. Some historic sites, such as old schoolhouses, are being used for rural community meetings and as museums. For example, the BLM provided land for the Snake Creek schoolhouse some years ago, and Congress appropriated the Landusky School to the town of Landusky.

Tribal Consultation

Previous consultation with tribes indicated that they use certain areas for religious and cultural purposes. Certain types of archaeological sites have cultural and religious significance. These include vision quest sites, monumental/ anthropomorphic/zoomorphic rock features, rock art sites, burials, habitation sites with special purpose ceremonial structures, and ceremonial and/or dance grounds. These areas include the Sweet Grass Hills and the Little Rocky Mountains, which are designated Traditional Cultural Properties.

Economics

The planning area consists of approximately 2.4 million surface acres of BLM land distributed across eight contiguous counties: Glacier, Toole, Liberty, Hill, Chouteau (north of the Missouri River), Blaine, Phillips, and Valley. The majority of these BLM surface lands are located in Phillips County (31%), Valley County (32%), and Blaine County (11%). BLM lands account for approximately 14% of the total land area and BLM mineral estate accounts for 28% of the mineral estate in the eight counties (see Table 3.25, BLM Surface and Subsurface Acres, in the Lands and Realty section). Much of the economic activity is confined to these eight counties because the area is remote and no major population or business centers exist near the boundaries to the east, north, or west. Major business centers to the south include Great Falls (approximately 90 miles south of Shelby and 110 miles southwest of Havre); Lewistown (approximately 100 miles southeast of Fort Benton); and Billings (approximately 200 miles south of Malta). Economic activity is further restricted by the following factors:

- Of the eight border crossings along the 300 mile border with Canada, only one (Port of Sweetgrass) is open 24 hours per day.
- Only one major highway (Highway 2) goes to the west over the Rocky Mountains to Kalispell (approximately 156 miles west of Shelby).
- Only one major highway (Highway 2) goes to the east (approximately 145 miles from Glasgow to Williston, ND and 229 miles to Bismarck, ND).
- Only four highways cross the Missouri River along the 270 mile southern border.

During the last century, ranching, farming, mining, natural gas development, the railroad, construction of Fort Peck Dam in the late 1930s, the establishment and subsequent closure of Glasgow Air Force Base in the late 1970s, and the Zortman/Landusky Mines (closed in the late 1990s) have all been important factors in the social and economic history of the area. More recently, outdoor recreation, tourism, and the growing presence of the U.S. Border Patrol have been

contributors to the local economies. Long-term economic trends have also been characterized by gradual population loss.

Agriculture played a dominant role in the region's initial post-European settlement and economic expansion. The development of the railroad across northern Montana in the late 1880s and the subsequent opening of the area to homesteading in the early 20th century ushered in an era of accelerated European settlement. Agriculture and other natural resource production helped spur the development of additional transportation infrastructure and the emergence of Havre, Malta, and Glasgow as regional trade and service centers for northcentral Montana. In more recent times, the establishment and subsequent closure of Glasgow Air Force Base, and federal water and wildlife management projects and programs have played pivotal roles in the region's economic development. Mineral and energy resource development, primarily in the form of mining and natural gas, have also shaped the area's economic history. Mining and oil and gas industries have also been important contributors to the regional economic base through their fiscal support for local government and education. The Cultural Resources section provides additional information on the history of the area.

Certain defining features of every area heavily influence and shape the nature of local economic activity. Principal among these are the size of the area's population, the presence of or proximity to large cities or regional population centers, types of longstanding industries such as oil and gas development and agriculture, and predominant land and water features and unique area amenities.

Economic Characteristics and Trends

The following summary of economic trend information for the planning area is followed by a description of the key land uses in the planning area that could be affected by BLM management actions. These are: (1) oil and gas exploration, development, and production; (2) travel, tourism and recreation; (3) livestock grazing and production; (4) government; (5) ecosystem restoration; and (6) other mineral exploration, mining, and reclamation. BLM lands provide areas for hunting and fishing, hiking, camping, and general sightseeing, as well as providing important habitat for area fish and wildlife that spend time both on and off BLM lands.

Potential economic effects associated with this proposed RMP include changes in employment, income, public revenues, economic dependency, economic stability, and quality of life. The information contained in this section is presented to help clarify economic issues, describe relevant economic trends, and provide context for potential changes to economic indicators that may be predicted in the environmental analysis in Chapter 4.

Montana is one of the least densely populated states in the country, with an average population density of 6.8 persons per square mile compared to a national average of about 87.4 persons per square mile. The 8-county planning area had an average population density of 2.5 persons per square mile, with county population densities ranging from less than 1 person per square mile in Phillips County to nearly 6 people per square mile in Hill County where Havre is the center of local economic activity (U.S. Census Bureau 2010).

The information provided in Table 3.9 provides a snapshot of the local study area at both a small (county level) and large (8-county planning area) scale. Although the region surrounding the planning area is less densely populated (fewer people living within a square mile of each other) than the state, its economy is still relatively diverse and supports employment in a wide range of industrial sectors. Of the 344 industries present in Montana, 161 industries currently operate within the HiLine planning area. Assessing the employment contributions of individual sectors helps identify industries that are important to the local economy and provides measures for economic diversity. Economic diversity, or the extent to which economic activity is distributed among a number of industrial sectors, promotes long-term stability and providers greater employment opportunities. Economies which are highly specialized (i.e., those that depend on a few industries for the bulk of employment and income) tend to be more prone to cyclical fluctuations and offer job opportunities which use a more limited skillset. Economic specialization may also be of particular interest to those managing public lands when specialization occurs within industries related to the use of publically administered resources.

Table 3.9
Selected 2012 Study Area Statistics

County/Area	*Employment*	*Households*	*Number of Industries/ Sectors*
Montana	634,895	444,197	344
8-County Planning Area	38,246	25,590	161
Blaine	3,166	2,604	106
Chouteau	3,462	2,467	94
Glacier	7,673	4,883	116
Hill	10,985	6,867	128
Liberty	1,526	1,030	74
Phillips	2,846	1,885	95
Toole	3,694	2,394	89
Valley	4,895	3,441	111

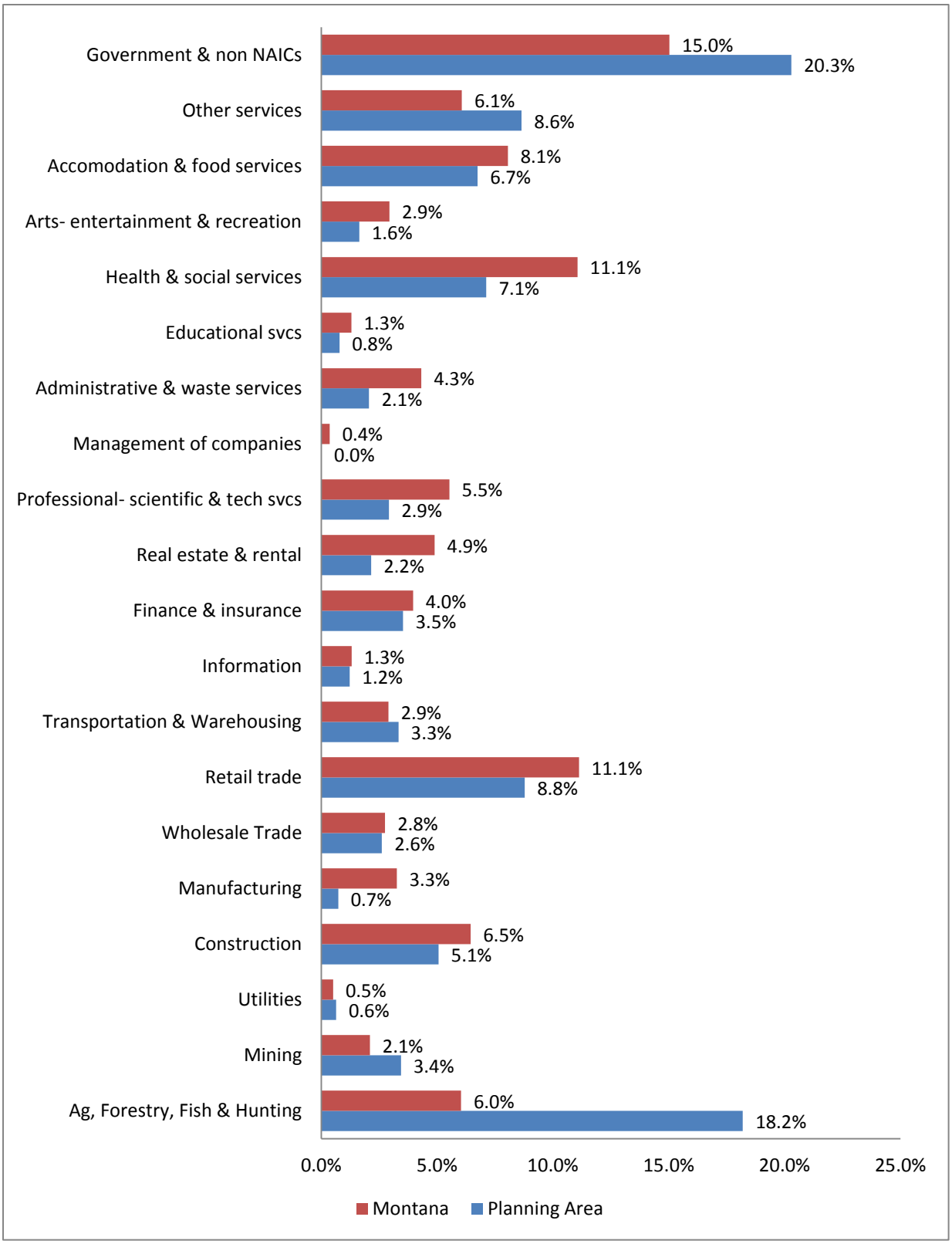
Source: IMPLAN (2012)

The Interior Columbia Basin Ecosystem Management Project identified communities that were specialized with respect to employment. Employment specialization can be examined using the ratio of the percent employment in each industry in the region of interest (eight-county planning area) to the percent of employment in that industry for a larger reference region (the State of Montana). For a given industry, when the percent employment in the analysis region is greater than in the reference region, local employment specialization exists in that industry (USFS 1998). As shown in Figure 3.9, applying this criterion to 2012 employment data for the HiLine planning area reveals that the region is highly specialized with respect to Agriculture, Forestry, and Fishing & Hunting (+ 12.2%) and Government and non-NAICs (+ 5.3%). The Government sector includes all federal, state and local employment while the Agriculture, Forestry, and Fishing & Hunting sectors is comprised of industries primarily engaged in growing crops, raising animals, harvesting timber, and harvesting fish and other animals from a farm, ranch, or their natural habitats. A portion of employment in these sectors is attributable to the management and utilization of natural resources administered by the BLM within the planning area. In this manner, the BLM is partially responsible for the region's specialization with respect to Government and Agriculture, Forestry, and Fishing & Hunting sectors. Although employment in these sectors may be affected by alternative management on the HiLine, local specialization with respect to the Government and Agriculture, Forestry, and Fishing & Hunting is unlikely to be affected.

Total personal income (TPI) within the planning area has steadily risen over the last 20 years. Between 1990 and 2011 TPI within the 8-County area grew from $ 943 million to $ 2.18 billion (reported in inflation adjusted 2011 dollars) (Bureau of Economic Analysis 2012). Although per capita personal income (average income per person) within the study area is slightly lower than that across the state, the HiLine planning area supports an average household income slightly higher than the state's average (Table 3.10). There are two major sources of personal income: (1) labor earnings or income earned through employment and (2) non-labor income. Labor earnings, or wages, were supported by 151 industrial sectors and represented approximately 58% of the study area's TPI in 2011.

Personal income also includes non-labor income individuals receive from sources other than an employer. In general there are two categories of non-labor income, investment income (dividends, interest, and rent payments) and transfer payments from the government to individuals (Retirement & disability insurance, medical payments, welfare assistance, unemployment, and veteran's benefits). Non-labor income's share of TPI has grown drastically in recent years. In 1970 non-labor income accounted for nearly 24 percent of TPI within the study area. By 2011 non-labor income had grown to represent approximately 42 percent of TPI in the 8-county study area (Bureau of Economic Analysis 2012).

Figure 3.9
Employment Specialization



IMPLAN, 2012

Table 3.10
2012 Personal Income

County/Area	Total Personal Income ($ Millions)	Non-Labor Income Share of TPI*	Per Capita Personal Income	Average Income per Household
Montana	$37,561.94	*40%*	$37,369	$84,561
8-County Planning Area	$2,295.18	*43%*	$37,073	$89,690
Blaine	$192.20	*47%*	$28,760	$73,810
Chouteau	$217.76	*44%*	$36,883	$88,269
Glacier	$435.48	*45%*	$31,761	$89,187
Hill	$644.75	*42%*	$39,396	$93,892
Liberty	$96.94	*55%*	$40,528	$92,326
Phillips	$145.83	*43%*	$35,329	$77,368
Toole	$264.07	*38%*	$50,589	$110,308
Valley	$298.11	*39%*	$39,722	$86,635

IMPLAN, 2012
*Bureau of Economic Analysis, 2012

Non-labor income's increasing share of regional TPI can be attributed to increases in both investment income and transfer payments. Between 1970 and 2011 investment income as a share of TPI within the planning area grew by 98% from $234 to $464 million; while the region's transfer payments increased by 233% from $142 to $473 million. Transfer payment's growing share of local TPI can be attributed to large increases in both age-related and income maintenance transfer payments. Over this forty year period age-related payments (i.e. Medicare and retirement and disability benefits) increased 222% from $ 80 to $ 258 million as local payments associated with income maintenance (i.e. Medicaid and welfare assistance) increased 903% from $15 to $146 million.

BLM Land and Mineral Uses that Affect the Local Economy

The effect of the BLM on local economic activity and conditions is related to BLM land use decisions and associated land uses. Surface and mineral estate and major BLM land/mineral uses by county are displayed in Table 3.11. This is followed by a narrative description of those major BLM land and mineral uses within the planning area.

Table 3.11
Surface and Mineral Estate and Major BLM Land/Mineral Uses by County

County	Total Acres	BLM Surface Acres	BLM % of Total Surface Acres	BLM-Administered Mineral Estate (Acres)	BLM % of Total Mineral Estate	Interactions with BLM Land/Mineral Uses
Montana	93,155,840	7,967,376	8.6	37,789,542	40.6	Oil and gas leasing and production, livestock grazing, recreation use, rights-of-way
8-County Planning Area	17,594,739	2,441,268	13.9	5,015,010	28.5	
Blaine	2,704,755	300,019	11.1	771,114	28.5	Oil and gas leasing and production, livestock grazing, recreation use
Chouteau	2,542,874	45,230	1.8	304,815	12.0	Oil and gas leasing and production, livestock grazing, recreation use
Glacier	1,916,621	1,060	<0.1	390,431	20.1	Oil and gas leasing and production, livestock grazing, limited recreation use

Table 3.11
Surface and Mineral Estate and Major BLM Land/Mineral Uses by County

County	*Total Acres*	*BLM Surface Acres*	*BLM % of Total Surface Acres*	*BLM-Administered Mineral Estate (Acres)*	*BLM % of Total Mineral Estate*	*Interactions with BLM Land/Mineral Uses*
Hill	1,853,670	14,558	0.8	153,771	8.3	BLM Havre Field Office, oil and gas leasing and production, livestock grazing, recreation use
Liberty	915,046	7,620	0.8	66,492	7.3	Oil and gas leasing and production, livestock grazing, limited recreation use
Phillips	3,289,325	1,030,895	31.3	1,806,009	54.9	BLM Malta Field Office, oil and gas leasing and production, livestock grazing, recreation use
Toole	1,223,008	27,368	2.2	124,312	10.2	Oil and gas leasing and production, livestock grazing, recreation use
Valley	3,149,440	1,014,518	32.2	1,398,066	44.4	BLM Glasgow Field Office, oil and gas leasing and production, livestock grazing, recreation use

Source: Table 1.2

Livestock Grazing and Production

Ranching is an important part of the history, culture, and economy of the planning area. Grazing is allowed on BLM lands under the Taylor Grazing Act and FLPMA for the purpose of fostering economic development for private ranchers and ranching communities by providing ranchers access to additional forage (GAO, Sept. 2005). The major contribution of BLM to the area's livestock industry is largely through providing grazing lands. Livestock grazing on BLM lands is authorized on an annual basis. The established preference limit for grazing on BLM lands within the planning area is 410,814 Animal Unit Months (AUMs). This preference is the maximum number of AUMs that could be offered annually under ideal forage conditions. A number of factors including drought, wildland fire, transfer of grazing permits, financial limitations on operators, and implementation of grazing management to improve range conditions are known to make range conditions less than ideal. In order to achieve and maintain rangeland health standards, stipulations on the season and level of use have been set forth in the permits and leases issued to public land ranchers. AUMs authorized under a term grazing permit or lease are referred to as "active" while "billed" AUMs better reflects the amount of forage which ranchers actually use each year. Typically billed AUMs are less than active AUMs. In 2012 the BLM reported to have 408,282 active AUMs within the HiLine District although there were only 377,218 billed AUMs that year. Billed AUMs can change each year, between 2008 and 2012, the HiLine District billed an average of 371,975 AUMs (Table 3.12). Based on livestock inventories taken by National Agricultural Statistics Service (NASS), the BLM provides less than one-tenth of the forage needed to support the livestock produced within the planning area. . Data on the number of farms and livestock inventories by county are presented in Table 3.13.

Table 3.12
Average Annual Authorized Livestock Grazing Use
Billed AUMs 2008 - 2012

	Cattle	*Bison*	*Horses*	*Sheep*
5-Year Average	370,101	1,033	686	155

Source: Range Administration System, 2008 – 2012

Table 3.13
Livestock Operations by County

County/Area	*Number of Farms**	*Cattle and Calves Inventory***	*Sheep and Lambs Inventory***	*Total Annual AUMs of Feed Needed****
8-County Planning Area	5,046	393,000	9,800	4,739,520
Blaine	665	86,000	0	1,032,000
Chouteau	849	48,000	600	577,440
Glacier	625	49,500	600	595,440
Hill	854	26,000	900	314,160
Liberty	299	15,000	0	180,000
Phillips	556	88,000	4,300	1,066,320
Toole	428	16,500	1,700	202,080
Valley	770	64,000	1,700	772,080

Source: USDA National Agricultural Statistics Service (NASS) (USDA 2013b)
* 2007 Census of Agriculture, Dec. 31 inventory
** January 1, 2013 Agricultural Survey, Quick Stats
*** Total Annual AUMs of Feed Needed = ([cattle and calves inventory] + [sheep and lamb inventory/5] x 12 months). Assumes typical livestock operation where all calves would be weaned by December 31 and next calf crop would be born in late winter-spring.

About 550 operators have livestock grazing permits or leases on BLM lands in the HiLine District. It is common for an individual/ operation to hold more than one permit or lease. About 10% of the farms/ranches in the planning area hold BLM grazing permits/leases.

Cattle are the most prevalent class of livestock, although bison, sheep, and horses also graze some BLM land in the planning area. Livestock operations are primarily cow/calf operations. Most calves are born in late winter through spring on private lands. Cattle are turned out to graze as cow/calf pairs. Calves have historically been weaned in the fall and most leave the region to be grown out and/or fed in other parts of the U.S. About 68% of the cattle and 90% of the sheep are marketed (2007 Census of Agriculture). At weaning, most cows are taken to winter pasture where they remain until they calve the following year.

Under the assumption that all permittee and lease holders are located within this planning area, roughly 39% of the 5,046 farms/ranches raise livestock and the BLM provides nearly 8% of the total forage requirements for the livestock inventory within the planning area. By assuming a direct relationship between the percent of farms that produce livestock and the percent of farm-related employment that is associated with livestock production, it is estimated that BLM livestock grazing contributes about 451 direct and about 231 total jobs and approximately $9.2 million in labor income to the local economy (IMPLAN 2012). In this context, employment is defined as the average annual employment, including all full-time, part-time, and temporary positions supported by forage administered by the HiLine District. Thus, 1 job lasting 12 months = 2 jobs lasting 6 months each = 3 jobs lasting 4 months while labor income is the sum of employee compensation and proprietor (owner) income.

The amount of BLM grazing land and the dependency of local livestock operators varies among the counties. Phillips and Valley Counties offer the most grazing land and the highest dependency on BLM land for livestock grazing. Chouteau, Glacier, Hill, Liberty, and Toole Counties offer the least amount of BLM grazing as well as the smallest dependency on the BLM for livestock forage needs. Livestock grazing on BLM land involves livestock operators who have Section 3 grazing permits (grazing on public lands within grazing districts, BLM Manual 1373.12) and Section 15 grazing leases (grazing on public lands outside of grazing districts). On public domain lands, 50% of revenues from Section 15 grazing fees on public domain lands are distributed to the state and counties; 12.5% of grazing fees from Section 3 permits are distributed to the state and counties. On lands acquired under the Bankhead-Jones Land Utilization Act, 25% of revenues from both Section 3 and Section 15 lands are distributed to the counties. Within the planning area, 65% of the BLM surface land base is public domain land and 35% is LU acquired land. Average annual revenues collected from grazing receipts (2008-2012) by the federal government were $502,166; of this, approximately $89,581 was distributed to counties.

The grazing fee the BLM charges is established by formula and is generally lower than fees charged by other federal agencies, states, and private ranchers who set fees to obtain the market value of forage. The formula used to calculate the BLM grazing fee incorporates the ranchers' ability to pay and does not recover the agency's expenditures or capture the fair market value of forage. Livestock operations in the planning area often involve large areas of land, and ranchers depend on a mix of private and federal lands to graze cattle seasonally. None of the livestock operations are wholly dependent on forage coming from public lands. To qualify for a grazing permit/lease on public land an operator must have land and the capability to accommodate their livestock for a specified period of time on private land owned or controlled (base property) apart from the BLM land (43 CFR 4110). The common qualification standard for the region is that the operator needs to accommodate livestock for four months on their base property to qualify to graze the same amount of livestock for eight months on public lands. Therefore, an individual operator cannot be dependent on more than 68% of their forage need coming from BLM land. Within the planning area, it is rare for dependence on BLM land forage to exceed 50% and many operations depend on BLM land forage for less than 20% of their total forage needs. However, many of the BLM livestock operations depend heavily on forage from BLM lands during a specific season; i.e., many operators graze BLM land in the spring through fall for five to seven months and winter their livestock on base property.

Although BLM forage comprises a relatively small share of the total AUMs in the planning area, this forage may be particularly valuable to livestock producers because the grazing fees are very favorable and it is often available during a critical period of the year when forage on private hay fields and meadows is being grown to provide forage for the winter. The BLM grazing fees ($1.35/AUM in Fiscal Year (FY) 2012) are considerably lower than the statewide average of $20.50 per AUM (Montana Agricultural Statistics, National Agricultural Statistics Service, 2014). If the BLM were to charge a market-based fee, the price would likely not equal private or state fees because of factors such as range productivity services provided by the landowner and access to the land (GAO, September 2005).

Access to BLM grazing is important to area livestock producers even though additional management costs are usually incurred to use these lands. According to a 2005 GAO report on livestock grazing, "fees charged by private ranchers and state land agencies are higher than the BLM and Forest Service fees because, generally, ranchers and state agencies seek to generate grazing revenues by charging a price that represents market value for that land and/or the services provided."

Mineral Development and Production

Mining sector activities include gold mining, oil production, natural gas production, and bentonite mining. Gold mining occurred in the Little Rocky Mountains for more than 100 years and once provided a major economic stimulus to the region and employed hundreds of people. However, since the closure of the Zortman/Landusky Mine in 1998, the few remaining jobs related to gold mining have been associated with reclamation and water management and treatment. The combined site maintenance and water treatment costs will run an estimated $2.5 million per year. A few people were employed in bentonite mining south of Malta until the 1980s when that mine closed.

Currently, jobs in oil and natural gas development and production account for nearly all of the direct employment reported in the mining sector today. Local oil and gas production also supports jobs in the natural gas pipeline transmission industry. Local contractors, as well as regional firms primarily from the Williston Basin in North Dakota provide contract services to local oil and gas fields.

Nature of the Oil and Gas Industry in the Planning Area

In the last five years between 2008 and 2012, oil and gas drilling and production occurred in all eight counties. During this period, an annual average of 20.4 oil wells, 70.2 gas wells, and 14 dry holes were drilled in these producing counties (MBOGC 2013). In FY 2010, about 69,300 bbl of oil and 15,151,500 MCF of natural gas were produced from federal minerals. Statewide average wellhead prices in 2010 were $70.24 per bbl. for crude oil and $3.64 per MCF for natural gas (IPAA 2012). The 2010 statewide average cost of drilling and equipping each well was $8,188,070 for oil wells, $33,953 for gas wells, and $141,732 for dry holes (IPAA 2012).

Oil and Gas Leases

As of November 21, 2013, more than 671,546 acres of federal minerals were leased for oil and gas within the planning area. Annual lease rental is paid on 146,679 acres that are not held by production. Total lease and rental revenues paid to the federal government were estimated to be $256,689. Lease rents were not paid on 524,867 acres that were held by production. Instead, royalties are paid on oil and gas production from these leases.

Competitive federal oil and gas leases generate a one-time lease "bonus" bid as well as annual rents. The minimum lease bonus bid is $2.00 per acre. If no bonus bids are received, the parcels are later made available as noncompetitive leases where no bonus bids are collected. Over the past 10 years, bonus bids for all acres leased in the planning area averaged $10.35 per acre. Lease rental is $1.50 per acre per year for the first five years and $2.00 per acre per year thereafter. Typically, oil and gas leases expire after 10 years unless held by production. Annual lease rentals continue until one or more wells are drilled that result in production and associated royalties. A portion of the revenues collected by the federal government is distributed to the state and counties. The amount that is distributed is determined by the federal authority under which the federal minerals are being managed. The leased acres changes daily as leases expire and other parcels are leased. Generally, within the planning area, public domain federal minerals account for about three-fourths of the acres leased; Bankhead-Jones lands account for about one-fourth of the acres leased; and the other authorities for acquired minerals account for less than 1% of federal leased acres.

Forty-nine percent of these federal leasing revenues from public domain minerals are distributed to the state and the state distributes 25% back to the counties (Title 17-3-240, Montana Code Annotated). Twenty-five percent of the federal leasing revenues are distributed to the counties on federal minerals administered under the Bankhead-Jones Act. Total annual federal lease and rental revenue is approximately $256,689. Of this, an estimated $113,456 was disbursed to the state and counties.

Production

The amounts of federal minerals and the contributions of that production to local economies vary among the counties. Blaine and Toole Counties produce the most oil and Phillips and Blaine Counties produce the most natural gas from federal minerals. Across the 8-county planning area, federal minerals account for approximately 85% of total oil production Nearly 90% of the natural gas produced in the 8-county planning area comes from federal minerals.

Federal oil and gas production in Montana is subject to production taxes or royalties. These federal oil and gas royalties generally equal 12.5% of the value of production (43 CFR 3103.3.1). Forty-nine percent of these royalties from minerals produced from public domain lands are distributed to the state. In Montana, 25% of the royalty revenues that the state receives are redistributed to the counties of production (Title 17-3-240, MCA). Twenty-five percent of royalties associated with mineral production from Bankhead-Jones lands are distributed to counties of production. Federal royalty revenues within the planning area were calculated to be $12.2 million, of which an estimated $5.4 million were distributed to the state and counties.

Local Economic Contribution

Aggregated mining sectors (industry sectors 20-30) supported approximately 1,279 total jobs and $51.5 million in labor income within the planning area in 2012 (IMPLAN 2012). Almost all of the jobs and labor income are associated with oil and gas production. Most of the oil and gas service companies associated with oil and gas operations in the planning area are located within the planning area. The amounts of federal minerals and the dependency of local economies on that production vary among the counties.

Counties and school districts receive revenues from oil and natural gas leasing and production taxes and ad valorem property taxes on certain field and pipeline facilities. Detailed breakdowns of taxable values associated with the oil and natural gas industry for analysis of property tax assessments are not available. However, revenues associated with mineral exploration, development, and production of federal minerals allow higher levels of government and/or school district services than would be available without these revenues. In other cases these revenues reduce the tax burden on residential, commercial and industrial property taxpayers within the county. These benefits can be offset by higher service demand associated with oil and gas activities; however, road maintenance appears to be the major function that requires a higher level of service as a result of oil and gas activities.

Drilling is usually done by a contractor who transports a rig and crew into the area and drills several wells. Drilling occurs continuously until a well is completed. The rig then moves to its next assignment. Drilling within an area has been done by only one or two companies at a time. The temporary workforce typically includes about 15 drilling-related workers, about 4 workers to cement the well, and a three-person logging crew. A second crew of about 14 will complete the wells drilled during one season. A third crew of 10-15 workers installs gathering lines for all wells drilled within a field during one drilling season. Drilling, completion, gathering system/field infrastructure construction crews are generally non-local and stay in nearby towns on a temporary basis. Some crews hire a few local workers, but non-locals require temporary lodging in motels or recreational vehicles for the duration of their stay. Additional jobs are generated in the lodging, food service, entertainment, and automotive services sectors of the local economies. Field operations are typically performed by a few local employees and local contractors in the oil and gas service and construction industries.

The proximity of oil and gas wells and related facilities can influence nearby residential property sales, especially those on split estate land. Landowners who do not own mineral rights may be subject to federal mineral development on their land. Usually, these landowners enter into a surface use agreement and receive compensation, i.e. income, for the use of their land. Estimates of how individual properties are affected by nearby oil and gas development vary from case to case depending on specific location and the exact character and features of a property. Based on research in Colorado, BBC Research and Consulting reported in "Measuring the Impact of Coalbed Methane Wells on Property Values" that surface property owners perceive coalbed methane (CBM) activity "as having an adverse, if localized, effect on property values within view or earshot of CBM facilities." In the study, interviewees said they "believe a property is most affected in the event that a well is located directly on it, although the intensity of effect may vary with the size of the property and the opportunities available to maintain separation between the well and the residence or other improvement." BBC Research conducted Hedonic Pricing Analysis that included 754 properties and concluded that the location of a well on a property at the time of a residential sale reduced the net value of the residential property by 22%. However, the study found that the impact of a well within 550 feet of a property (but not on the property) may be positive if one takes into account spacing orders and setback requirements. The study concluded that this positive effect "is likely attributable to a belief that the property in question would not be drilled because a well had already been drilled in close proximity." GIS analysis indicates there are about 500 residential structures within the planning area on lands with federal minerals that have high or moderate potential for oil and gas development.
Other economic activity related to mining includes sand, gravel, and stone mining and quarrying, and support activities for these other mining activities. The only other mineral production within the planning area is sand and gravel production, with 37 mineral material sites (sand and gravel) spread across the planning area. Total average annual production is about 26,000 cubic yards of dry gravel (38,480 short tons). Royalty rates along the HiLine average about $1.00 per cubic yard. Annual mineral material royalties from sales of federal mineral materials average about $26,000. None of these royalties go to state or local governments. However, the BLM does make sand and gravel available to county and local governments through free use permits. The commodity price for sand and gravel sold for commercial purposes averaged $7.43 per short ton in 2011 (USGS Minerals Yearbook, Sand and Gravel 2011).

Recreation Use

Outdoor recreation and access to public lands have been attributed with attracting and sustaining families and businesses, creating healthy communities and fostering a high quality of life. It is estimated that more than three out of every four Americans participate in active outdoor recreation each year and more than 140 million Americans make outdoor recreation a priority in their daily lives (Outdoor Industry Association 2012). These recreationists spend money on gear, vehicles, trips, and travel-related expenses which support jobs and income, and generate tax revenues in local communities. On annual average, the outdoor recreation and tourism industry is valued at more than $5.8 billion, supporting approximately 64,000 jobs and generating nearly $403 million in tax revenue across Montana (Outdoor Industry Association 2012).

Undeveloped lands across the state provide local residents, out-of-state visitors, and international travelers with high quality outdoor recreation opportunities. While outdoor recreation by non-local recreationists is responsible for injecting millions of new revenue into the state's economy each year, access to outdoor recreation opportunities close-to-home adds to the quality of life enjoyed by local residents and increases the attractiveness of Montana as a place to live and work. BLM lands provide a wide array of recreational opportunities which are enjoyed by local and non-local residents. The large expanse of undeveloped lands and unique opportunities on those lands attracts recreational visitors who participate in activities such as hiking, mountain biking, camping, ATV riding, four wheel driving, hunting, and wildlife viewing. On their way to recreate on BLM lands, and once they arrive, these visitors spend money on goods and

services they would spend elsewhere if these opportunities did not exist. In this manner recreational experiences supported by BLM lands contribute to the local economy by attracting and maintaining local outdoor recreation related spending within the planning area.

The economic influence of recreation use on BLM lands is related to local expenditures for goods and services such as gasoline, lodging, meals, and supplies. To understand the local economic influence of recreation use, it is important to understand that local expenditures vary depending on the type of activity, whether the recreation use is from local residents or non-local residents, and whether the activity involves overnight stays. Local expenditures related to recreation use support local employment and labor income (standard economic indicators). Generally, employment related to recreation and tourism tends to be seasonal and relatively low paid, with a high portion of the labor force self-employed. The recreation opportunities available in the planning area play an important role in the quality of life of many local residents, and also attract visitors from elsewhere in the state and region. The BLM lands in the planning area received an estimated 113,000 recreation visits in FY 2010 (BLM, RMIS 2011). Major recreation activities on BLM lands are hunting (33%), fishing (12%), off-highway vehicle (OHV) use (11%), wildlife viewing (8%), and picnicking (8%). Recreation and tourism is not classified or measured as a standard industrial category. Components of recreation and tourism activities are instead captured in other industrial sectors, primarily the retail sales and services sectors.

It is assumed that day use and overnight use in the planning area would be similar to that found in the Dakota Prairie National Grasslands, where an estimated 61% is day use; the vast majority of which is local day use. Average spending for day and overnight use on the Dakota Prairie Grasslands is assumed to be representative of daily recreation expenditures on BLM lands within the planning area where average spending per recreation visit for day trips was $34 for locals and $65 for non-locals and $178 for locals and $365 for non-local overnight visits (Stynes and White 2005). These expenditures would be split among the following economic sectors: lodging, restaurants, groceries, gas/oil, other transportation, activities, admissions/fees, and souvenirs.

Government revenues received from the recreation program are associated with recreation use permits. In FY 2010, $8,155 was collected in campground fees and Special Recreation Use Permits. None of these revenues from the HiLine District are distributed to the state or counties. The BLM's recreation fee guidance (IM 2005-063) identifies the goal of using fee revenues at sites of collection or within the field office of collection.

Timber Management

Timber harvest from BLM lands within the planning area is relatively small. The Allowable Sale Quantity (ASQ) from BLM lands within the planning area is 350 mbf per year. However, the actual timber harvest within the planning area is relatively small, with the 10-year average harvest only about 67 thousand board feet (67 MBF or 152 CC) per year. Christmas trees are also sold. The annual average number of Christmas trees sold over a 10-year period was 76. About 5% of the sawtimber that is harvested comes from salvage sales. Annual timber revenues average $1,190 for all products and $553 for salvage sales. Four percent of the revenue from timber sales on public domain goes to the state, 76% to the Bureau of Reclamation, and 20% to the U.S. Treasury. Distribution of revenue from salvage sales is different, i.e., 4% of revenue from timber sales on public domain goes to the state, and 96% goes to the BLM.

Lands and Realty Actions

In FY 2013 the BLM issued or renewed 65 rights-of-way (ROWs) in the Glasgow, Havre, and Malta Field Offices within the HiLine District. These right-of-ways are leased for infrastructure in support of economic activities within the planning area. ROW's generally include powerlines, telecommunication lines, roads/highways, water facilities, and may also include roads and pipelines associated with oil and gas development. BLM leasing revenues from right-of-ways generated $76,582 for the federal government in FY 2013 (Table 3.14). If the right-of-way is issued under FLPMA authority, none of the rents are shared with the state or local governments. If the right-of-way is issued under the Mineral Leasing Act Authority, 49% of rents are shared with the state, which distributes 25% of the revenue it receives to the appropriate counties. If rights-of-way rents are collected from Bankhead Jones (LU) lands, 25% if the revenue is paid to the county.

Table 3.14
FY 2013 Federal Rights-of-Way Revenues

Field Office	*FLPMA Authority*	*MLA Authority*	*Total Revenue*
Glasgow	$117	--	$117
Havre	$53,346	$2,331	$55,677
Malta	$2,547	$18,241	$20,788
Total	$56,010	$20,573	$76,582

Source: Lands and Realty Database (LR2000), December 10, 2012

Currently, no rights-of-way exist for wind energy on BLM lands in the planning area. However, it is anticipated that some development will occur on public lands over the life of the plan. Analysis of anticipated impacts is included in Chapter 4.

Direct BLM Contributions to Area Economic Activity

BLM Labor and Operations

BLM operations and management in the area make a direct contribution to area economic activity by employing people who reside in the area and by expending dollars on other non-personnel needs. Management of BLM lands and resources is carried out by professional and administrative employees who are stationed in BLM offices in Havre, Malta, and Glasgow. In December 2010, the three offices combined had positions for 44 permanent employees and 7 non-permanent employees. The BLM also has additional employees located in the Great Falls Field Office (Great Falls), Lewistown Field Office (Lewistown), and the Montana State Office (Billings) who worked on minerals and resource management in the HiLine District. In FY 2012 BLM spent $4.146 million for labor and $3.645 million on operations within the planning area. The three communities that have the largest BLM labor income are Malta, Havre, and Glasgow. BLM operations expenditures include administrative costs as well as contracts for various forms of ecosystem restoration to protect or restore the lands managed by the BLM.

Ecosystem Restoration

Some land uses/activities such as weed treatments and hazardous fuels treatments are paid for by the BLM and are grouped together as ecosystem restoration. Major activities associated with ecosystem restoration include treatment of invasive species and pest management, wildland fire suppression, hazardous fuels treatments, and mine reclamation. Annual ecosystem restoration includes one major mine reclamation and water treatment project ($2.479 million/year), mechanical treatment/pre-commercial thinning of 237 acres of forest/woodlands, prescribed burning of about 43 acres of forested areas, mechanical treatments and prescribed burning of 355 acres of grass/shrubs and treating 1,280 acres of invasive species. Mine reclamation, water treatment, 90% of pre-commercial thinning, and 63% of invasive species treatments are contracted out or paid for through cooperative agreements. Annual timber harvest paid for by the BLM but performed by private businesses for hazardous fuels treatments and timber sales would continue to produce about 152 CCF of sawtimber. With the exception of the Zortman/Landusky mine reclamation, these restoration activities are conducted using appropriated funds from the district's annual budget. Although the HiLine District provides some funding for the reclamation and water treatment projects associated with the Zortman and Landusky Mines, economic stimuli money from the Reinvestment Act of 2009 accounts for the majority of project funding. These funds are managed by MDEQ through their contract with Spectrum Engineering, Inc. in Billings, Montana.

Invasive Species: Economic effects of invasive species and their treatments are related to their influence on range productivity, wildfire risk, and attractiveness for recreation, and ultimately, on how these impacts affect local employment, income, and government revenues. Direct and indirect impacts from treatments of invasive species vary based on the species being treated and the type of treatment used. Table 3.15 identifies the average BLM per-acre cost of weed treatments and Table 3.16 identifies the projected annual average BLM acres treated. About one-third of the treatments are done by the BLM and two-thirds are done through agreements or contracts.

Table 3.15
Invasive Species Treatment Average Cost per Acre*

	Glasgow Field Office	*Malta Field Office*	*Havre Field Office*	*Planning Area Total*
Biological – Non-Classical	NA	NA	$23	$23
Biological – Classical*	$50	NA	$20	$30
Chemical – Ground	$195	$20	$221	$201
Chemical – Air	$200	$187	$204	$202
Other Treatments	NA	NA	$525	$531
Average All Treatments	$148	$248	$199	$198

* Weighted average by acre.

Table 3.16
Average Annual Invasive Species Treatment (Acres)

	Glasgow Field Office	*Malta Field Office*	*Havre Field Office*	*Planning Area Total*
Biological – Non Classical	0	0	110	110
Biological – Classical*	50	20	20	90
Chemical – Ground	85	356	254	695
Chemical – Air	285	0	90	375
Other Treatments	0	4	5	9
Total	420	380	479	1,279

* Classical Biological Controls represents only releases made in any given year.

Fire Suppression and Fuels Treatments: The cost of wildfire suppression within the planning area depends on the number and size of fires. Most wildfires are controlled in the initial attack, when they are relatively small. However, weather conditions, terrain, vegetation, and proximity to populated areas all contribute to the cost of fire suppression. Restoration/fuel reduction efforts in Montana reduce fire hazard, improve ecological conditions of forested areas, and result in economic benefits that exceed the costs of reducing hazardous fuels (Keegan, et al. 2002). Between 2001 and 2008, BLM fuel treatment costs within the planning area averaged $182 per acre for pre-commercial thinning of forested areas, $43 per acre for prescribed burning of forested areas, and $355 acre for mechanical treatments and prescribed burning of grass and shrublands.

Total BLM Economic Contribution

Revenue Disbursement: BLM land management activities and land/mineral uses that generated revenue to counties are displayed in Table 3.17. A large source of these payments was payment in lieu of taxes (PILT) and mineral payments. PILT payments are made to counties to compensate for federal lands that are exempt from local property taxes. Payment amounts are based on a complex formula that considers, among other things, revenue sharing from the previous year, county population, and acreage of a county in federal ownership. Another large source of revenue to counties within the planning area is oil and gas lease bonus, rents, and royalty payments. These revenues are influenced by leasing bonus bids, the well head price paid for oil and natural gas, and levels of production from federal minerals.

Table 3.17
Payments to Counties from BLM-Related Land/Mineral Uses

County/Area	*BLM Portion of 2013 PILT Payments*[1]	*Grazing Fees*[2]	*Average Annual Oil and Gas Leasing Bonus, Rents, Royalty Payments*
8-County Planning Area	$2,301,359	$89,523	$1,850,029

Sources:
[1] USDI FY 2013 Payments In Lieu of Taxes.
[2] Based on Average annual authorized Use 2008-2013 from BLM Rangeland Administration System (RAS).

Employment and Income: BLM-related employment and income by major program area are displayed in Table 3.18.

Table 3.18
BLM Resource-Related Employment and Income by Major Program Area

Resource/Program Area	*Resource-Related Jobs*	*Resource-Related Income ($1,000)*
Grazing	683	9,368
Minerals	616	27,089
Recreation Use	55	1,364
BLM Expenditures	100	6,252
Payments to States/Counties	67	2,708
Externally Funded Restoration Activities	20	851
Total Resource Management	1,541	47,632
BLM as a Percent of Total Planning Area Economy	4.0%	3.7%

Source: IMPLAN, 2012

Activities occurring on or associated with BLM land and mineral resource uses supported an estimated average annual 1,541 jobs and $47.6 million in labor income within the planning area (FEAST/IMPLAN 2012).

Fire Management and Ecology

Most, if not all of the ecological systems in the planning area have adapted to fire and other disturbances and are maintained by those disturbances. Vegetation management and land uses in the past century have altered many plant communities and fuel loadings. Because of these altered conditions, there is potential for future fires to become larger and/or higher severity, especially in conifer fuel types. Nationally, acres burned per year have generally increased since 1960 (NIFC 2012). In addition, the introduction of non-native invasive plant species has increased the potential for negative impacts after fire, especially where annual grasses such as cheatgrass have invaded. Alternatively, the potential for abnormally low fire behavior has been created in areas where coverage of clubmoss or bare ground has increased; consequently, the plant community will tend to persist in the altered condition.

In the past decade, and especially after the 2000 fire season when the National Fire Plan was developed, the BLM and other agencies increased vegetation treatments such as thinning and prescribed burning to reduce hazardous fuels in developed areas and change plant community composition and structure for improved health and resiliency after fire.

Fire Management

The BLM fire and fuels organization is a centralized zone operation that includes the HiLine District and the Central Montana District Offices, and the Lewistown Interagency Fire Dispatch Office. The BLM works in an interagency environment with rural fire departments, tribes and other federal and state fire agencies. The closest available fire suppression resources respond to a fire for initial attack regardless of land ownership. The BLM has entered into Memoranda of Understanding (MOUs) with Blaine, Phillips and Valley Counties, and an agreement with Hill County which outline initial attack responsibilities.

Fires in the planning area that occur within the rural intermix or Wildland Urban Interface (WUI) are always fully suppressed because of the high values associated with mixed ownership which may include croplands, rangelands, and structures. Fire management has included the full range of suppression options from full suppression to managing fire for beneficial effects.

The planning area is divided into Fire Management Units (FMUs). FMUs are managed in accordance to planning objectives and constraints, vegetation, fuel types, wildland urban interface areas, and other characteristics. The planning area includes seven FMUs: Sweet Grass Hills, Havre Prairie Potholes, Malta Prairie Potholes, Bears Paw, Little Rockies, Malta Breaks, and Sun Prairie.

Each FMU has been evaluated and assigned a fire management category. These categories range from Category A where fire (including prescribed fire) is not desired at all, to Category D where fire is desired and there are no constraints on its use. Most of the planning area is Category B, where fire is a useful management tool, but unplanned ignitions are likely to cause negative impacts because of intermixed private lands and rural structures. The Missouri Breaks area is Category C, where fire is desired but fuels buildup and intermixed private lands create constraints to the use of wildfire for resource benefit. The planning area has no lands assigned to Categories A or D. Appendix D has more information about fire management categories, and Map 2.1 in Chapter 2 (Alternative A) shows the FMUs and areas covered by Categories B and C.

Prescribed Fire Treatments

The BLM has used prescribed fire on 4,645 acres within the planning area from 2001 through 2012. Of those acres, 3,236 were in grassland/shrubland areas, and 1,409 acres were in forested areas. Fire treatments in forested areas have mostly been used to burn slash residues in hazardous fuels reduction projects near the towns of Zortman and Landusky. More recent projects are focusing on forest and upland health, and restoration of fire regimes; understanding that healthy forests have appropriate stand densities and fuel loadings. Mechanical treatments are addressed in the Forests and Woodlands section under Forest Treatments.

Prescribed fire in forested settings is most commonly implemented during the late winter and early spring months when soil, duff, and dead wood fuel moistures are at their highest of the year. This allows low to moderate severity fire effects with minimal mortality in the forest canopy. This is especially important in high value areas such as mechanically treated sites. The cost of implementation in late winter or early spring is usually lower than other times of year because adjacent fuels are less receptive to ignition or high rates of fire spread, so fewer holding resources (e.g., engines, fire personnel) may be necessary as compared to fall burning. No matter the time of year, pre-burn preparations in forested settings usually include surface-disturbing activities such as hand lines, but in late winter or early spring control lines can be narrower or unnecessary where natural barriers like game trails are adequate.

In grassland settings as compared to forested settings, prescribed fire can be implemented more reasonably during summer and fall because fuels are lighter and burn quickly, and flame lengths are generally shorter than in forested settings. In some years, summer and fall fire restrictions and non-availability of prescribed fire personnel can constrain summer and fall prescribed fire implementation.

Wildfire Occurrence

Fire occurrence in the planning area generally extends from March or April through October, with the summer fire season occurring from mid-June through early September. Many spring or fall wildfires are human caused from equipment or debris burning, whereas most summer-season fires are started from lightning strikes that occur during thunderstorms in the summer months. Most fires remain small because of initial attack suppression efforts, or because of precipitation or vegetation greenness. Fires that grow large usually result from a combination of dry lightning, high winds, cured vegetation, and/or fuel buildup. Drought conditions can exacerbate these conditions or contribute to early or extended fire seasons. Although uncertainty remains about the effects of climate change on fire occurrence, size and severity, it seems accurate to assume warmer and dryer conditions in the planning area would likely create longer fire seasons.

Table 3.19 shows BLM-reported fires in the planning area between 1980 and 2012. Data are summarized from fires reported to the National Interagency Fire Center (NIFC) database. Reported fires include those where BLM provides assistance to other agencies or rural fire departments as well as fires on BLM lands where BLM receives assistance from other agencies or rural fire departments. About 78% of the fires were naturally ignited from lightning, and about 22% were human-caused by equipment, vehicles, powerlines, or unknown sources. This fire history data generally does not include tribal, state, private, or other federal agency fires, unless the BLM assisted with those fires. Rural volunteer fire departments successfully and independently suppress a very large, but unknown number of fires every year.

Table 3.19
BLM-Reported Fires (1980-2012)

Total reporting years	33	
Reported fires	424	
Total action fires	355	(minus false alarms)
Maximum fires in a year	27	in 1988 and 2006
Average fires/year	12	
Total acres	144,149	acres
Average acres/year	4,368	acres
Maximum fire size	13,466	acres in October 2005
Average fire size	340	acres
Maximum yearly acres	25,230	acres in 2012

Source: NIFC database.

Historic and Pre-Settlement Human Fire

Diaries and oral histories from early explorers, Native Americans, and trappers have documented the deliberate and multipurpose use of fire by Native Americans, but the information is usually lacking in spatial and temporal scales (Baker 2002). The frequency and extent of fire use is argued to have shaped North America's plant communities (Pyne 1982; Williams 2000, 2004); however, it has also been suggested that this idea is over-emphasized (Barrett, Swetnam, and Baker 2005). The use of fire is documented for prairies to the east of the planning area (Lewis and Clark Journals) and in the forests to the west (Barrett 1980; Barrett and Arno 1982), but little or no local information exists for the planning area, and therefore, little opportunity to use the information to establish reference conditions.

Fire Danger and Behavior

In early spring, fire occurrence on BLM lands is predominately in the grass/shrub fuel type and tends to occur between snowmelt and green-up, when fine fuels have dried and will carry fire. The average burning index is usually at its highest during this time of year (NWCG Pocket Card, CMZ BLM 2011), which can indicate higher flame lengths and associated difficulties in control efforts. The burning index is often used as a fire danger indicator in areas where fine fuels such as grass are the main carrier of fire. Spring precipitation and green-up reduce the burning index to the lowest values of the year, where acres burned in June are relatively low considering the number of fires. As herbaceous vegetation matures and fuels dry in summer, the burning index values steadily increase, and associated fire danger increases until early September. The data suggest the possibility to manage wildfires for resource benefit immediately before and during green-up.

Energy release component (ERC) is a cumulative measure for the fire season which provides a reflection of drought conditions, and is used as a fire danger indicator in forested settings. ERC represents the release of heat per unit area in a flame zone, and indicates potential fire intensity. Typically, maximum ERC values are reached in late August or early September (NWCG Pocket Card, CMZ BLM 2011), and decline only after significant precipitation events.

From mid-June through August, thunderstorms can occur almost daily and may or may not have precipitation associated with them. Under dry conditions, these storms can produce multiple fires per day with increased potential for escape from initial attack suppression efforts.

Fire Ecology

Plant species in the planning area can be fire adapted in several ways, or by a combination of the following characteristics: physical attributes that resist burn damage; post-fire sprouting capabilities of roots and stems; or seedling establishment (Miller 1994).

Structurally, a tree such as ponderosa pine is fire resistant because it has thick bark (insulation) and few ladder fuels which could cause fire to move into the crown. Ponderosa pine is adapted to frequent fire that burns surface fuels and maintains an open understory. When fire is eliminated from this type of plant community, ladder fuels will increase

(such as thickets of pine and Douglas-fir seedlings) and will contribute to stand replacing crown fire and canopy mortality.

Plants with rhizomatous root systems, such as chokecherry, needle-leaf sedge, and western wheatgrass will re-sprout vigorously after fire, even after fairly severe burns. The depth of the root system ranges from shallow to deep, so some roots and buds are protected from all but the most severe burns. Plants with root crowns or basal buds, such as birch, serviceberry and currant will re-sprout after fire, but the roots can be more susceptible to heat damage than are rhizomatous roots. Many deciduous shrubs and herbaceous species are intolerant of partial or full shade and will become suppressed and decline in forest understories if fire is eliminated from the plant community.

Some species such as lodgepole pine are adapted to fire by creating post-fire conditions which enhance seedling establishment. Lodgepole pine cones are often serotinous, which means they must be heated to open and release the seeds. In addition, the seedlings require a sunny, mineral seedbed to germinate and grow successfully. In general, lodgepole pine forests are adapted to infrequent, stand-replacing fire, which creates ideal conditions for seed germination and seedling establishment. In the higher elevations of the island mountain ranges, lodgepole pine generally reestablishes in dense "dog-hair" stands, and can expand into Douglas-fir/ponderosa pine stands (Pfister, et al. 1977) that have been killed by crown fire. Casual observations in the Little Rocky Mountains suggest that lodgepole pine has replaced ponderosa pine in many areas, particularly after the 1936 fire. Because lodgepole pine forests are adapted to stand-replacing fire, they can contribute to large fire size.

Wyoming big sagebrush is usually killed by fire, and must reestablish by seed. In all but the most extreme conditions, fires burn in a mosaic pattern, or a narrow, wind-driven pattern. The patterns leave remnant patches near or within the burn area, and those plants supply seed for reestablishment (Howard 1999). Conifers such as juniper, pine, and Douglas-fir can encroach into sagebrush/grasslands and create conditions that may contribute to large fire size and higher severity burns. Likewise, encroachment of annual grasses can contribute to large, stand-replacement fire in sagebrush communities.

Fire Regimes

As general examples, some plant communities require frequent low severity fire, while others require infrequent stand-replacing fire. Most plant communities require fire frequencies and burn severities somewhere between these two descriptions. Plant community or ecosystem adaptations to fire, with respect to frequency and severity, are referred to as fire regimes.

When an ecological system or plant community does not burn at adapted intervals or severities, changes occur to the system which can affect species composition, vegetation characteristics, and fuel loading. These changes can further affect fire interval and burn severity, which further contribute to uncharacteristic changes in the plant community. These altered conditions within a plant community or system can be measured and classified according to the departure of that community relative to its natural or historic fire regime.

Fire Regime Condition Class (FRCC) has been developed as an interagency, standardized process to assess and monitor fire regimes and the condition of vegetation communities relative to their fire regime. The FRCC includes five fire regime groups (Hann, et al. 2008) as shown in Table 3.20. Three condition classes measure the departure of a plant community from its historic fire regime. Condition Class 1 is within the natural range, Condition Class 2 is moderately altered from the natural range, and Condition Class 3 is significantly altered from the natural range. Table 3.21 provides definitions of these classes (Hann, et al. 2008).

Within the planning area, condition classes and fire regimes have been analyzed at the project level and at a coarse-scale national level, but have not been assessed at the landscape level. In conjunction with other standard vegetation health assessments, FRCC assessments help establish reference conditions, identify current conditions, and perhaps direct attention to priority areas that would benefit from vegetation treatments such as fire. A national project called LANDFIRE has produced a mid-scale, spatial FRCC dataset for the nation. The data are currently available and will be used to provide a foundation within the planning area for assessing baseline conditions, and for monitoring vegetation treatment efforts. FRCC assessments will continue to be developed and monitored at the project level.

Table 3.20
Fire Regime Groups and Descriptions

Fire Regime Group	*Frequency*	*Severity*	*Severity description*
I	0-35 years	Low / mixed	Generally low-severity fires replacing less than 25% of the dominant overstory vegetation; can include mixed-severity fires that replace up to 75% of the overstory.
II	0-35 years	Replacement	High-severity fires replacing greater than 75% of the dominant overstory vegetation.
III	35-200 years	Mixed / low	Generally mixed-severity; can also include low-severity fires
IV	35-200 years	Replacement	High-severity fires replacing greater than 75% of the dominant overstory vegetation.
V	200+ years	Replacement / any severity	Generally replacement-severity; can include any severity type in this frequency range.

Source: Hann, et al. 2008

Table 3.21
Fire Regime Condition Class (FRCC) Characteristics

Condition Class	*Description*
1	Less than 33% departure from the central tendency of the historical range of variation: Fire regimes are within the natural or historical range and risk of losing key ecosystem components is low. Vegetation attributes (composition and structure) are well intact and functioning.
2	33% to 66% departure: Fire regimes have been moderately altered. Risk of losing key ecosystem components is moderate. Fire frequencies may have departed by one or more return intervals (either increased or decreased). This departure may result in moderate changes in fire and vegetation attributes.
3	Greater than 66% departure: Fire regimes have been substantially altered. Risk of losing key ecosystem components is high. Fire frequencies may have departed by multiple return intervals. This may result in dramatic changes in fire size, fire intensity and severity, and landscape patterns. Vegetation attributes have been substantially altered.

Source: Hann, et al. 2008

Emergency Stabilization and Rehabilitation

Rehabilitation is conducted on a case-by-case basis and may be necessary following fire suppression, wildland fire, and prescribed burns to address the following:

- Emergency stabilization and rehabilitation. Actions such as seeding, fencing, and temporary closures could be taken to stabilize or rehabilitate burned areas.

- Invasive Nonnative Plant Species (INPS). Burned areas and areas subject to fire suppression activities are susceptible to the establishment or expansion of INPS. Pre- and post-fire management is crucial for controlling nonnative plant species.

Appendix D provides more information about Emergency Stabilization and Rehabilitation.

Fish

The BLM is responsible for managing fisheries habitat on BLM lands. Managing fish populations is the responsibility of state (MFWP) and federal wildlife management agencies. The U.S. Fish and Wildlife Service (USFWS) provides regulatory oversight for all species that are listed, proposed for listing, or are candidates for listing under the Endangered Species Act (ESA). For more information, see the Special Status Species section later in this chapter.

Fish Species

The variety of fish species present in the planning area is high, with 76% of the total fish species common to Montana found in the planning area. A complete list of the 73 fish species (species, hybrids, and special populations) occurring in the planning area is located in Appendix N, Table N.1.

The aquatic resources in the planning area include fish, aquatic macro-invertebrates, and their habitats. These habitats consist of rivers and streams, springs, seeps, and lakes or reservoirs that provide year-round (perennial) or seasonal (intermittent) habitat for a variety of fish species or life stages, aquatic macro-invertebrates, and aquatic plant communities. Water quality is a key indicator of environmental conditions for fish and aquatic habitats. Other elements critical to aquatic habitat and suitable fish habitat, including riparian habitat, are sufficient water volume, suitable water temperature, and a limited presence of nonnative competitors. The BLM uses its surveys and those done by DEQ and MFWP to assess the abundance, distribution, and health of fish populations and aquatic habitat within the planning area.

Riparian vegetation is also an important factor in maintaining aquatic resource conditions, particularly in smaller rivers and streams. Riparian vegetation provides in-stream habitat for fish, adds structure to the banks, reduces erosion, moderates water temperatures, and is a source of organic nutrients for the system. Riparian vegetation also moderates flows by reducing runoff into streams and stores water for later release. As riparian habitats degrade, erosion and sedimentation increase, and streams widen and become shallower. Temperature fluctuations increase and oxygen content can reach critically low levels. These factors collectively reduce or degrade available fish habitat. A more thorough discussion of riparian vegetation can be found in the Vegetation – Riparian and Wetlands section.

Land use practices can directly or indirectly affect aquatic habitat and resource conditions. For example, logging and grazing activities may result in the direct loss or modification of riparian vegetation. These activities may also increase sediment delivery to the streams, which would affect water quality and substrate characteristics.

The linear characteristics of aquatic habitat and the wide dispersal and scattered parcel distribution of BLM lands in the planning area result in aquatic habitat for specific streams and rivers crossing land owned by different entities, making it difficult to describe specific habitat conditions relative to single land ownership. As a result, the current conditions of aquatic resources in the planning area are presented in terms of overall habitat conditions, stream types, and fish species distribution and diversity.

Of the 73 different species of fish found in the planning area (Appendix N, Table N.1), 46 are native, and 27 have been introduced new to the system over the years. Fisheries habitat on/in the Missouri River within the planning area has changed dramatically over the past 50-100 years with the advent of dams and subsequent flood control and the gradual reduction of cottonwoods and other deciduous trees. This is reflected in the high number of threatened and endangered and special status fish species (7 species) in the relatively short section of river. The planning area has a total of 3,231 miles of fish-bearing streams (MTNRIS 2007). A complete list of the fish-bearing streams is shown in Appendix N, Table N.2. Approximately 8% (243 miles) of these streams cross BLM lands.

Habitat conditions throughout the planning area vary both among and within water bodies. For example, the upper reaches of small streams may be intermittent, while the lower reaches may receive perennial flows, resulting in distinctly different habitat conditions even within the same stream.

Extensive information on aquatic habitat and fisheries resources is contained in the Montana Fisheries Information System (MFISH) at the MFWP website at http://fwp.mt.gov/fishing/mFish/default.html. MFISH is a database containing information on fish species distribution, supporting data for distribution, and stream level information for lakes and streams in Montana. The database is managed and maintained by the Information Management Bureau of the

Information Services Division of MFWP and is annually updated through interviews with MFWP, U.S. Forest Service, USFWS, BLM and tribal fisheries biologists, and supplemented with information provided in technical documents and reports.

The MFISH system ranks river and stream reaches according to their overall fisheries resource value. The resource value is determined by a complex point system, where the most points are assigned for important habitat for fishes of special concern (particularly important spawning habitat) and the least points are assigned for the occurrence of nonnative fish species. Additional consideration is given for social and economic values, such as higher points for a stream in an area with few streams. The rankings range from 1 to 5, representing respectively outstanding, high, substantial, moderate, and limited resource values. Within the planning area, the rankings generally correspond to the size of the river or stream, or the stream classification (see Appendix N, Table N.2). The only rivers in the planning area with a resource value of 1 (outstanding) are the Missouri and Marias rivers. Most of the other major drainages have resource values of 2 and 3, particularly in their lower reaches where perennial flows occur.

Lakes and Reservoirs

The MFISH database lists 97 lakes, ponds, and reservoirs in the planning area, although numerous smaller lakes and ponds also occur in the area (Appendix N, Table N.3). An additional 69 fishing lakes, ponds, and reservoirs (for a total of 166) exist in the planning area. Of the 166 water bodies identified, 40 (24%) are managed for warm/cool water species, 74 (44%) for trout, 21 (13%) for trout and warm/cool water species, and 31 (19%) were winterkilled at the time of this writing. Many of these water bodies were constructed (man-made). Sixty-one of the above water bodies are managed by the BLM. Twenty-six of the BLM-managed reservoirs, however, have winter-kill problems caused by a lack of depth and/or siltation. The remaining 35 reservoirs provide a vital fishery for the planning area. Fish stocking is coordinated with MFWP. Habitat improvement on some of these reservoirs has occurred to improve winter survival (windmill aeration) and water quality (exclosure construction).

The largest lakes or reservoirs in the planning area are Fort Peck Lake, Tiber Reservoir, Fresno Reservoir, and Nelson Reservoir. Fort Peck Lake (249,349 acre surface area) is immediately adjacent to the planning area and is an important fishery to the planning area. These water bodies are primarily managed for warm or cool water fish species.

A greater variety of fish species is generally found in the more downstream reaches of larger drainages, with comparatively fewer species present in upstream reaches throughout the planning area. This variation is related primarily to water quantity, as many of the smaller streams and the upper reaches of larger streams are ephemeral (seasonal). In addition, MFWP has identified chronic (most years) or periodic (drought years) dewatering concerns for certain reaches of the planning area (MTNRIS 2005).

The greatest fish diversity (57 species) occurs in the Missouri River (due to Fort Peck Reservoir), including 28 native species (MTNRIS 2005). Of the other large rivers in the planning area, the Marias River has 26 native species (38 total), and the Milk River has 22 native species (32 total species). The other major rivers and streams in the area typically support 16 to 23 total species and 12 to 17 native species. Many of the same fish species are abundant or common in most of these drainages, although species diversity is typically greater in the lower reaches of these streams.

The most abundant game fish species in the planning area include channel catfish, smallmouth bass, northern pike, sauger, and walleye (MTNRIS 2007). Less abundant game species include species of the family Salmonidae (various trout species, salmon, whitefish, cisco, and chars), largemouth bass, mountain whitefish, black crappie, white crappie, paddlefish, shovelnose sturgeon, pallid sturgeon, burbot, and yellow perch. See Appendix N, Table N.4 for a complete list of game fish in the planning area.

The most dominant non-game species in the planning area are goldeye, common carp, sand shiner, fathead minnow, flathead chub, longnose dace, white sucker, and shorthead redhorse.

Cold water game fish in the planning area are dominated by four introduced species (rainbow, brown, brook, and lake trout [lake trout are primarily not native, except in the Waterton and Saint Mary Lakes]), although these fisheries are limited in this portion of the state. Cold water fisheries are maintained through hatchery planting programs primarily in the area's reservoirs, ponds, and lakes. Mountain streams in the Sweet Grass Hills and Little Rocky Mountains, and other prairie streams typically rely on natural fish reproduction.

Several unique warm water fish species also occur in the planning area, including paddlefish, burbot, and two species of sturgeon, although these species are found primarily in the mainstem river reaches with perennial flows.

The abundance and distribution of the various fish species in the area is influenced by the available habitat, their ability to adapt to changing habitat conditions, and the degree of fishing pressure. Many of the game fish are also supported to some degree by hatchery planting operations.

Fort Peck Lake, which runs along the southern border of the planning area but is outside the HiLine District, has the most diverse fish species (57 species); most are native to the Missouri River system. Sixteen species, mostly game fish, have been introduced to develop sportfishing opportunities, including two species of salmon (Chinook and kokanee). The reservoir's walleye fishery has been of particular interest to resident anglers, and in recent years has begun to attract nonresidents as well. The difference in species diversity reflects the size of the reservoir (habitat variability) and its depth. Deeper water bodies provide habitat during the winter, while shallow water bodies tend to freeze in winter. As a result, many of the small reservoirs in the planning area support limited numbers of species and smaller populations of fish.

Numerous other aquatic resources are also present in the area's water bodies. These resources often are important in the diets of various fish species, or they comprise part of the food web upon which fish ultimately depend. Such aquatic resources include macro- and micro-invertebrates, zooplankton, phytoplankton, periphyton (attached algae), snails, clams, and worms. Numerous taxa of aquatic insects whose distribution and abundance vary with geographic location, habitat type, and habitat condition, occur in planning area drainages. Immature and adult forms of stoneflies (*Plecoptera)*, mayflies (*Ephemeroptera*), caddisflies (*Trichoptera*), and true flies (*Diptera*) are particularly important in the diets of juvenile and adult trout, whitefish, and other native and nonnative fish species. Aquatic vascular plants include ferns and flowering plants that grow submersed in water, float on the water surface, or have basal portions inundated with foliage and upper parts immersed. As with the fish resources, these other aquatic resources depend primarily on water quality and quantity conditions.

Factors Affecting Aquatic Habitats

The principle natural factors that limit or affect aquatic resources in the planning area include drought, naturally erosive soils, dissolved oxygen levels in winter and summer, and water temperature.

The principal anthropogenic factors limiting or affecting aquatic resources in the planning area include excess siltation, stream dewatering, loss or degradation of riparian habitat, habitat fragmentation, roads, road drainage structures, livestock use, and past mining practices. Eleven stream diversions or diversion ditch rights-of-way are located on BLM surface. Most of these diversions are not screened to prevent fish mortality when the ditches are dewatered.

The introduction of nonnative species is also of primary concern, due to the effects of hybridization, predation, and competition. An additional factor affecting salmonids (particularly rainbow trout) includes the potential spread of whirling disease. Whirling disease is caused by the parasite *Myxobolus cerebralis*, and it has the potential to severely impact wild trout fisheries in Montana, resulting in serious loss of recreational activity and its associated economic benefits.

Current management actions in the planning area focus on maintaining or improving aquatic habitats for fisheries and providing fishing opportunities on selected BLM reservoirs and ponds. Management actions for fisheries habitats are often conducted through large-scale water and riparian management actions (see the Vegetation – Riparian and Wetland, and Water sections), and water quality in the planning area is expected to improve as effects of surface-disturbing activities on vegetation cover are reduced through implementation of best management practices in riparian areas. Spatial protective stipulations for surface-disturbing activities are currently applied to both riparian and aquatic habitats as well as to reservoirs and ponds to afford a level of protection from human disturbance and development activities.

The introduction of invasive, nonnative species is one of the leading threats to the ecological integrity of forests, grasslands, and waterways. Introduced intentionally or after escaping from cultivation, nonindigenous plants can colonize aquatic communities where they compete with and often displace native species. No nonindigenous invasive

aquatic plants are currently known from the planning area, but a number of species could potentially affect aquatic resources in the planning area (see the Noxious Weeds and Other Invasive Non-Native Species section).

Management challenges for fish and other aquatic species include minimizing impacts to aquatic habitats through the control of plant and animal invasive and non-native species, and protecting and improving habitats by minimizing activities that affect water quality and the hydrologic regime. Impacts specific to aquatic habitats in the planning area include increased road building (often associated with other surface-disturbing activities such as oil and gas exploration and extraction), reservoir construction, intentional and accidental introduction of non-native species, and from activities in the surrounding landscapes that result in increased sediment loads in aquatic habitats.

Potential aquatic habitat restoration/enhancement projects have been identified for streams in the Little Rocky Mountains, fisheries reservoirs, and prairie streams. These projects may include:

- large woody debris placement;
- riparian planting;
- exclosure fencing;
- riparian pastures;
- windmill aeration;
- water quality restoration projects;
- road drainage restoration;
- fish screens on diversion ditches;
- signing;
- erosion control;
- fishing reservoir construction; or
- Off-highway vehicle trail rehabilitation.

Special Status Fish Species

Special status species are plants and animals that require particular management attention due to population or habitat concerns and are either:

- federally listed threatened and endangered species and designated critical habitats;
- federally proposed species and proposed critical habitats;
- federal candidate species;
- delisted species within the 5 years following delisting; or
- Montana BLM sensitive species.

The BLM accomplishes its threatened and endangered species management through coordination with the USFWS and MFWP. The BLM initiates Section 7 consultation with the USFWS before approving or implementing any action that may affect listed species or designated critical habitat. Streamlined consultation procedures detailed in the July 27, 1999 Memorandum of Agreement (MOA) and subsequent implementation guidance for Section 7 consultations are utilized to provide collaborative opportunities in the consultation process. The BLM has entered into an MOA with the USFWS to improve the efficiency and effectiveness of RMP-level Section 7 consultation processes under the ESA. Through this MOA, the BLM agrees to promote the conservation of candidate, proposed, and listed species and to informally and formally consult on listed and proposed species and designated and proposed critical habitat during planning to protect and improve the condition of species and their habitats to a point where their special status is no longer necessary.

Federally listed species can have critical habitat identified as crucial to species viability. For those species that are listed and have not had critical habitat designations identified for them, the BLM cooperates with the USFWS to determine and manage habitats of importance. Protective measures for migratory birds are provided in accordance with the Migratory Bird Treaty Act of 1918 and the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d), enacted in 1940, with amendments. Other fish and wildlife resources are considered under the Fish and Wildlife Coordination Act (1934).

Special status species indicators reflect population levels, distribution, and quantity and quality of preferred and suitable habitat and the prey needed to support them. This includes critical breeding habitat, wintering grounds, and corridors

needed to support migrations and a healthy genetic pool needed for adaptability to future circumstances and conditions. Indicators are detected through allotment evaluations, stream and vegetation monitoring, population surveys, the Natural Heritage Program database, field observations, and USFWS data.

Threatened and Endangered Fish

Two fish species which are listed as threatened and endangered (T&E) under the Endangered Species Act (Table 3.22) are presently known to occur in the planning area but not on BLM lands or are only marginally affected by BLM management.

Table 3.22
Threatened, Endangered, and Candidate Fish Species
In the HiLine Planning Area

Common Name	*Scientific Name*	*Global Rank*	*State Rank*	*Species Status*
Pallid Sturgeon	*Scaphirhynchus albus*	G1	S1	Listed Endangered
Bull Trout	*Salvelinus confluentus*	G3	S2	Listed Threatened

Pallid Sturgeon

The pallid sturgeon was listed by the USFWS as an endangered species in 1990. Its historic range included the Missouri River, the middle and lower reaches of the Mississippi River, and the lower reaches of the Yellowstone, Platte, and Kansas Rivers. The current distribution of the pallid sturgeon in Montana includes the Missouri River between the mouth of the Marias River and Fort Peck Reservoir, the Milk River from the mouth to Vandalia Dam, between Fort Peck Dam and the North Dakota border, and in the 112 kilometers of the Yellowstone River below the mouth of the Powder River. The areas of highest occurrence appear to be in Montana, in the Yellowstone River below the Intake Diversion Dam, and in North Dakota, in the Missouri River from its confluence with the Yellowstone River downstream to the headwaters of Lake Sakakawea. Populations in Montana are comprised entirely of old, large fish, as there is no evidence of successful reproduction in at least 25 years. The Upper Missouri River population is thought to be comprised of only 50 adult fish, and a small number of young hatchery-reared individuals. Five radioed pallid sturgeon that migrated up the Milk River in Valley County in 2011 and stayed for an extended time included a female that had a high probability of being in spawning condition (Fuller, et al. 2012).

Bull Trout

The native bull trout has been determined to be a separate species from the coastal Dolly Varden. Bull trout in the planning area are only found in the Upper Saint Mary and Belly River drainages of Glacier National Park and the Blackfeet Indian Reservation. They are not found in BLM-managed habitat. Their declining trend has led to their designation as a threatened species. Bull trout do not tolerate high sediment levels in their spawning streams. Sediment can suffocate the developing embryos before they hatch.

Montana BLM Sensitive Fish Species

Montana BLM sensitive species occurring in the planning area include nine fish species. Table 3.23 shows the species and their general habitat association.

For most special status species, comprehensive data on population numbers and distribution within the planning area are not available. Occurrence data from the Montana Natural Heritage Program and BLM records identify the presence and location for some special status wildlife species in the planning area; however, these data reflect observations from opportunistic or project-specific surveys, rather than a complete inventory of the planning area.

Table 3.23
Montana BLM Sensitive Fish Species
In the HiLine Planning Area

Common Name	*Scientific Name*	*State of MT Species of Concern/MFWP Tier Level**	*General Habitat*
Northern Redbelly X Finescale Dace	*Phoxinus eos x phoxinus neogaeus*	2	River/Stream
Paddlefish	*Polyodon spathula*	1	River/Stream
Pearl Dace	*Margariscus margarita*	1	River/Stream
Sauger	*Sander canadensis*	1	River/Stream
Sturgeon Chub	*Macrhybopsis gelida*	1	River/Stream
Westslope Cutthroat Trout	*Oncorhynchus clarkii lewisi*	1	River/Stream

Species added to the Montana BLM sensitive species list will have management actions developed to conserve, enhance and protect the species in accordance with applicable BLM guidance.

Montana BLM sensitive species are those species designated by the BLM State Director, usually in cooperation with the state agency responsible for managing the species, and State Natural Heritage Programs. BLM sensitive species are those species that:

- could become endangered in or extirpated from a state, or within a significant portion of its distribution;
- are under status review by the USFWS;
- are undergoing significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution;
- are undergoing significant current or predicted downward trends in population or density such that federal listed, proposed, candidate, or state listed status may become necessary;
- typically have small and widely dispersed populations;
- inhabit ecological refugia or other specialized or unique habitats; or
- are state listed, but which may be better conserved through application of BLM sensitive species status.

Sensitive species fish found in the planning area include the paddlefish, shortnose gar, westslope cutthroat trout, northern redbelly dace x finescale dace hybrid, sturgeon chub, sicklefin chub, pearl dace, blue sucker, and sauger. Most of these species occur primarily in the Missouri River along the southern border of the planning area and in the Milk River system with little or no direct impact from management of BLM lands (exceptions are the pearl dace and the northern redbelly x finescale dace hybrid). The blue sucker has only been found in the Milk River below Vandalia Dam. The westslope cutthroat trout is only found on the Blackfeet Indian Reservation, which is outside of BLM management.

Northern Redbelly x Finescale Dace Hybrid (*Phoxinus eos x P. neogaeus*)

The northern redbelly x finescale dace hybrid (*Phoxinus eos x P. neogaeus*) is a Montana Fish Species of Special Concern, Class C, as well as a BLM sensitive species. It was placed on the list due to its rarity and unusual form of genetic reproduction (gynogenesis). Montana appears to be the only state that designates a special status for this hybrid fish. Further inventory is needed to better delineate *Phoxinus spp*. distribution in Montana. Due to the difficulties of field differentiation, it is likely that some waters thought to contain only the northern redbelly dace may also have the hybrid. The finescale dace may also be present in very small numbers, but no verified specimens exist for Montana. It must have been present at some point after the last period of glaciations in order for the original hybridization to occur. Although its presence would no longer be necessary for gynogenesis to occur, it is possible finescale and northern redbelly used to in the past or currently may overlap with the hybrid but nothing is confirmed.

Northern redbelly dace habitat and populations should be treated the same as those of the northern redbelly x finescale dace hybrid in those streams that have not had records for the hybrid. *Phoxinus spp*. are not extremely common in Montana. Few prairie streams in Montana have the clear pool-type habitat preferred by *Phoxinus spp*. Due to the limited distribution and knowledge of either species, it is important to reduce impacts to their known habitats.

The northern redbelly dace and /or the hybrid are found in 22 streams which cross BLM surface ownership (see Appendix N, Table N.5).

Changes in stream temperature, sedimentation, streamflow, and water quality could impact pearl dace and northern redbelly x finescale dace hybrid species. Management actions should encourage healthy riparian areas, ample streamflow, screened diversion ditches, stable stream channels and banks, reduced erosion, and functional floodplains. Management actions within the Water, Vegetation – Riparian and Wetlands, and Fish sections of this RMP are designed to conserve, enhance and protect habitats for these species.

Pearl Dace

The pearl dace is a native of both the eastern and northern drainages within the glaciated plains ecoregion of Montana, and is an indicator species of the coolwater northern redbelly dace assemblage. Pearl dace are not abundant at the relatively few sites in cool, small streams and ponds that they are known to inhabit, so they are designated a Montana Fish of Special Concern. The pearl dace is found within nine streams that are located within BLM surface ownership (see Appendix N, Table N.5).

Other Species

The spoonhead sculpin and trout-perch are State of Montana species of special concern found in the planning area, but these fish are not BLM sensitive species because they are not found in areas managed by the BLM. The other species are generally found in large rivers outside the jurisdiction of the BLM.

Fluid Minerals

Oil and Gas

Between 1998 and 2012, approximately 270 federal leases consisting of approximately 254,176 acres were nominated and offered for lease in the planning area. As of December 2012, 1,199 existing federal oil and gas leases covered 804,873 acres, or approximately 19% of the federal oil and gas mineral estate in the planning area. Phillips County had the greatest number of federal oil and gas leases (589) and the most acreage leased (473,025 acres). Conversely, Glacier County had the least number of federal leases (27) while Liberty County had the least amount of federal acreage leased (14,225 acres). In the same time period between 1998 and 2012, 1,238 federal leases representing approximately 1,205,638 acres were terminated. A federal lease will terminate if paying production is not established on the leasehold within the specified primary term, or if established production on a lease ceases. A leased parcel that contains at least one well that is capable of production in paying quantities will not expire.

Drilling and Completion Activity

Extraction and production of oil or natural gas from the various hydrocarbon-bearing formations in the planning area follow similar processes. These processes include drilling the production hole, extracting the oil and gas resource, separating any water produced with the hydrocarbon, and in the case of natural gas, separating any liquid hydrocarbon and trucking or piping the product to a sales point and the produced water to a disposal facility.

All extraction processes involve above-ground facilities such as tank batteries, separators, treaters, dehydrators, and storage tanks. The size of the facilities can vary substantially depending on the production rate of the well and other components produced with the hydrocarbon. For example, a low gas/low water-producing well may have only one small dehydration/separation/treater unit. However, a well that produces hydrogen sulfide in conjunction with the hydrocarbon may flow to a centralized plant or plants to remove the water, sulfur, and other waste byproducts.

Appendix E.1, Oil and Gas Operations, contains a complete overview of the exploration, leasing, production and regulation of fluid minerals on BLM surface lands and federal subsurface minerals on split estate lands.

The following description of current and historical drilling is a brief summary of information included in the Reasonable Foreseeable Development (RFD) summary. The complete RFD is available on the internet at http://blm.gov/8qkd. While a lot of the information is dated back a few years, the purpose of presenting it here is to provide some background information that was used to project future activity levels in the planning area.

Early exploration in Montana emphasized finding crude oil reserves. Erdmann (1963) reported that "gas was an incidental, unwanted byproduct with little or no market that seldom brought a price of more than 3 cents per thousand cubic feet at the casing head, if it could be sold at all." Erdmann (1963) indicated that even into the 1960s interest in exploring for gas was less than that for oil due to the tradition of low field prices for this commodity. In more recent years, increases in the value of natural gas have made it a sought after commodity. In 2005, Montana ranked 16th out of the 50 states in the nation in natural gas production (Energy Information Administration 2007).

Historically, a total of 20,170 wells have been drilled in the planning area through March 28, 2007 (IHS Energy Group 2007). About 16% of these wells were drilled on federal minerals. According to the Montana Board of Oil and Gas Conservation (MBOGC) (2007), a total of approximately 8,088 wells within the planning area are still active or producible with 62% of that total classified as gas wells and the remaining 38% classified as oil wells. When all well types are considered (including injection wells, disposal wells, gas storage wells, etc.), 44% of all the wells drilled in the planning area are still in an active status (8,882 wells) while the remaining 56% have been abandoned or are in the process of being abandoned (IHS Energy Group 2007 and MBOGC 2007).

Natural gas production activity over the last land use plan cycle of 1990 through 2006 (BLM 1988 and 1994a) showed this area to be an important natural gas producing area for Montana. Between 1990 and 2006:

- 3,631 wells were drilled; of which 2,767 were gas completions, 204 were oil completions and 660 were dry holes. About 93% of the successfully completed wells were natural gas completions.
- Annual overall gas production rates increased, while oil production rates decreased.
  - In 2006, the planning area produced a total of 56.3 billion cubic feet of natural gas, or 61% of Montana's total natural gas production.
  - Total natural gas production in 2006 was about 41% greater than the production recorded for 1990.
  - The highest total production, almost 56.8 million cubic feet of natural gas, was reported in 2001.
  - Blaine, Hill and Phillips Counties accounted for 81% of the natural gas production in 2006, with Phillips County leading the way.
- Gas production has remained fairly constant since 2001, after increasing in 1999 and 2000.
- In 2005, the planning area accounted for 21 of Montana's top 25 gas producing fields (MBOGC 2006). Of these, the Bowdoin Field is the second largest producing gas field in Montana contributing 14% of the state's total natural gas production.

Oil producing fields in the planning area presently make a smaller contribution to the state's oil production. Following is a summary of oil production within the planning area:

- In 2005, only four fields (Cut Bank-9th, Kevin-Sunburst-13th, Rabbit Hills-35th, and Reagan-42nd) ranked in the top 50 oil producing fields in Montana (MBOGC 2006).
- For 2005, production for the planning area totaled 1.225 million barrels of oil (MBOGC 2006). That year's production was about 50% less than the production recorded for 1991. The reported 1991 production was the highest of the 16-year period and production has declined each year since then.

- Glacier, Toole, Blaine, Valley, and Liberty Counties accounted for almost all of the oil production in the planning area. Glacier County accounted for 37% of the production in the planning area in 2006.

- In 2006, oil production in the planning area contributed only about 4% of Montana's total oil production (MBOGC 2006 and 2007).

- It is unlikely that oil production in the planning area will increase in the future; it will most likely continue to decline.

Vertical, Directional and Horizontal Drilling

To ensure that drilling and completion operations are conducted in a safe and environmentally sound manner, the BLM approves and regulates all drilling and completion operations, and related surface disturbance associated with federal and Indian oil and gas mineral development. Operators must submit Applications for Permit to Drill (APDs) to the agency in accordance to Onshore Order #1. Prior to approving an APD, the BLM identifies all potential subsurface formations that will be penetrated by the wellbore. This includes groundwater aquifers and any zones that would present potential safety or health risks that may need special protection measures during drilling, or that may require specific protective well construction measures. All well casing and cementing operations that occur on federal/Indian lands would be reviewed and approved by BLM and conducted in accordance with the applicable requirements specified in Onshore Oil and Gas Order No. 2 and the American Petroleum Institute (API) standards.

Vertical drilling is the traditional drilling method employed throughout the planning area. Depending on subsurface geology, technological advances in directional and horizontal drilling allow operators to deviate boreholes from a few degrees (directional) to completely horizontal. This allows operators to reach reservoirs that are not located directly beneath the drilling rig, or allows the borehole to contact more of the reservoir. Directional drilling can also be utilized to reduce impacts to vegetation, soil, wildlife habitat (including fragmentation), livestock grazing, and visual and recreational values. Fewer miles of roads and pipelines are necessary and in some cases, facilities such as reserve pits have been shared among multiple wells on a single pad. Directional boreholes may be specifically deviated or allowed to drift updip naturally on the flanks of a geologic structure.

Operators prefer conventional vertical drilling over directional or horizontal drilling because drilling and completion costs for directional and horizontal boreholes are higher than for conventional vertical boreholes, and the risk of losing the borehole due to technical drilling difficulties is also higher.

However, if specific reservoir conditions are deemed suitable and support the use of directional/horizontal practices, directional drilling can allow for greater borehole-to-reservoir contact (increased drainage area) and increased productivity. In this case, the potential for increased productivity may offset the additional drilling costs and risks, making this type of borehole the preferable drilling option. According to Eustis (2003), horizontal or directional drilling:

- increases the ability to intersect many fractures;
- minimizes premature entry of water or gas into the borehole;
- increases the potential drainage area;
- increases the ability to intersect layered reservoirs at high dip angles;
- improves coal gas production;
- increases productivity; and
- improves the injection of water, steam, etc.

While unconventional zones (methane-bearing coal zones, oil or gas bearing shale zones, gas hydrates or "tight gas" in low porosity or low permeability traditional zones), have long been surpassed by the oil and gas industry, recent technological advances in horizontal drilling and hydraulic fracturing described below have allowed development of these formations that were once universally considered as uneconomic.

Horizontal drilling is defined as deviating a wellbore at least 80 degrees from the vertical so that the borehole penetrates a productive formation in a manner parallel to the formation. Most horizontal wells are drilled vertically from the surface to several hundred feet above the productive formation. The wellbore is then drilled in a curve ending with the well going sideways through the productive formation.

Drilling time may be longer for horizontal wells than for a vertical well drilled to the same producing formation due to increased drilling footages. The need for more drilling mud volume may also increase water needs, pit size or the number of holding tanks on site compared to a vertical well in the same producing formation.

Well Testing and Completion

After the well is drilled, testing operations would commence. If testing indicates the presence of an economic level of oil and/or gas, the well would be completed. Typical completion operations would involve setting and cementing the production casing to the total depth of the well. There are also instances where casing is set at the top of the target zone, and the formation is completed in the open hole.

After the proper casings are set, wells are often treated to improve the recovery of hydrocarbons by increasing the rate and volume of hydrocarbons moving from the natural oil and gas reservoir into the wellbore. These processes are known as well-stimulation treatments, and they are designed to create new fluid passageways in the producing formation or remove blockages within existing passageways. They include fracturing, acidizing, and other mechanical and chemical treatments often used in combination. The results from the different treatments are additive and often complement each other, which makes it possible to introduce fluids carrying sand, walnut hulls, or other small particles of material into the newly created crevices to keep the fractures open when the pressure is relieved. This increases the flow rate and volume of reservoir fluids that move from the producing formation into the wellbore.

After completion operations are finished, wellhead equipment consisting of various valves and pressure regulators are installed to control the oil or gas flow to the production facilities and allow safely shutting in the well under any conditions.

Hydraulic Fracturing

The practice of hydraulic fracturing has been utilized by the oil and gas industry since the late 1940s. Within the planning area, hydraulic fracturing, in conjunction with horizontal drilling described above, has allowed for development of unconventional zones that were once considered uneconomical, like the Bakken and Three Forks Formations in the Williston Basin area.

Hydraulic fracturing is a technique used to create additional space and connecting channels for the existing rock pores that are located in deep underground geologic formations. This technique usually requires greater volumes of fluid. The induced space allows the rock to more readily release oil and natural gas so it can flow to the surface via the well bore. The typical steps of hydraulic fracturing can be described as follows:

1. Water, sand and additives are pumped at high pressures down the wellbore.
2. The liquid goes through perforated sections of the wellbore and into the surrounding formation, fracturing the rock and injecting sand or other proppants into the cracks to hold them open.
3. Experts continuously monitor and gauge pressures along with the volume of fluids and proppants, while studying how the sand reacts when it hits the bottom of the wellbore, slowly increasing the density of sand to water as the frac progresses.
4. This process may be repeated multiple times, in “stages” to reach maximum areas of the wellbore. When this is done, the wellbore is temporarily plugged between each stage to maintain the highest water pressure possible and get maximum fracturing results in the rock.
5. Frac plugs are drilled or removed from the wellbore and the well is tested for results.
6. The water pressure is reduced and fluids are returned up the wellbore for disposal or treatment and re-use, leaving the sand in place to prop open the cracks and allow the oil/gas to flow to the well bore.

Hydraulic fracturing generally increases the production rate of any well and provides a conduit to reserves that would otherwise be uneconomical to develop. The fracturing fluid is typically more than 99% water and sand, with small amounts of readily available chemical additives used to carry the proppant and control the chemical and mechanical properties of the water and sand mixture.

Before hydraulic fracturing takes place, all surface casing and some deeper, intermediate zones are required to be cemented from the bottom of the cased hole to the surface in accordance with Onshore Order #2 and API standards. The

cemented well is pressure tested to ensure there are no leaks and a cement bond log is run to ensure the cement has bonded to the casing and the formation.

In addition to federal regulations, the State of Montana, Department of Natural Resource and Conservation, Oil and Gas Conservation Division, Board of Oil and Gas Conservation (MBOGC) regulations also ensure that all resources including groundwater are protected. The MBOGC regulations require new and existing wells which will be stimulated by hydraulic fracturing must demonstrate suitable and safe mechanical configuration for the stimulation treatment proposed. If the operator proposes hydraulic fracturing through production casing or through intermediate casing, the casing must be tested to the maximum anticipated treating pressure. In accordance with MBOGC Rule 36.22.1015 operators are required to disclose and report the amount and type of fluids used in well stimulation to the Board or, if approved by the Board, to the Interstate Oil and Gas Compact Commission/Groundwater Protection Council hydraulic fracturing web site (FracFocus.org).

The MBOGC (2007) reported 91 directional wells in the planning area at the end of 2007: 42 wells each in Blaine and Hill Counties, 3 wells in Glacier County, and 1 well in Toole County. Three Applications for Permit to Drill (APDs) have been filed for wells in Chouteau County. Of these 91 wells, 50 are gas or gas shut-in, 1 is an oil shut-in, 7 are abandoned, 5 are spud and 28 are APDs.

Directional wells have been almost entirely gas wells and the successful productive completion rate is reported as 88%. The high success rate in the planning area is attributed to almost 90% of completed wells being field development wells. The industry prefers to not drill wildcat wells directionally in areas lacking detailed geology and reservoir characteristics, due to inherent and increased risks.

To date, the Eagle Sandstone supports almost all directionally drilled wells. The drilling depths in the Eagle range from 1,200 to 2,800 feet. Nine wells have been drilled in the Sherard field, 21 in the Sawtooth Mountain field and 33 in the Tiger Ridge field.

Horizontal boreholes have not been commonly used in the planning area. Horizontal boreholes appear to have only been used to contact more of the reservoir (increase the drainage area) and to increase productivity. The MBOGC (2007) reported that 36 wells located in the planning area are classified as horizontal wells. These wells are concentrated in Toole (12 wells), Glacier (11 wells), and Blaine (10 wells) Counties. One abandoned well and two spud wells are located in the northeast portion of Valley County. Of these 36 wells, 20 are oil or oil shut-in and temporarily abandoned, 7 are abandoned, 4 are APDs, 2 are spud, 2 are injection wells and 1 is a gas well.

Horizontal wells have been almost entirely oil wells and the successful productive completion rate for these types of boreholes has been 75%. Almost all completed wells have been field development wells. The target formations for these wells have been older and deeper than for the directional wells. Most wells target the Jurassic Ellis Group (11 wells), Mississippian Madison Group (8 wells), and the Devonian Birdbear (Nisku) formation (6 wells). Target drilling depths have been 1,300-6,950 feet, with about 66% in the 2,500-3,500 feet range.

Produced Water

Associated water produced with the oil or gas is disposed of by trucking the water to an authorized disposal pit; placing the water in lined or unlined pits; discharging the water into surface drainages, or through subsurface injection. The disposal of produced water in an injection or disposal well requires permit(s) from the primacy state or EPA. Primacy means that a state or agency has the ultimate responsibility for permitting and monitoring the Underground Injection Control program for Class 2 wells (saltwater disposal and secondary recovery wells). Montana is currently a primacy state candidate; operators in Montana must seek EPA approval until primacy is granted. In some instances, an additional surface management agency authorization may be necessary. The quality of the water often dictates the appropriate disposal method, and the MDEQ has primacy through the EPA to approve surface disposal of this water. An Environmental Assessment is prepared for all requests concerning disposal of produced water from federal wells.

In the planning area, approximately 193.6 million barrels of associated water was produced in the ten-year period from 2003-2012. Of the total 193.6 million barrels of produced water, 156.4 million barrels, or roughly 81%, were produced in Glacier County (61.2 million barrels) and Toole County (95.2 million barrels), primarily from mature oil fields that

employ water flooding operations. The remaining 37.2 million barrels of water were produced from the remaining counties, as follows:

- Blaine County 18,316,470 barrels
- Chouteau County 79,828 barrels
- Hill County 2,955,812 barrels
- Liberty County 7,618,436 barrels
- Phillips County 7,999,896 barrels
- Valley County 165,875 barrels

This water production occurred as a byproduct of natural gas production with the bulk of the water production occurring in Blaine and Valley Counties. (Water Production Data gather from PI/Dwights Production Data, December 2012).

Spent Hydraulic Fracturing Fluids

A small portion of the fracking fluids are initially produced during "flowback" with the remainder of the fluid either remaining in the reservoir rock or produced with the other wellbore fluids (oil, gas, formation water) during the production phase. However, the disposal of the frac fluids would follow a similar process as the produced water (trucking the water to an authorized disposal pit, placing the water in lined or unlined pits; discharging the water into surface drainages, or through subsurface injection). The proper method of disposal is determined based on the constituents of the fluid and surface resources that may need protection.

Coalbed Natural Gas

The extraction of coalbed natural gas (CBNG) combines the issues of high water production with low-pressure gas operations. The reservoir characteristics of coal dictate that high water production rates are initially required to dewater the reservoir and allow the gas to flow from the cleat surfaces within the coal. The gas is primarily trapped on the face of the coal within the cleat system via molecular attraction. In order to liberate the gas molecules from the coal face, the hydrostatic pressure, or head, must be reduced.

A typical CBNG well will initially exhibit high water production rates with little or no gas. At a certain point, the water rate will begin to steadily decline while the gas rate increases until it reaches a maximum gas rate. This simplified explanation of the process indicates that the CBNG production process appears to be backwards when compared to conventional oil and gas production, which starts with high hydrocarbon production rates and low water rates and then advances to low hydrocarbon rates and high water rates.

Generally, CBNG reservoirs occur at depths of less than 5,000 feet and are considered shallow wells by the industry. A typical CBNG well operation consists of a wellhead, insulated well house to cover the wellhead, powerline (buried or overhead), and a subsurface pipeline to transport the gas to a central production facility. The purpose of the powerline is to provide power to the high capacity electrical submersible pumps (ESPs) or progressive cavity (PC) pumps. The pumps are set toward the bottom of the tubing in the well and produce/push water up through the tubing. This allows the gas to flow freely up the well in the annular space between the tubing and the casing – which is also referred to as the backside. Central production facilities typically include gas metering equipment and compressors. Depending on how the operator disposes of the produced water, there could be an additional pipeline to transport the water to the nearest water disposal site, which could be a water treatment facility, water disposal well, water injection well (for secondary recovery operations), or some other water-holding facility (e.g., evaporation pond).

The water disposal sites are commonly co-located with the central production facilities. The quality of the extracted water resource varies, and options for its disposal are highly dependent on its quality, quantity and cost. In some cases, depending on water quality and quantity, water may be allowed to be disposed of in the local drainages. This action would be considered on a case-by-case basis and would need to be approved by both the MDEQ and the BLM.

No CBNG exploration or development has occurred within the planning area; therefore, no CBNG produced water discharge into surface water features including ephemeral channels has occurred. Under all disposal options, operators must obtain all necessary state permits.

Forests and Woodlands

Healthy forests are capable of providing society with the long-term sustainability of forest resources and products. A healthy forest displays resilience to disturbance by maintaining a diverse set of structures, compositions and functions at the stand and landscape levels.

The forests and woodlands of the planning area generally begin at about 2,500 feet in elevation in and around the "breaks" of the Missouri River and extend northerly toward the mountains in "stringers" following the drainages. In the three island mountain ranges (Sweet Grass Hills, Bears Paw Mountains and Little Rocky Mountains) the forests become more prevalent and exist on all aspects upwards to about 7,100 feet in elevation. The coniferous forests in the mountains are comprised of mostly ponderosa pine, Douglas-fir and lodgepole pine with minor amounts of limber pine occurring on the steeper and more exposed, drier slopes. The Sweet Grass Hills support disjunct populations of both whitebark and the more abundant limber pine. The Hills represent the easternmost extension of whitebark pine's range in Montana and are approximately 100 miles from the closest whitebark pine stands to the west (Kendall 1998). The forests of the breaks are considerably more open and almost exclusively ponderosa pine with Douglas-fir limited to the cooler, more moist bottoms and northerly aspects.

Hardwood species such as birch, aspen, cottonwoods and willows exist almost exclusively in areas where there is an abundance of moisture year round such as river bottoms and streams. The hardwood forests are minor by comparison to the coniferous forests, but provide an important component on the landscape for wildlife values.

Table 3.24 summarizes the forest and woodland acres throughout the planning area. The acres shown in the table are subject to change as ground truthing is completed.

Table 3.24
BLM Forests and Woodlands

Location of BLM Forests/Woodlands	*Acres*	*Percentage of Total Acres*
Bears Paw Mountains	840	2%
Breaks and other locations along streams and rivers	6,245	13%
Little Rocky Mountains	30,949	63%
Sweet Grass Hills	6,248	13%
Wilderness Study Areas	4,590	9%
Total for all locations	48,872	100%

Factors Affecting Forest and Woodland Health

Healthy forests and woodlands are biologically and structurally diverse. They are tolerant of fires and other natural disturbances and are dominated by vigorous trees, native grasses, shrubs and forbs. A healthy forest is not void of insects, disease and other causes of mortality, but is able to withstand such infestations as a natural part of the successional cycle.

Healthy forests and woodlands are dependent upon disturbances that help keep the forests from entering a late successional stage known as "climax." Prior to the advent of organized fire suppression our forest and woodlands burned fairly frequently but with very low intensities. These low-intensity fires served the purpose of maintaining our forests in an early successional state that kept them free from diseases and did not allow dead fuels to build up. In addition, these fires also maintained a mix of natural openings and parks within the forests which were critical for wildlife. As the natural cycles of disturbances are altered the forest approaches climax and these natural openings begin closing in with encroachment. A climax forest becomes overstocked and stagnated, and therefore more susceptible to diseases and pathogens as well as being less desirable for wildlife. A forest without cyclic disturbances begins a process of decaying and mortality increases. As mortality increases in all age classes, natural openings are lost to encroachment and these stands become more susceptible to high severity (instead of maintenance) wildfires. These wildfires burn with such intensities that tree loss is nearly 100%, and soil properties are altered such that re-sprouting of desirable grasses, shrubs and forbs does not happen. Oftentimes the burned site becomes infested with non-native and exotic plant species.

Cyclic natural disturbances may not be feasible or tolerated due to land ownership patterns and development over the past 100 years. However, active forest management which mimics natural disturbances is possible. Forest management with goals of restoring and maintaining forest health and natural openings would reduce overstocking, improve vigor and desirable species, improve wildlife habitat, increase desired forest structures, reduce the risk of high severity wildfires, and provide some economic return to local economies.

Forest Products

No active forest management is occurring in the Bitter Creek and Burnt Lodge Wilderness Study Areas and Sweet Grass Hills ACEC since commercial sales are not allowed. Forest product sales in the Bears Paw Mountains are limited, primarily due to lack of access. Commercial activities in the breaks are limited to personal use, special forest products such as: fuelwood, Christmas trees, and post and pole products.

The BLM has an active program of selling personal use, special forest products permits in the Little Rocky Mountains, and in the past 10 years the commercial sales of forest products has increased. Demand for commercial forest products remains high; however, opportunities for the Little Rocky Mountains are limited due to market conditions and transportation costs. The nearest wood products processing facility is located in Columbia Falls, Montana, over 340 miles away.

Forest Treatments

Over the past 10 years, less than 1,000 acres (2%) of forested land in the planning area have been treated. Most of the work has occurred in and around the towns of Zortman and Landusky in the Little Rocky Mountains. Projects there were designed to improve forest health, but had specific objectives of reducing hazardous fuels. Detailed inventories of these treated stands occurred. Using this most recent data, the treated acres averaged approximately 1.7 thousand board feet (MBF) per acre of product removal, along with about one ton per acre of other material (biomass) removed. Based on the data from past projects in the planning area, approximately 83 million board feet (MMBF) along with 50,000 tons of other biomass are available for removal in order to achieve healthy forest objectives. However, not every acre of forested ground is currently available for active management, nor is it foreseeable in the near future. A variety of laws, restrictions, management objectives, etc. play a role in determining feasibility of forest management. If an estimated 20% of the planning area will not receive any kind of treatment in the foreseeable future, approximately 39,100 acres would remain available for some kind of forest health treatment. To meet the goal of treating all available acres on a 100-year rotation cycle (391 acres/year), the probable sale quantity for the planning area would be approximately 664 MBF and 4,000 tons per year of biomass.

Personal use permits for incidental forest product removal such as fuel wood, Christmas trees, and post and poles are projected to continue at the current rate of 100 permits per year.

Geology

Geologic Setting

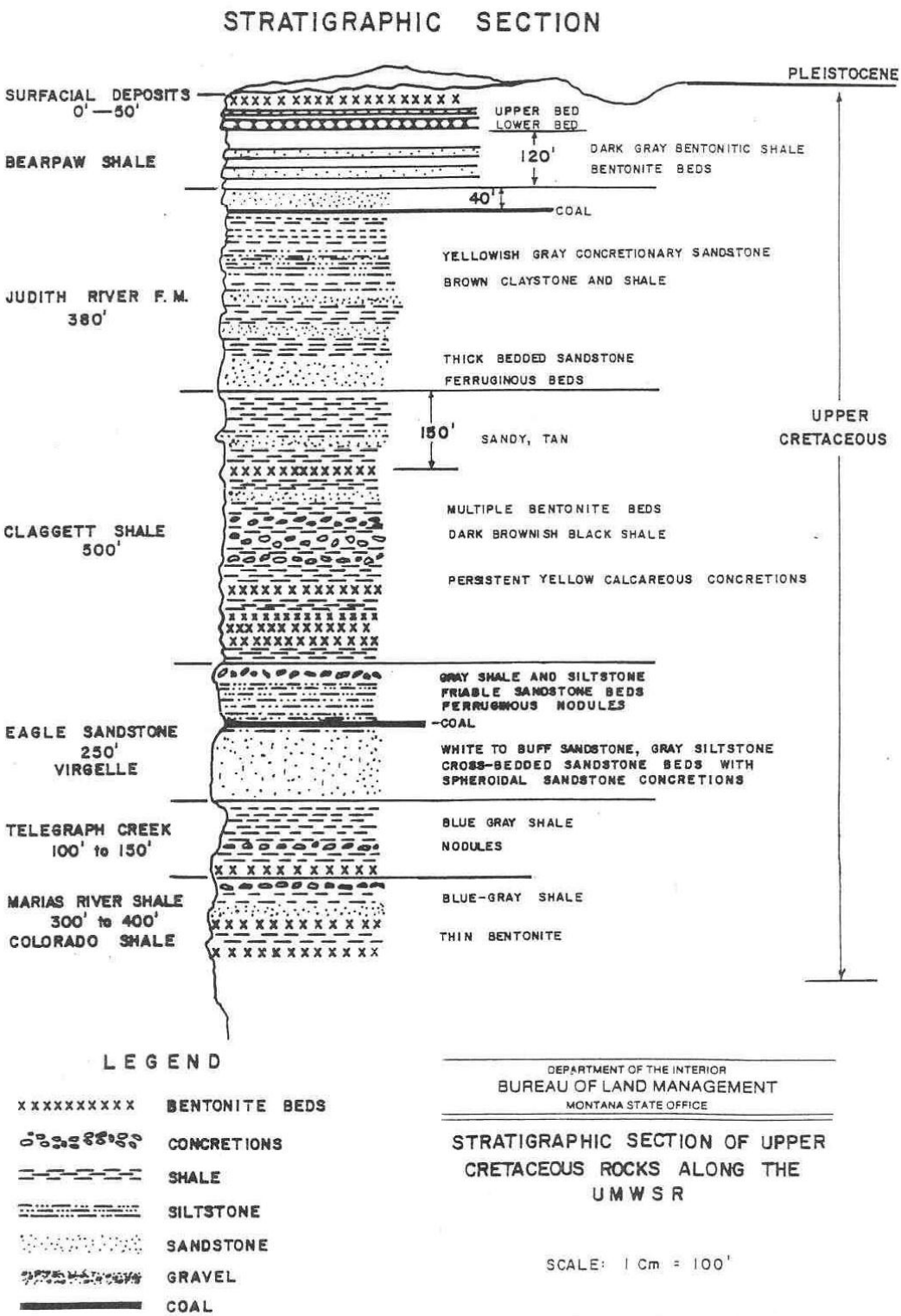
The following discussion offers a brief synopsis of the geologic history of the planning area. The regional stratigraphy is depicted in Figure 3.10.

Paleozoic Era strata, rock types spanning time from approximately 570 to 240 million years ago, range in thickness from 5,000 to 10,000 feet. The distribution of the units that comprise the Paleozoic Era strata is important because most of the oil and natural gas in Montana occurs within them.

Cambrian Period aged sediments consisting of sandstone (Flathead formation) are overlain by shale and limestone. Thickness varies from 1,000 to 1,500 feet across the area.

Ordovician aged rocks formed from deposition of sands, muds (Winnipeg formation), and limey sediments (Big Horn dolomite). Where exposed in the Little Rocky Mountains, rock thicknesses approach 275 feet.

Figure 3.10
HiLine Planning Area Stratigraphic Column



Drilling data indicate that several hundred feet of Silurian strata are present in easternmost Montana in a belt about 100 miles from the Canadian border. These sediments comprise the Interlake formation; a limey and dolomitic rock unit containing commercial deposits of oil.

About 1,000 feet of strata was deposited in middle Devonian time consisting of limestone and dolomite (Jefferson formation), thick deposits of anhydrite (similar to gypsum), and dark shales (Three Forks formation).

The Mississippian Period strata consist of approximately 1,000 feet of Madison group limestone with occasional thick beds of anhydrite. The Madison limestone yields large quantities of oil. In central Montana, narrow channel sands (Tyler formation) in the top of the Big Snowy Group also produce oil.

At the beginning of the Mesozoic Era, 240 to 66 million years ago, a condition developed which widely affected the pattern of sedimentary rocks in Montana. Northcentral Montana was elevated by a broad, gentle tectonic uplift. The horizontal Paleozoic strata were slightly domed or arched upward across a distance of about 300 miles, centering near Havre. This uplift is known as the Paleozoic Sweet Grass Arch.

Toward the middle of Jurassic time another marine sea spread over this portion of the state depositing sandy, shaley and limey sediments of the Ellis Group. Thicknesses range from 200 to 600 feet, being thickest to the east. The bottom bed of the Ellis Group formations consists of very fine sandstone (Sawtooth formation). The middle portion (Rierdon formation) is essentially limestone, and the upper part (Swift formation) is mainly shale with some sandstone. In central Montana, red and gray shale with a 5-10 foot bed of gypsum is present at the base.

The late Cretaceous to early Tertiary time was a period of intense volcanism and mountain building activity in this portion of Montana. The region is broken by centers of intrusive and/or extrusive igneous activity. Such areas include the Bears Paw Mountains, the Little Rocky Mountains, and the Sweet Grass Hills. Along the margins of these uplifts, the exposed stratigraphic section may include units as old as Precambrian in age, up to those deposited just prior to the uplift. With the coming of the Tertiary Period the ancestral Rockies of western Montana were being eroded and the material spread for hundreds of miles over the plains region east of the mountains. The Hell Creek formation of latest Cretaceous age and the Fort Union formation of earliest Tertiary age resulted. Later, during Tertiary time, the old erosion surface of western Montana was uplifted again (Laramide orogeny) to form the second Rockies. Beds of gravel eroded from these mountains and were deposited by rivers and streams onto the plains. These gravels are known as the Flaxville gravels and are considered to be middle to late Tertiary age.

At the beginning of the Quaternary Period, large amounts of snowfall accumulated in Canada. The snow compacted to ice, building to a thickness of perhaps two miles. The weight of the ice caused it to spread southward into Montana, to approximately the present course of the Missouri River. Two major periods of glacial advance into the region occurred during the Pleistocene Epoch. The first, and farthest, advance occurred during the Illinoian stage, and the second during the Wisconsian. The ice blocked many of the north-flowing rivers creating large glacial lakes across central Montana. As the ice melted, its load of soil and rock material was deposited over most of northern Montana, filling preglacial valleys and covering the upland plains with glacial drift or moraine consisting of gravels, sand, and clay; but also characterized by numerous large boulders of igneous rock. With the last retreat of glacial ice from the region about 10,000 years ago, the landscape looked quite different. The Missouri River, which formerly flowed in the current Milk River Valley and drained into Hudson Bay, was pushed south to its present position. Many other lesser streams and rivers either disappeared totally or had their courses radically altered.

In more recent time, erosion has dissected the landscape into its present form. Alluvial material derived from eroding mountains, or from reworked glacial deposits, occurs at several levels above current drainages.

Geologic Hazards

The planning area covers an area of very low probability for seismic hazards (USGS 2008). Other small-scale and localized geologic hazards such as rockfalls and sinkholes do exist in the planning area. However, these are infrequent events and pose minimal threat to public safety.

Geologic Features – Azure Cave

Azure Cave is a limestone solution cavern located near Zortman, Montana, in the Little Rocky Mountains. The cave has national significance because of its bat hibernaculum values. It is one of several hibernaculums in the Pacific Northwest and possibly the northernmost in the United States.

Azure Cave is described in greater detail later in this chapter under Special Designations, Areas of Critical Environmental Concern, Existing ACECs.

The surface geology at the site of the cave is Mississippian limestone of the Mission Canyon or Lodgepole formation. Based on the stratigraphy and structural traps, the area is rated as having a moderate occurrence potential for oil and gas.

The Record of Decision for the Judith-Valley-Phillips RMP (BLM 1994a) designated 142 acres as the Azure Cave ACEC to protect resources and the bat hibernaculum. The designation of the ACEC only applies to BLM lands. The cave is currently being managed to protect bats during crucial hibernation periods and the BLM allows access on a limited basis. Additionally, the BLM continues the withdrawal from mining claim location to protect public recreation values and the bat hibernaculum.

Factors that impact cave resources include vandalism and unauthorized entry, and unauthorized and illegal disposal of solid and/or hazardous waste which may result in degradation of groundwater resources.

Lands and Realty

The lands and realty programs are support programs which respond to the demands of industry and utilities, the public, other government entities, and other BLM disciplines to help ensure that BLM lands and boundaries are managed to provide the greatest possible benefit to the public. The programs are responsible for management of land ownership adjustments, management of land boundaries, land use authorizations, public access, withdrawals, trespass prevention, identification and abatement, and land tenure records system and associated geospatial data. The most active part of the lands and realty program is the authorization of rights-of-way which are issued primarily for roads, utilities, communication sites, and oil and gas facilities.

Table 3.25 shows BLM acres (surface and subsurface) by county. The BLM lands in the westernmost counties of Glacier, Toole, Liberty and Hill consist of mostly scattered surface parcels. The easternmost counties of Blaine, Phillips and Valley contain large blocks of contiguous BLM land as well as many significant parcels of land acquired from private landowners under the Bankhead-Jones Farm Tenant Act (LU lands).

Table 3.25
BLM Surface and Subsurface Acres

County	*BLM Surface*	*BLM Subsurface*
Blaine	299,201	615,688
Chouteau	45,025	174,281
Glacier	1,040	6,184
Hill	14,448	156,967
Liberty	7,543	66,990
Phillips	1,029,362	1,744,612
Toole	27,646	123,203
Valley	1,013,209	1,351,730
Total	2,437,474	4,239,655

Split estate is a land status term which applies when the surface is patented or deeded into non-federal ownership, while the federal government retains the mineral rights. Reverse split estate applies when the federal government transferred both the surface and mineral estate into non-federal ownership, but the surface estate was subsequently returned while the minerals, or a portion of them, were retained by the private landowner.

Four Indian reservations are located within the planning area: Blackfeet, Rocky Boy's, Fort Belknap, and a portion of the Fort Peck Reservation. The BLM has no jurisdiction on tribal lands.

Land Ownership Adjustment

Land ownership (or land tenure) adjustment refers to those actions that result in the disposal of BLM lands and/or the acquisition of non-federal lands or interests.

Disposal of BLM lands usually takes place through exchange or sale. Disposals result in a title transfer, wherein the lands leave the public domain. All disposal actions are coordinated with adjoining landowners, local governments, and current land users. Disposals through sale and use of sale receipts must meet the guidance and specifications provided by the Federal Land Policy and Management Act (FLPMA) (43 CFR 2710).

Land exchange involves trading lands or interests in lands with willing non-federal landowners. Exchanges are discretionary BLM transactions, except for those exchanges that are congressionally mandated or judicially required. The value of the lands to be exchanged must be approximately equal and the lands must be located within the same state. Exchanges must be in the public's interest and in conformance with the applicable land use plan. Land exchange is the BLM's preferred method of land ownership adjustment to bring lands and associated interests with high public resource values into public ownership; consolidate land ownership and mineral estate patterns to achieve more efficient management of resources and BLM programs; and dispose of public land parcels identified through the RMP.

The primary means of land ownership adjustment within the planning area has been through exchange. Since completion of the West HiLine and Judith-Valley-Phillips RMPs, eight land exchanges affecting federal and/or non-federal lands within the planning area have been completed. These exchanges have improved public land ownership patterns by generally disposing of small, isolated tracts of public land with limited resource values while acquiring over 5,900 acres of nonfederal land with higher public resource values that are adjacent to larger blocks of BLM land (LR2000, December 2007). Lands in the planning area have also been used in exchanges mandated by Congress.

Acquisition of land, or interest in land, occurs through exchange, donation, or purchase when the subject land meets acquisition criteria identified in land use planning and manual guidance. The primary funding source for purchases is the Land and Water Conservation Fund (LWCF). Congress appropriates these funds annually based on agency nominations; the BLM tends to nominate acquisitions within special designation areas. Acquisitions are for the full fee interest in title or for partial interests such as road easements or conservation easements. The BLM acquires land and easements from willing sellers.

Recreation and Public Purposes (R&PP) Act: The R&PP Act authorizes the transfer of BLM lands when it serves the public interest. No R&PP patents have been issued in the planning area since the completion of the West HiLine and Judith-Valley-Phillips RMPs.

Other Disposal Authorities: During this same time period, no lands were conveyed for agricultural entries under the Desert Land Act or Carey Act, nor have any lands been conveyed for airport grants, Indian allotments, color-of-title actions, and railroad or state grants.

State Indemnity Selections: Under Ordinances of 1785 and 1850, sections 16 and 36 in each township were set aside for the maintenance of public schools and were known as school sections. A state indemnity or 'in lieu' selection is made by the state to compensate for school sections which it did not receive, either because the section was fractional, claimed prior to statehood, or reserved for some other purpose. Under such circumstances, a state is entitled to a state indemnity selection. As of April 2007, 1,021 acres of state indemnity selection obligations remain throughout the State of Montana.

Land Use Authorizations

Land use authorizations include right-of-way grants under Title V of FLPMA and right-of-way grants and associated temporary use permits under the Mineral Leasing Act of 1920 (MLA), as amended; leases, permits, and easements under Section 302 of FLPMA; and R&PP Act leases.

Land use authorizations are issued for a variety of purposes. Examples of long-term uses include rights-of-way for linear and site facilities. A permit is issued for a short term, up to three years, and allows the temporary use of BLM lands for such things as agricultural purposes, filming, placement of beehives, etc. which involve minimal land improvement or disturbance. Permits can be renewed, but are also revocable. The HiLine District analyzes requests for land use authorizations and applies mitigation measures on a case-by-case basis.

Rights-of-Way: A right-of-way grant authorizes the use of a specific area of BLM land for a specific facility and a specific period of time; however, it grants no authority or possessory interest to the holder. The majority of rights-of-way granted are authorized by FLPMA or MLA. FLPMA rights-of-way authorize the use of BLM land for access to private land, for utility facilities and infrastructure, or for communication facilities. The MLA authorizes rights-of-way for oil and gas facilities not authorized under oil and gas lease.

Exceptions to the need for a right-of-way under FLPMA or MLA include roads and/or facilities authorized by specific statute such as Federal Aid Highways, county roads authorized under Revised Statute (RS) 2477 prior to implementation of FLPMA, and casual use activities that do not cause any appreciable surface disturbance.

RS 2477 provided for the use of unencumbered public lands for public roads; there was no requirement for an executed document authorizing these roads, nor were they required to be officially recorded on the BLM's land use plats. Roads not already verified through administrative or judicial determinations to be RS 2477 roads will continue to be used in the previous manor until their status can be verified. It is a controversial issue that remains unresolved at this time.

The HiLine District administers 722 rights-of-way which encumber nearly 26,150 acres of BLM land (LR2000 Database Report, December 2012). The various types of rights-of-way and total acres for each are shown in Table 3.26. These grants are for a number of different facilities and are held by private individuals as well as various industry and government entities. Oil and gas pipelines, power transmission and distribution lines, roads, and telecommunication lines are the most common types of right-of-way facilities and account for well over half of the total number of grants. Other right-of-way facilities include communication sites, water facilities, railroads, and material sites. Approximately 10 to 15 right-of-way actions are processed annually. In addition, applications are received to amend, assign, renew or relinquish existing right-of-way grants.

Table 3.26
BLM-Administered Rights-of-Way in the HiLine Planning Area

	Havre Field Office		***Glasgow Field Office***		***Malta Field Office***		***Total***	
Type	***No.***	***Acres***	***No.***	***Acres***	***No.***	***Acres***	***No.***	***Acres***
Powerlines	50	1,653	22	1,523	35	1,362	107	4,538
Telecommunication Lines	31	877	9	215	15	905	55	1,997
Roads/Highways	50	1,238	29	1,386	41	1,290	120	3,914
Communication Sites	19	19	2	6	23	98	44	122
Oil/Gas Pipelines and Facilities	63	585	8	251	61	1,873	132	2,709
Oil/Gas Roads	35	162	4	45	14	32	53	239
Material Sites	5	76	5	40	7	74	17	189
Water Facilities	111	2,774	27	621	41	8,253	179	11,649
Railroads	8	212	2	272	5	306	15	791
Total	372	7,596	108	4,359	242	14,194	722	26,148

Source: Lands and Realty Database, LR2000, December 20, 2012.

Communication Sites: These are locations containing authorized communication facilities which may include cellular telephone, microwave, paging, TV translators, mobile radio, or other communication uses. Only facility owners or facility managers are required to have authorizations; tenants or customers need a lease agreement with the facility owner or manager to utilize the site.

The BLM administers 44 communication site rights-of-way at 11 different locations. The location and designated use of each communication site is shown in Table 3.27. The nine commercial sites have management plans, and most sites are occupied by more than one user. The BLM has administrative sites on Antoine Butte, Mount Royal, Rose Hill, and Whitewater (LR2000, December 20, 2012).

Table 3.27
Communication Sites

Communication Site	*Location*	*Designated Use*
Antoine Butte	T. 25 N., R. 24 E., Section 12	Low Power; Broadcast
Harlem	T. 32 N., R. 23 E., Section 6	Low Power; Non-broadcast
Kevin Rim	T. 35 N., R. 18 E., Section 18	Low Power; Non-broadcast
Larb Hills	T. 31 N., R. 33 E., Section 31	Low Power; Non-broadcast
Loring	T. 36 N., R. 29 E., Section 17	Low Power; Broadcast
Mount Royal	T. 36 N., R. 5 E., Section 30	Low Power; Broadcast
Northern Border	T. 33 N., R. 38 E., Section 12	Low Power; Broadcast
Rose Hill	T. 30 N., R. 40 E., Section 18	Low Power; Non-broadcast
Saco Hills	T. 31 N., R. 33 E., Sections 7, 8	Low Power; Broadcast
Sheep Coulee	T. 28 N., R. 8 E., Sections 31, 32	Low Power; Non-broadcast
Whitewater	T. 35 N., R. 32 E., Section 33	Low Power; Non-broadcast

Source: LR2000 database, December 20, 2012.

The BLM has additional administrative communication facilities at non-commercial sites or on other agency land. They are located at Cabin Creek on the Charles M. Russell National Wildlife Refuge, on Centennial Butte on the Rocky Boy's Reservation, and at Opheim.

Several communication sites in the planning area have been amended to allow the Northern Tier Interoperability Consortium to install communications and auxiliary equipment under the umbrella of the Department of Homeland Security. These sites include Antoine Butte, Mount Royal, the Saco Hills, and Whitewater.

Leases, Permits and Easements: The HiLine District administers one Section 302 FLPMA land use permit for agricultural purposes, which involves about 6.8 acres of BLM land.

Nine agricultural Section 302 FLPMA leases for small grain farming are administered in the Lonesome Lake Management Area. The leases are issued for a fixed period of time, can be renewed, but are not revocable. The nine leases comprise 2,129 acres that are currently managed under a Memorandum of Understanding with the Bureau of Reclamation (No. 4-AG-05050).

No BLM-granted easements exist in the planning area. These easements should not be confused with access or conservation easements which are acquired by the BLM from non-federal landowners. An example of a BLM-granted easement would be an instance where private land containing a residence lies adjacent to BLM land that could be used for grazing. The private landowner could apply to the BLM for an easement that would restrict grazing on that land.

Recreation and Public Purposes (R&PP): The Recreation and Public Purposes Act authorizes the leasing of BLM land for recreation or public purposes to state and local governments, or to qualified nonprofit organizations. Applicants for an R&PP lease must have an established or a defined proposed project and submit a detailed plan of development. Five R&PP leases comprising about 52 acres exist within the planning area, including leases to the Malta School District for the location of two elementary rural schools on BLM land, the County of Phillips for the Lewis and Clark Amphitheater, and the Zortman Fire Station for the location of a fire dispatch building on BLM land. A recreational roping arena is located in the Glasgow Field Office. No airport leases are located on BLM land in the planning area.

Table 3.28 depicts BLM leases and permits in the planning area.

Table 3.28
BLM Leases and Permits

	Havre Field Office		*Glasgow Field Office*		*Malta Field Office*		*Total*	
Type	*No.*	*Acres*	*No.*	*Acres*	*No.*	*Acres*	*No.*	*Acres*
Section 302(b) Lease	10	2,136	0	0	0	0	10	2,136
R&PP Lease	0	0	1	40	4	12	5	52

Source: Lands and Realty Database (LR2000), December 31, 2012.

Access

Access refers to the physical ability and legal right of the public, agency personnel, and authorized users to reach BLM lands. The lands and realty programs primarily assist in the acquisition, marking, and documenting of perpetual, exclusive easements to provide for legal access where other programs have identified a need. Public access easements are pursued as opportunities arise and/or when access is critical, are granted in perpetuity, and are usually exclusive, which means the BLM controls use of the road. When the BLM acquires a perpetual, exclusive easement for public road access, any commercial use of the road by industry or utilities requires an approved right-of-way grant from the BLM.

Access to BLM land is an issue of concern for both agency personnel and the public. The fragmented ownership pattern of BLM land intermingled with private and state land complicates the access issue. While progress has been made, the HiLine District still has areas that lack legal access to BLM land. Access acquisition efforts have focused on larger blocks of public lands which are designated for retention in public ownership; areas with important resource values; areas where public demand for access is high; and areas with substantial BLM investments. Access is acquired from willing landowners on a case-by-case basis as opportunities arise.

The acquisition of road easements is the primary means of obtaining legal access to BLM land where none currently exists. Exclusive easements provide public access, while nonexclusive easements are generally for administrative use. The HiLine District currently administers a total of 35 easements, including 28 exclusive and 7 nonexclusive (LR2000, April 2007).

Land exchanges are used on occasion to acquire needed access to BLM land, and the consolidation of BLM land ownership patterns by exchange has generally improved access in the planning area. When disposing of BLM parcels containing roads or trails necessary for access to other BLM lands, the HiLine District protects these access routes by reserving them in the conveyance documents and documenting them in the land tenure records system with associated geospatial data. Easements held by the BLM for public access across state and private land are shown in Table 3.29.

Sandy Retention Reservoir, Southeast Chouteau County Photo by Brian Hockett

Table 3.29
BLM Easements Across State and Private Land

Serial #	*Road Name*	*Legal Description*
M7852	Triple Crossing Access	T26N R34E, sec. 32: W2
M17369	Dry Fork Road	T24N R25E, sec. 23, 26
M17370		T24N R25E, sec. 25, 26
M16930		T24N R26E, sec. 30, 35
M16931		T23N R27E, sec. 3, 4
M17082		T24N R26E, sec. 36
M16456		T24N R26E, sec. 36
M22526		T24N R26E, sec. 28, 29, 32, 33, 34, 35
M83412		T24N R28E, sec. 26, 27
M83413		T24N R28E, sec. 28
		T24N R27E, sec. 36
		T23N R28E, sec. 16
M35069	Square Butte Road	T23N R24E, sec. 36
M35070		T23N R24E, sec. 16
M35079		T23N R24E, sec. 16
M39387	Beaver Branch Road	T27N R39E, sec. 7, 18
M40854		T26N, R37E, sec. 18
M79542		T26N R37E, sec. 16
M58619	Meissner Road	T29N R6E, sec. 24
M60820	Assiniboine Creek Road	T32N R29E, sec. 31
M67003	Big Reservoir Rd	T30N R40E, sec. 16
M74128	Fisher Road	T28N R35E, sec. 18
M77582	Coal Mine Coulee Road	T26N R19E, sec. 34, 35
		T26N R20E, sec. 34
M78475	Central Montana Rail Acquisition	T36N R27E, sec. 17, 18, 19, 29, 30
M78843	Cow Creek Road	T26N R19E, sec. 36
M78918	White Rock Coulee Road	T27N R28E, sec. 16, 17, 20, 36
M83410	Big Sag Road	T25N R31E, sec. 16
M83411	First Creek Road	T25N R30E, sec. 16
M84001	Moffat Bridge	T29N R6E, sec. 17
M93282	Vimy Ridge Road	T25N R9E, sec. 11
M93487		T25N R9E, sec. 11

Source: Lands and Realty Database (LR2000), November 30, 2009.

Facilities

Five administrative sites are physically located within the planning area, but are supported and managed by BLM offices outside the area. The Little Rockies Fire Station and the Zortman administrative site, located east of Zortman, Montana, are managed and supported by the Central Montana District fire program. The Missouri Breaks Interpretive Center and The Fort Benton Visitor Center are located in Fort Benton and are managed by the Upper Missouri River Breaks National Monument. The Eagle Creek repeater is also located within the planning area, but is only used for radio support of and is managed by the Upper Missouri River Breaks National Monument.

The Malta Field Office administrative site and related buildings are managed by the Malta Field Office. Offices located in Glasgow and Havre are leased from private entities. A regular assessment of asset condition is used to manage owned sites and optimize facility leasing versus owning any facilities needed to successfully support the management of the planning area.

The BLM has radio repeater sites at the following locations: Antoine, Mount Royal, Opheim, Whitewater, and Willow Creek.

Bridges and recreation sites exist in the planning area. Bridges may be inspected and maintained on different schedules than the roads, but are managed as transportation-related facilities. Recreation site inspection and maintenance will be done to support the recreation program objectives of the sites.

Withdrawals

A withdrawal is a formal action that sets aside, withholds, or reserves federal lands by administrative order or statute for public purposes. The purpose of a withdrawal is to accomplish one or more of the following:

- segregate (close) federal land from the operation of all or some of the public land laws and/or mineral laws;
- transfer total or partial jurisdiction of federal land between federal agencies; and/or
- dedicate federal land for a specific public purpose.

Withdrawals can be categorized into three major types:

- ***Congressional:*** legislative withdrawals in the form of public laws. Examples include designations for wild and scenic rivers and national parks.

- ***Administrative:*** withdrawals made by the President, Secretary of the Interior, or other officers of the executive branch of the federal government. The Secretary may delegate this withdrawal authority only to individuals in the Office of the Secretary who have been appointed by the President, by and with the advice and consent of the Senate (FLPMA, sec. 204. [43 USC 1714] (a). Examples include recreation sites and public water reserves.

- ***Federal Power Act:*** power project withdrawals established under the Federal Power Act of June 10, 1920. These withdrawals are automatically created upon the filing of an application for hydroelectric power development with the Federal Energy Regulatory Commission.

Table 3.30 summarizes the types of withdrawals and the acres of BLM land withdrawn in the planning area. The BLM also administers withdrawals for several other agencies including the Bureau of Reclamation, U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, and U.S. Department of State/International Boundary.

Table 3.30
Withdrawals (Acres)

Type	*Havre Field Office*	*Glasgow Field Office*	*Malta Field Office*	*Total*
Little Rocky Mountains	NA	NA		3,978
Azure Cave			143	
Camp Creek Campground			40	
Montana Gulch Campground			60	
Landusky Town Site			82	
Landusky Recreation Site			15	
Zortman Town Site			108	
Zortman/Landusky Mine Reclamation			3,530	
Sweet Grass Hills	19,687	NA	NA	19,687
Power Site Reserve/Classification	30,406	NA	NA	30,406
BLM	NA	434	1,061	1,495
Total	50,093	434	5,039	55,566

Source: West HiLine Draft EIS p. 59, JVP Final EIS p. 134, and LR2000 (July 2007).

On October 5, 2000, the BLM withdrew 3,530 acres in the Zortman/Landusky mine reclamation area from location and entry under the Mining Law (i.e., closed to the location of new mining claims) to protect the ongoing reclamation of the Zortman and Landusky Mines located in the Little Rocky Mountains. A five-year extension was granted on October 5, 2005 to continue protection of the reclamation area, and an additional five-year extension was granted effective

October 5, 2010. Approximately 1,200 acres have been disturbed by mine operations and reclamation work, of which about half is on BLM land.

Power Site Reserve and Power Site Classification withdrawals are administrative withdrawals that protect water/power development potential. The withdrawals are located in two general areas along portions of the Marias and Milk Rivers. Generally speaking, these sites are withdrawn from surface disposal only.

All water power and water storage withdrawal reviews in Phillips and Valley Counties are pending site evaluation for water power potential.

The BLM considers requests for new withdrawals and withdrawal revocations, extensions, or modifications on a case-by-case basis. Existing withdrawals are also reviewed on a case-by-case basis prior to the end of the withdrawal period or as otherwise required by law to determine whether they should be extended, revoked, or modified.

Livestock Grazing

The BLM is responsible for administering livestock grazing on BLM lands in the planning area. Livestock grazing can include the grazing of cattle, sheep, horses, goats, and bison. BLM lands are important to local ranch operations, particularly in the eastern half of the planning area (Blaine, Phillips and Valley Counties). In these areas, the majority of ranch operations lease or are permitted to graze on some BLM lands. The BLM lands are almost always intermingled with private and state lands, which are grazed as one unit. Across the planning area only a few allotments contain 100% BLM land. BLM lands maintain the integrity of many ranch operations and support the culture, lifestyle, and livelihood of the grazing lessees. In many cases, if ranchers lost their BLM grazing permit(s)/lease(s), the viability of their ranch operation would be seriously affected, thereby making it extremely difficult for them to stay in the livestock business.

Animal Unit Month (AUM) Allocations

Land in the planning area has been used by ranchers for grazing livestock since the latter part of the 19th century. More sheep were grazed in the early part of the 20th century than in the latter part. Sheep numbers probably reached their peak in the 1950s, but have steadily declined since then.

The HiLine District manages BLM lands for livestock grazing in portions of Blaine, Chouteau, Glacier, Hill, Liberty, Phillips, Toole, and Valley Counties, with the majority of the lands in Blaine, Phillips and Valley Counties. Approximately 2.4 million surface acres of BLM land are available for grazing within 969 allotments (see Appendix G). Grazing allotments typically contain a combination of federal, state, and private lands and range in size from approximately 8 acres to 154,970 acres, with the average allotment size being approximately 3,150 acres. The HiLine District administers 763 grazing authorizations (permits and leases), permitting approximately 386,600 Animal Unit Months (AUMs) of livestock forage. Actual AUM use in the planning area is generally less than authorized AUM use. At present, approximately 28,904 acres of BLM land are closed to grazing. All allotments in the planning area have been assessed for rangeland health standards.

Grazing systems used on BLM lands fall into the following categories: yearlong, season long, and rotational (i.e., deferred rotation, rest rotation, and time-controlled grazing systems). Of the 969 allotments in the planning area, approximately 28% (270) authorize yearlong use, which is a reflection of the intermingled land pattern that exists across the planning area, as well as the small percentage of BLM land found in those allotments. The majority of these ranch operations use pastures containing BLM land throughout the year; however, this does not mean individual pastures containing BLM lands are used 12 months of the year.

Of the 763 grazing permits/leases the vast majority are cattle only; a handful authorize sheep; and 2 authorize bison. The use of horses for ranch operations is common and is authorized on a small percentage of the permits/leases.

Rangeland improvement projects can serve as vegetation management tools or best management practices (BMPs) to control or improve livestock distribution, enhance wildlife habitat, and control noxious/invasive plants. These projects consist primarily of fences, reservoirs, springs, water wells, and vegetative or land treatments. When properly

implemented, rangeland improvement projects assist in maintaining or improving rangeland health and increase forage production. Table 3.31 shows the range improvement projects completed on BLM land between 1992 and 2008, along with the total recorded number, which includes both the 1992-2008 and previously recorded rangeland improvement projects.

Table 3.31
Range Improvement Projects

	Projects Completed 1992-2008		***Total Recorded Number****	
Project Type	***No. of Projects***	***Miles/Acres***	***Total No. of Projects***	***Total Miles/Acres***
Reservoirs	828	NA	5,006	NA
Springs	5	NA	74	NA
Wells	6	NA	88	NA
Pipelines	34	63 Miles	55	109 Miles
Fences	216	413 Miles	1,314	3,963 Miles
Land Treatment	14	1,968 Acres	36	10,990 Acres
Vegetation Treatment	18	5,308 Acres	170	52,518 Acres

Source: Rangeland Improvements Projects System (RIPS), 2008.
* Some of these projects may be within the boundary of the Charles M. Russell National Wildlife Refuge, but were never removed from BLM records. Similarly, some may be within the Upper Missouri River Breaks National Monument.

All allotments in the planning area have been categorized as Improve Existing Resource Conditions (**I**), Maintain Existing Resource Conditions (**M**), or Custodial Management (**C**) to identify areas where management was potentially needed, as well as to prioritize workloads and the use of range improvement dollars. When the allotments were originally categorized, resource conditions in some of the allotments placed in the **I** category were not necessarily in need of improvement. Criteria that were used to place allotments in the **I** category included the following:

- amount of BLM land present in the allotment;
- willingness of permittees/lessees to invest in management;
- opportunities for constructing range improvements;
- existence of grazing-related resource conflicts;
- allotment had moderate to high forage production potential and was producing at low to moderate levels;
- the rancher or the BLM identified opportunities for improvement in range condition;
- range trend was static or downward;
- livestock management could be improved through water distribution;
- seasons of use or other factors;
- opportunities existed for a positive economic return on public investments.

In addition to the above factors, current policy is to categorize allotments as Category **I** where current livestock grazing management or level of use on public land is a significant causal factor in the non-achievement of land health standards. When identifying Category **I** allotments, the BLM will review condition of critical habitat, conflicts with sage-grouse, and whether projects have been proposed specifically for implementing the Healthy Lands Initiative. Allotments where land health standards are met or where livestock grazing on public land is not a significant causal factor for not meeting the standards and current livestock management is in conformance with guidelines would be categorized as Category **M**. Category **C** allotments would be allotments where public lands produce less than 10 percent of the forage in the allotment or are less than 10 percent of the land area.

The BLM has worked to resolve the issues identified in higher priority allotments. Currently, 198 allotments are categorized as **I**, 439 are classified as **M**, and 332 are classified as **C** (Appendix G). The **I** and **M** category allotments contain approximately 2,313,862 acres of BLM land, or 95% of the total acreage in the planning area. In the past, allotments in the **I** category generally received top priority.

Table 3.32 Watershed Plans, Watershed Reports and Implementation Plans Completed	
	Year Completed
Antelope-Brazil Complex Watershed Report	2003
Bears Paw to Missouri River Breaks Grazing Allotments Grazing Guidelines Implementation (Standards for Rangeland Health) and Grazing Permit/Lease Renewals	2005
Beauchamp Watershed Plan	2001
Beaver Creek Watershed Plan	2004
Big Warm Watershed Plan	2007
Cottonwood Watershed Plan	2005
Frenchman Creek Watershed Plan	2006
Larb Creek Watershed Report	2005
Loma/Vimy Ridge Watershed Environmental Assessment and Plan Amendment	2002
Lonesome Lake Management Area Environmental Assessment and Resource Management Plan Amendment	1996
Lower Little Beaver Watershed Monitoring and Standards and Guidelines Report	2006
Lower Little Beaver Watershed Plan	2001
Lower Marias Grazing Allotments Grazing Guidelines Implementation (Standards for Rangeland Health) and Grazing Lease Renewals	2006
Missouri-Lonetree Watershed Plan	1997
Missouri-Lonetree Watershed Plan Review and Update	2004
Missouri-Lonetree Watershed Ten Year Monitoring and Standards and Guidelines Report	2010
Northeast Bears Paw Grazing Allotments Grazing Guidelines Implementation (Standards for Rangeland Health) and Grazing Permit Renewals	2009
Northwest Blaine Grazing Allotments Grazing Guidelines Implementation (Standards for Rangeland Health) and Grazing Lease/Permit Renewals	2006
Porcupine-Buggy Complex Watershed Report	2002
Rock Creek Watershed Report	2004
Telegraph-Fourcette Watershed Plan	2002
Upper Marias, Sweetgrass Hills and Kevin Rim Grazing Allotments Grazing Guidelines Implementation (Standards for Rangeland Health) and Grazing Lease/Permit Renewals	2007
Wayne Creek and Woody Island Grazing Allotments Grazing Guidelines Implementation (Standards for Rangeland Health) and Grazing Lease/Permit Renewals	2007
Whitewater Watershed Plan	2004
Willow North Watershed Monitoring and Standards and Guidelines Report	2005
Willow North Watershed Plan	1999

The federal grazing regulations require the BLM to evaluate rangeland health and manage livestock in accordance with the Standards for Rangeland Health and Guidelines for Livestock Grazing Management for Montana, North Dakota, and South Dakota (BLM 1997a). The five standards (see Appendix H) relate primarily to physical and biological features of the landscape and are intended to be within control of the land manager and achievable by the user. These standards relate to all BLM resource programs, and rangeland health can be positively or adversely impacted by any resource program or resource use.

The standards are used to enhance sustainable livestock grazing and wildlife habitat while protecting watersheds and riparian ecosystems. Current management strives to maintain or improve rangeland health on all grazing allotments; however, the emphasis is on **I** and **M** category allotments and not all allotments in the planning area.

A total of 969 allotments totaling 2,429,979 acres have been evaluated (Appendix G), of which 907 allotments (2,239,760 acres) were found to meet rangeland health standards and 62 allotments (190,219 acres) were found to not be meeting one or more standards. In 35 of the 62 allotments not meeting standards, livestock were determined not to be the primary factor causing degradation of rangeland health. In the remaining 27 allotments not meeting rangeland health standards, past or present livestock uses were determined to be contributing factors. It is important to note that only specific areas (e.g., 15% or less of the allotment) within the 27 allotments were failing to meet at least one rangeland health standard, and in all cases corrective actions have been taken. Through an environmental review process for the 969 allotments, management prescriptions for vegetation and grazing management were identified and implemented in watershed plans, watershed reports and implementation plans. These included construction of range improvements and changes to grazing management. The plans listed in Table 3.32 are located in or partially within the HiLine planning area.

Where livestock grazing has been identified as contributing to an allotment failing rangeland health standards, guidelines or BMPs have been or will be implemented. Monitoring is conducted to determine whether objectives are being met and if further adjustments in management need to be made.

Over the last 40 to 50 years, an improvement in range condition has occurred, due largely to improved grazing management practices, development of range improvement projects (e.g., fences and water developments) and, in some cases, reduction in livestock numbers or change in kind of livestock. To various degrees, improvements in range condition generally are anticipated to continue under all alternatives based on vegetation treatment, range improvement projects, and development of guidelines for those areas determined not to meet rangeland health standards.

Local ranching operations are increasingly being purchased for non-agricultural purposes and often by non-local investors. Although not exclusive, recreational sport hunting tends to be chief among those purposes, while traditional uses and users are often given a lesser priority. This trend is likely to continue and will increase the workload of area resource specialists as they adapt management to these changing paradigms. Rarely are new permittees/lessees familiar with the subtleties of BLM land ranching, and quite often existing activity plans do not fit the needs of new landowners.

The BLM anticipates that continued implementation of Standards for Rangeland Health and site-specific allotment objectives will continue to stabilize and improve range areas.

Noxious Weeds and Other Invasive Non-Native Species

An invasive species as defined in Executive Order 13112 is an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health. Within the planning area, present invasive species consist of primarily exotic plant species. However, other types of organisms such as animals and pathogens are making their way closer to the planning area and could potentially impact activities on BLM lands within the next 20 years. Most of these species are associated with water bodies and have been designated by the state as Aquatic Nuisance Species (ANS).

The State of Montana has developed priority categorization systems for noxious plants and ANS. Both noxious weeds and ANS have been identified as having the potential to cause economic and environmental harm and/or harm to human health.

Noxious Weeds and Invasive Plants

Noxious weed invasion contributes to the loss of rangeland productivity, increased soil erosion, reduced water quantity and quality, reduced species and structural diversity, loss of wildlife habitat, and in some instances, is hazardous to human health and welfare, as emphasized in the federal Noxious Weed Act of 1974 (PL 93-629, as amended by section 15 – Management of Undesirable Plants on federal Lands, 1990). Some weed species pose a significant threat to multiple use management of BLM land.

Noxious and invasive plant species, for the most part, are associated with areas experiencing natural or man-made disturbances. Noxious and invasive plants are mainly found along waterways, roads, recreational destinations, over-utilized rangeland, pipelines, drilling pads, rights-of-way, and livestock/wildlife paths and congregation areas. Data derived from state and BLM-based mapping suggests that approximately 140,000 acres or 8% of BLM land in the planning area is infested or potentially infested by at least one invasive species. This data includes species that do not occur on state or county noxious weed lists, but are known to be invasive. This data does not include any grass species and incomplete information on some species. The species known to occur within the planning area (on private, state, and federal lands) are outlined in Table 3.33.

Table 3.33
Noxious and Invasive Plants
Occurrence in the HiLine Planning Area

Name	***Scientific Name***	***Symbol****	***Status***	***Occurs on Public Land***	***Occurs on Private/ State Land***	***BLM Acre Class****
field brome	*Bromus arvensis*	BRAR5	BLM Invasive	Yes	Yes	High
downey brome (cheatgrass)	*Bromus tectorum*	BRTE	MT Priority 3	Yes	Yes	High
hoary cress (whitetop)	*Cardaria draba*	CADR	MT Priority 2B	Yes	Yes	Trace
musk thistle	*Carduus nutans*	CANU4	BLM Invasive Liberty County Noxious	Yes	Yes	Rare
diffuse knapweed	*Centaurea diffusa*	CEDI3	MT Priority 2B	Yes	Yes	Rare
spotted knapweed	*Centaurea maculosa*	CEST8	MT Priority 2B	Yes	Yes	Mod
Russian knapweed	*Centaurea repens*	ACRE3	MT Priority 2B	Yes	Yes	High
yellow starthistle	*Centaurea solstitialis*	CESO3	MT Priority 1A	No	Yes	None***
oxeye daisy	*Chrysanthemum leucanthemum*	LEVU	MT Priority 2B	No	Yes	None
Canada thistle	*Cirsium arvense*	CIAR4	MT Priority 2B	Yes	Yes	High
poison hemlock	*Conium maculatum*	COMA2	BLM Invasive Chouteau County Noxious	Yes	Yes	Trace
field bindweed	*Convolvulus arvensis*	COAR4	MT Priority 2B	Yes	Yes	High
houndstongue	*Cynoglossum officinale*	CYOF	MT Priority 2B	Yes	Yes	Low

Table 3.33
Noxious and Invasive Plants
Occurrence in the HiLine Planning Area

Name	***Scientific Name***	***Symbol****	***Status***	***Occurs on Public Land***	***Occurs on Private/ State Land***	***BLM Acre Class****
Russian olive	*Elaeagnus angustifolia*	ELAN	BLM Invasive	Yes	Yes	Mod
leafy spurge	*Euphorbia esula*	EUES	MT Priority 2B	Yes	Yes	High
baby's breath	*Gypsophila paniculata*	GYPA	BLM Invasive Blaine County Noxious Chouteau County Noxious Valley County Noxious	Yes	Yes	Trace
orange hawkweed	*Hieracium aurantiacum*	HIAU	MT Priority 2A	No	Yes	None
black henbane	*Hyoscyamus niger*	HYNI	BLM Invasive	Yes	Yes	Trace
perennial pepperweed	*Lepidium latifolium*	LELA2	MT Priority 2A	Yes	Yes	Trace
Dalmatian toadflax	*Linaria dalmatica*	LIDA	MT Priority 2B	Yes	Yes	Rare
yellow toadflax	*Linaria vulgaris*	LIVU2	MT Priority 2B	Yes	Yes	Low
purple loosestrife	*Lythrum salicaria*	LYSA2	MT Priority 1B	No	Yes	None***
scentless chamomile	*Matricaria perforata*	MAPE2	BLM Invasive Chouteau County Noxious	No	Yes	None
Scotch thistle	*Onopordum acanthium*	ONAC	BLM Invasive	Yes	Yes	Low
curlyleaf pondweed	*Potamogeton crispus*	POCR3	MT Priority 1B	No	Yes	None
sulfur cinquefoil	*Potentilla recta*	PORE5	MT Priority 2B	No	Yes	Low
perennial sowthistle	*Sonchus arvensis*	SOAR2	BLM Invasive Liberty County Noxious	Yes	Yes	Low
Salt cedar	*Tamarix spp.*	TARA	MT Priority 2B	Yes	Yes	Low
common tansy	*Tanacetum vulgare*	TAVU	MT Priority 2B	No	Yes	None

Source: All species on Montana's Noxious Weed List also appear on BLM's Invasive Plant List. This table was constructed using data from the County Weed Districts, The Invaders Database System, The USDA PLANTS Database, and the Malta, Glasgow, and Havre BLM Offices.

* Symbol Taken from USDA's Plants Database

** BLM Class Values: None = 0 acres; RARE = <1 acre; Trace = 1 to 5 acres; Low = 5 to 50 acres; Mod = 50 to 500 acres; High = > 500 acres

*** Species was identified and eradicated in the recent past.

The invasive species management program continually changes as a result of new introductions, additional inventory and the ongoing implementation of management projects. The BLM uses a full range of integrated pest management in the planning area. The basic management of noxious and invasive plants consists of:

- early detection and rapid response (newly invading species);
- containment and management (widespread weed infestations);
- inventory, monitoring and evaluation; and
- internal and external awareness, education and outreach.

The control methods used to control noxious weeds include:

- chemical – application of herbicides
- physical – includes both mechanical and manual removal methods
- biological – both Classical and Non-Classical
  - Classical Biological control is the use of natural enemies from a target plant's native range and is usually a species of herbivorous insect/arthropod or a plant pathogen.
  - Non-Classical Biological Control is the use of targeted grazing to affect plant populations. The goal of Non-Classical Biological Control is not livestock production, although in some instances that can be a secondary benefit.
- cultural – includes revegetation and changes in land use practices (timing, duration, forage harvest, etc.)

Aquatic Nuisance Species (ANS) and Other Invasive Species

The current ANS list includes some plant species that are also listed as noxious. Table 3.34 shows the species of concern. Other than a few plant species, the planning area is currently free of ANS. However, suitable habitat for many of these species is present and if introduced, these species could impact BLM lands and their management.

Long-term monitoring indicates invasive species are generally spreading 10-25% annually on BLM land. This range is variable because trend data reflects the increased resources over time in locating invasive species rather than new increases in overall infested areas due to dispersion.

The annual expansion of invasive species will most likely continue at current rates as a whole. Uncommon species in the planning area should be static or declining in abundance due to coordinated emphasis on eradication and containment. Designated prevention areas and education activities at the state and local levels have been implemented for noxious weeds and other non-native invasive species. If effective, the spread of invasive species could be reduced by public land users who have been presented with the prevention message and apply that knowledge to their activities.

Widespread species will account for most of the expansion, even though mitigation is in place for most surface-disturbing activities. Widespread infestations must be prioritized for management due to limited resources, thus the absence of active management in these situations and the abundance of these species account for most of the annual spread. Increases in energy development or recreation would most likely increase the probability of spread because of the associated surface disturbance and/or the mobility of vehicles entering from infested areas.

Montana Aquatic Nuisance Species Priority Classes

Priority Class 1 species are currently not known to be present in Montana but have a high potential to invade, and there are limited or no known management strategies for these species. Appropriate management for this class includes prevention of introductions and eradication of pioneering populations.

Priority Class 2 species are present and established in Montana, have the potential to spread in Montana, and there are limited or no known management strategies for these species. These species can be managed through actions that involve mitigation of impact, control of population size, and prevention of dispersal to other waterbodies.

Priority Class 3 species are not known to be established in Montana, have a high potential for invasion, and appropriate management techniques are available. Appropriate management for this class includes prevention of introductions and eradication of pioneering populations.

Priority Class 4 species are present and have the potential to spread in Montana, but there are management strategies available for these species. These species can be managed through actions that involve mitigation of impact, control of population size, and prevention of dispersal to other waterbodies.

Factors that impact invasive species include natural and anthropogenic pathways and disturbance mechanisms. Their ability to spread is not always associated with their proximity to established infestations. Natural processes that contribute to the spread of invasive species include fire, flooding, ice scouring in streams, drought, wind, and wildlife. Construction activities (roads, wells, and pipelines), recreation, and agricultural uses also contribute to the spread of invasive species. These challenges require coordination across all of the BLM's resource programs to develop, integrate, and implement aggressive management techniques and strategies for controlling adverse impacts and the spread of invasive species in the planning area. Management actions anticipated to address the challenges presented by invasive species and pest control are incorporated in the alternatives in Chapter 2.

Table 3.34
Aquatic Nuisance Species

Common Name	***Scientific Name***	***Priority Class***	***Occurs In or In Proximity to Planning Area (Yes/No)***
Crustaceans			
spiny waterflea	*Bythotrephes cederstroemi*	Class 1	Unknown
rusty crayfish	*Orconectes rusticus*	Class 1	Unknown
Fish			
northern snakehead	*Channa argus*	Federal Injurious Wildlife Species	No
Eurasian ruffe	*Gymnocephalus cernuus*	Class 1	No
Asian carp	*Includes: Hypophthalmichthys nobilis, Mylopharyngodon piceus, Ctenoparyngodon idella, Hypophthalmichthys molitrix*	Class 1	No
round goby	*Neogobius melanostomus*	Class 1	No
zander	*Sander lucioperca*	Class 1	No
tench	*Tinca tinca*	Class 1	No
Mammals			
nutria	*Myocastor coypus*	Class 1	No
Mollusks			
zebra mussel	*Dreissena polymorpha*	Class 1	No
New Zealand mudsnail	*Potamopyrgus antipodarum*	Class 2	No
Parasites/Pathogens			
heterosporosis		Class 1	No
IHN virus		Class 1	No
Asian tapeworm	*Bothriocephalus acheilognathi*	Class 3	Unknown
whirling disease	*Myxobolus cerebralis*	Class 2	No
Plants			
flowering rush	*Butomus umbellatus*	Class 4	Unknown
egeria	*Egeria densa*	Class 1	No
hydrilla	*Hydrilla verticillata*	Class 1	No
yellow flag iris	*Iris pseudacorus*	Class 4	Unknown
purple loosestrife	*Lythrum salicaria*	Class 4	Yes
Eurasian watermilfoil	*Myriophyllum spicatum*	Class 3	No
curley pondweed	*Potamogeton crispus*	Class 4	Yes
salt cedar/tamarisk	*Tamarix spp.*	Class 4	Yes

Source: ANS, 2002.

Off-Highway Vehicle Use and Travel and Transportation Management

Off-Highway Vehicle Use

Off-highway vehicle (OHV) use in the planning area primarily consists of riding ATVs, motorcycles, and full-sized trucks and vehicles for pleasure. Participation in these recreational activities varies by season, topography, and vegetative cover. The BLM roads, primitive roads and trails in the planning area provide many opportunities for OHV use that vary from back country to concentrated use areas.

The HiLine District currently manages 124 acres of open, 2,429,930 acres of limited to existing roads, primitive roads and trails, and 7,419 acres of closed designations. The open areas described below have also been designated as intensive use areas, which are generally defined as BLM lands with no restrictions on which OHVs can be driven and where no compelling resource protection needs, conflicts of use, or public safety issues exist to warrant limiting cross-country travel. OHV use throughout the planning area is currently managed in accordance with the 2003 Record of Decision for the OHV EIS (BLM 2003c). This Record of Decision limits motorized travel to existing roads, primitive roads and trails unless designated otherwise in a Land Use Plan. This Record of Decision also prohibits motorized wheeled cross-country travel for big game retrieval but authorizes motorized wheeled cross-country travel to a campsite within 300 feet of roads and trails. Campsite selection must be completed by nonmotorized means and accessed by the most direct route causing the least damage. Any changes to these regulations for a planning area must also be accomplished through the NEPA process.

The following areas and acreages represent current OHV management decisions by OHV category:

Open

- Fresno OHV Area (84 acres) – open to cross-country motorized use and designated as an intensive use area. This area is located 20 miles north of Havre, near Fresno Reservoir. It contains approximately 84 acres of extremely variable terrain including steep hills suited for ATV and motorcycle hill climbing enthusiasts. Use occurs primarily during the spring and summer months, with peak use in the summer.

- Glasgow OHV Area (40 acres) – open to cross-country motorized use and designated as an intensive use area. This high priority travel management planning area is a 40-acre site immediately north of Glasgow which has been used primarily as an area for ATV and motorcycle use. Use occurs primarily during the spring and summer months, with peak use in the summer.

Limited

- Bitter Creek WSA (60,701 acres) – limited to identified primitive routes
- Burnt Lodge WSA (13,727 acres) – limited to identified primitive routes
- Remaining BLM land (2,355,502 acres) – limited to existing roads, primitive roads, and trails

Closed

- Sweet Grass Hills ACEC (7,429 acres) – closed to motorized travel

Overall, a small percentage of the total recreational OHV use in the planning area occurs cross-country, suggesting a low frequency of motorized, wheeled cross-country travel, with most occurring during the fall hunting season. However, even under a low frequency rate this type of travel causes problems.

Increased OHV use has become a significant issue within the planning area because of the potential resource degradation that can result from high levels of use. General estimates of OHV use can be assumed by reviewing the estimates prepared for Montana public lands as part of the Off-Highway Vehicle EIS and Proposed Plan Amendment for Montana, North Dakota, and Portions of South Dakota (BLM 2001b). This report estimated that the number of trucks used in off-

highway applications increased 12% between 1990 and 1998 (BLM 2001b, Table 3.6). ATVs and motorcycles were considered a separate group in this report, and their use increased by 61% from 1990 to 1998.

Demand for access to BLM land is expected to increase. If private landowners discontinue allowing access to their lands for hunting or other recreational purposes, the demand for access will also increase for other private landowners who do allow access. This is due to a number of factors, including public awareness, increased tourism, and increased restrictions by private landowners (e.g., closed roads, changes in ownership). The public is becoming more aware of the public land recreation opportunities existing in the planning area. In addition, visitation is expected to increase as the result of federal, state, and local agency marketing efforts to increase tourism. With an increase in nonlocal users, demand for commercially guided activities (such as hunting, fishing, and sightseeing) will increase. However, demand is expected to increase much faster than the BLM's ability to acquire new access.

Previous recreational use estimates indicated that the projected number of OHVs for Montana by 2005 could be 24,597 for ATVs and motorcycles and 33,727 for trucks. By 2015, it is projected that the number of ATVs and motorcycles will increase to 36,249, and the number of trucks will increase to 36,797 in Montana (BLM 2001b, Table 3.7). The data suggest that OHV use is one of the fastest growing activities in the State of Montana. With the registration of OHVs increasing on an annual basis, it is expected that OHV use will continue to increase on all BLM land throughout Montana.

Travel and Transportation Management

Transportation system roads provide physical access to BLM, state, private and other federal lands throughout the planning area. Demands for transportation are directly related to the resources found on BLM land. A transportation system provides access for commercial activities (e.g., livestock grazing, timber harvest, mineral development, outfitting and guiding); non-commercial activities and casual use (e.g., OHV use, hunting, fishing, camping, etc.); and for administrative access to manage resources.

BLM roads are currently classified by three different types: collector, local, or resource roads. Collector roads normally provide primary access to large blocks of land, and connect with or are extensions of a public road system. Local roads normally serve a smaller area than collectors and connect to collectors or a public road system. Resource roads are spur roads that provide point access and connect to local, collector, or other roads. Below are the new standardized terms and their descriptions (BLM Technical Note 422). However, the current policy of road classification will remain in place until implementation of travel management planning following the signing of the Record of Decision for this RMP.

- ***Road:*** A linear route declared a road by the owner, managed for use by low-clearance vehicles having four or more wheels, and maintained for regular and continuous use.
- ***Primitive Road:*** A linear route managed for four-wheel drive or high-clearance vehicles. Primitive roads do not normally meet any BLM road design standard.
- ***Trail:*** A linear route managed for human-powered, stock, or off-highway vehicle forms of transportation or for historical values. Trails are not generally managed for use by four-wheel drive or high-clearance vehicles.

The transportation system includes state, county and BLM roads. Various government entities and individuals acquire rights-of-way from the BLM for those portions of the transportation system roads that cross BLM land. Issuing a right-of-way is based on access needs and resource considerations.

Road Maintenance

Transportation system roads are currently classified by maintenance intensities. The intensities range from 0 (minimum maintenance) to level 5 (the highest level of maintenance).

The BLM road maintenance terminology also changed according to Technical Note 422. This policy changes maintenance levels to maintenance intensities. Maintenance intensities provide for the appropriate intensity, frequency, and type of maintenance necessary to keep the roads in acceptable condition. Maintenance intensities provide a range of

objectives and standards, from identification for removal through frequent and intensive maintenance. Maintenance intensities range from Level 0 to Level 5; however, the current policy of road maintenance will remain in place until implementation of travel management planning following the signing of the Record of Decision for this RMP.

Roads with the highest public use receive routine maintenance. Using native-surfaced roads during the wet season may contribute to irreparable road and resource damage. Concerns about public safety and the potential for resource and road damage may cause road closures during inclement weather. Each BLM road will have a maintenance intensity associated with it; however, this will be deferred to travel management planning.

State and county system roads are usually constructed and maintained to higher standards than BLM roads and provide access to and through BLM lands. These roads are not maintained by the BLM.

The inventory and management database for linear features, dams, buildings, and recreation and administrative sites is the Facility Asset Management System (FAMS).

Cattle guards, bridges and culverts on the road system are constructed and maintained using available funds. Bridges and major culverts are monitored and maintained as part of the transportation and facilities program and recorded in FAMS.

Roads in the planning area provide access for recreationists, ranchers, resource specialists, and administrators. The planning area has approximately 30,143 miles of currently mapped routes, of which 3,908 miles are on BLM land. Most of the roads are of native surface (dirt, gravel, or sand).

The BLM has compiled the best available GIS data to estimate current miles and locations of roads, primitive roads and trails throughout the planning area to facilitate planning decisions and analysis. However, the planning area has never completed formal transportation planning to determine which roads will be included in a formal transportation system. The HiLine District will complete an inventory of all BLM roads in an effort to depict a baseline road system. Identification of the travel management areas will be included in the RMP, but comprehensive travel management planning will be deferred until implementation following the signing of the Record of Decision for this RMP.

Paleontological Resources

Paleontological resources include any fossilized remains, traces, or imprints of organisms, preserved in or on the earth's crust, that are of paleontological interest and that provide information about the history of life on earth (16 U.S.C. 470aaa Sec. 6301(4)). Fossils are found where erosion has exposed the fossil-bearing strata. Most paleontological formations in the planning area, except in the Little Rocky Mountains, date from the Late Cretaceous Period; however, also present are Early Cretaceous Period units such as the Colorado shale. The earliest unit is the Judith River formation, which is highly fossiliferous and contains quantities of dinosaur, crocodilian, amphibian, fish, turtle, marine reptile, bird, invertebrate, plant, and trace fossils. Occasionally, small mammal remains are found. A later unit is the Bearpaw shale, which contains marine reptiles, fish, rare terrestrial dinosaurs, and invertebrate fossils. The latest and most productive deposit is the Hell Creek formation which contains abundant fossils of terrestrial dinosaurs, including those of Tyrannosaurus rex. These formations are exposed along the Missouri River valley and on the surface in the southern part of the planning area where glacial till is absent as well as in areas covered with glacial till, such as coulees. Paleozoic invertebrate fossils can be found in all of the planning area mountain ranges. Exposures of the Hell Creek formation along the Missouri River are found in southern Phillips and Valley Counties.

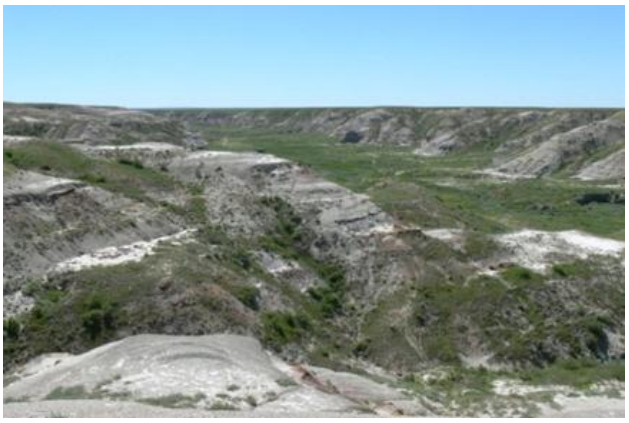
Paleontological Localities

As of March 2007, 621 paleontological locations have been documented in the planning area (Hanna 2007). Of the documented 621 locations, 409 (66%) are vertebrate fossil localities and 212 (34%) are nonvertebrate localities (Hanna 2007). Table 3.35 shows paleontological site distribution by county and includes all ownerships.

Table 3.35
Paleontological Site Distribution

County	*Number of Sites*	*Percentage*
Blaine	39	6.3%
Chouteau	7	1.1%
Glacier	4	<1%
Hill	417	67.1%
Liberty	32	5.1%
Phillips	43	6.9%
Toole	39	6.3%
Valley	40	6.4%

Source: Hanna, 2007



Paleontological Locality Photo by Craig Miller

The majority of the paleontological sites occur in Hill County (67.1%). It should be noted that while Phillips County does not have the same level of site density as Hill County, Phillips County has been the location of several nationally and internationally significant paleontological finds (e.g., Leonardo, the mummified dinosaur). Further, Phillips County has more significant paleontological sites on public land. The majority of the paleontological sites in the planning area are located on private surface ownership.

Paleontological Classifications

Occurrences of paleontological resources are closely related to the geologic units that contain them, and the potential for finding important paleontological resources can be broadly predicted by the presence of the pertinent geologic units at or near the surface. Therefore, geologic mapping can be used as a proxy for assessing the potential occurrence of important paleontological resources. The Potential Fossil Yield Classification (PFYC) system adopted by the BLM in 2008 uses geologic units as base data. The PFYC system provides a uniform tool to assess potential occurrences of paleontological resources and evaluate possible impacts.

Under the PFYC system, geologic units are classified based on the relative abundance of vertebrate fossils or uncommon invertebrate or plant fossils and their sensitivity to adverse impacts, with a higher class number indicating a higher potential. This classification is best applied at the geologic formation or member level. It is not intended to be an assessment of whether important fossils are known to occur occasionally in these units (i.e. a few important fossils or localities widely scattered throughout a formation does not necessarily indicate a higher class), nor is it intended to be applied to specific sites or areas. The classification system is intended to provide baseline guidance to assessing and mitigating impacts to paleontological resources. In many situations, the classification should be an intermediate step in the analysis, and should be used to assess additional mitigation needs. The PFYC classes are defined in detail below:

Class 1: Units unlikely to contain recognizable fossil remains. This includes units that are igneous or metamorphic in origin (but excludes tuffs), as well as units that are Precambrian in age or older. Management concern for paleontological resources in *Class 1* units is negligible or not applicable. No assessment or mitigation is needed except in very rare circumstances. The occurrence of significant fossils in *Class 1* units is non-existent or extremely rare.

Class 2: Sedimentary geologic units that are not likely to contain vertebrate fossils or scientifically significant nonvertebrate fossils. This includes units in which vertebrate or significant nonvertebrate fossils are unknown or very rare, units that are younger than 10,000 years before present, units that are Aeolian in origin, and units which exhibit significant physical changes in rock (i.e. compaction, cementation, mineral replacement). The potential for impacting vertebrate fossils or uncommon invertebrate or plant fossils is low. Management concern for paleontological resources is low, and management actions are not likely to be needed. Localities containing important resources may exist, but would be rare and would not influence the classification.

Class 3: Fossiliferous sedimentary geologic units where fossil content varies in significance, abundance, and predictable occurrence; or sedimentary units of unknown fossil potential. These units are often marine in origin with sporadic known occurrences of vertebrate fossils. Vertebrate fossils and uncommon nonvertebrate fossils are known to occur inconsistently and predictability is known to be low. Two subsets to *Class 3* units are described below:

Class 3a includes a broad range of potential impacts. Geologic units of unknown potential, as well as units of moderate or infrequent fossil occurrence are included. Assessment and mitigation efforts also include a broad range of options. Surface-disturbing activities will require sufficient assessment to determine whether significant fossil resources occur in the area of a proposed action, and whether the action could affect the paleontological resources.

Class 3b includes units that are poorly studied and/or poorly documented, so that the potential yield cannot be assigned without ground reconnaissance. Management concern for paleontological resources in these units is moderate, or cannot be determined from existing data. Surface-disturbing activities may require field assessment to determine a further course of action.

Class 4: Geologic units containing a high occurrence of significant fossils. Vertebrate fossils or scientifically significant nonvertebrate or plant fossils are known to occur and have been documented, but may vary in occurrence and predictability. Surface-disturbing activities may adversely affect paleontological resources in many cases.

Class 5: Highly fossiliferous geologic units that regularly and predictably produce vertebrate fossils or scientifically significant nonvertebrate or plant fossils, and that are at risk of human-caused adverse impacts or natural degradation.

Table 3.36 and Figure 3.11 show the acres and areas for each geologic class described above.

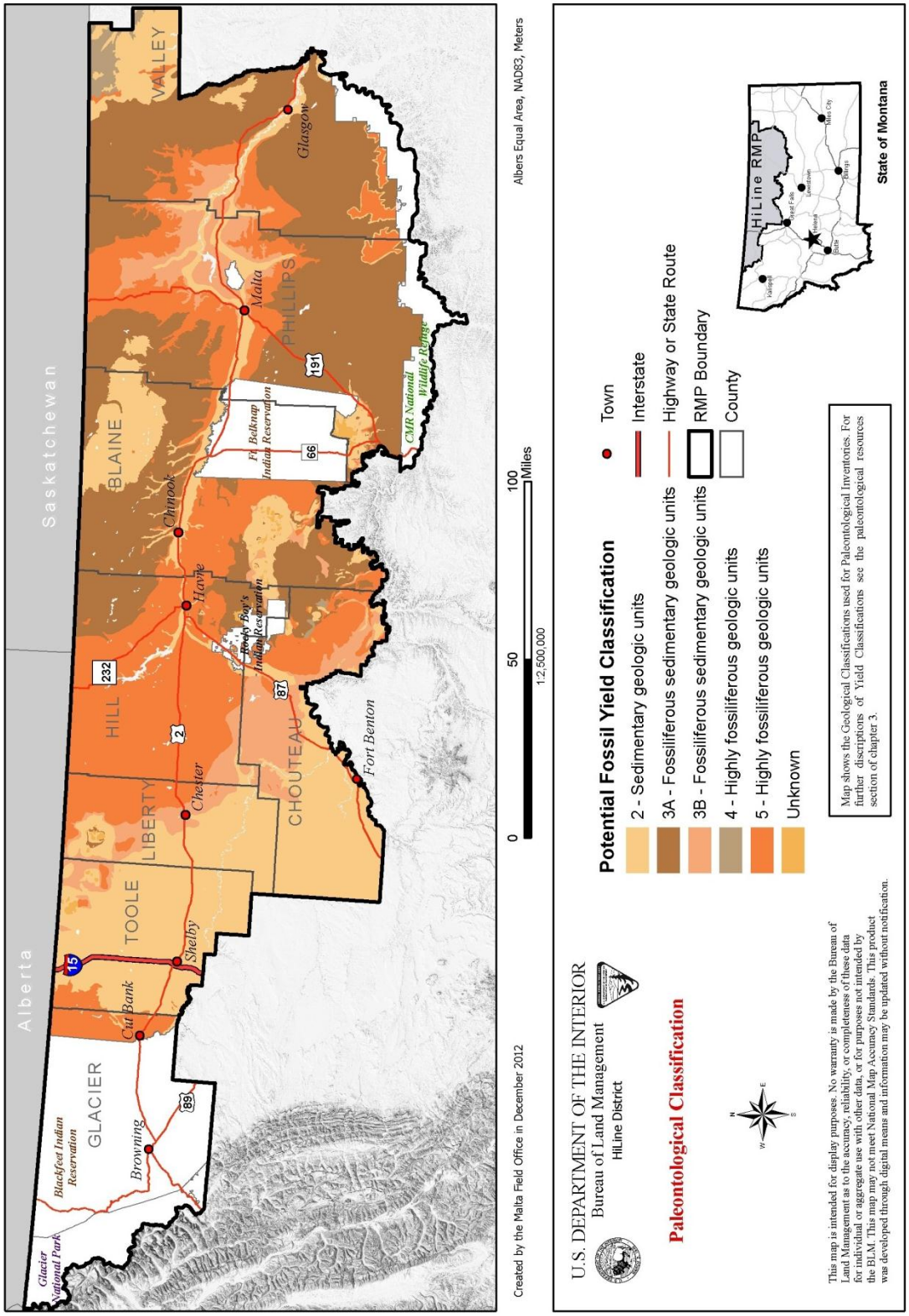
Table 3.36
BLM Surface Ownership by Geologic Class
(Acres)

Geologic Class	***Paleontological Potential***	***BLM Surface Only***	***Percentage of Total BLM Land in the Planning Area***
2	Low	123,958	5%
2	Moderate	42,666	25%
3a	Moderate	1,340,385	55%
3b	Moderate	103,255	4%
4	High	716	<1%
5	High	371,554	15%

Based on the table above, the majority of BLM surface acres fall within geologic *Class 3* and *Class 5*. Projects proposed in *Class 4* and *Class 5* geologic units with the potential to impact significant resources will be subject to paleontological inventory. Projects proposed in *Class 3* geologic units may also be subject to paleontological inventory depending upon the topography in the project area.

Professional paleontologists conducting research or assessment and mitigation are regulated through the permit process. The BLM issues, on average, one or two permits a year specifically for the planning area. Approximately 18 statewide research permits allow surface collecting/reconnaissance and include the planning area. The BLM also issues approximately ten consulting permits annually in Montana. These are statewide permits which include the planning area.

Figure 3.11
Paleontological Classifications



Recreational fossil collecting of common invertebrates, plants and petrified wood is allowed on most BLM land; however, some locations/areas may be closed to casual collection. Amateur fossil collectors and hobbyists may collect reasonable amounts of common invertebrate and plant fossils on public lands. The number of people involved in this activity is unknown. The HiLine District processes approximately six inquiries a year regarding fossil and/or rock collecting. Further interest in fossil collection is demonstrated by the existence of privately owned paleontological guiding businesses that provide recreationists the opportunity to excavate fossil remains on private land. In addition, hikers, mountain bikers, and other outdoor enthusiasts sometimes accidentally discover fossil remains. Some of these discoveries are passed on to the appropriate agencies, but some are not. Many important paleontological discoveries have been and will continue to be made by amateur or accidental paleontologists, but the number of such discoveries is also unknown.

Fossil theft and vandalism is an issue within the planning area. Public interest in fossils and the commercial value of fossils have increased significantly in recent years. As public interest increases, the monetary value of fossils also rises; federal land management agencies (including the BLM) are under increasing pressure to both protect scientifically significant fossil resources and to ensure their appropriate availability to the general public. Escalating commercial values of fossils also means that increasingly, fossils on federal lands are subject to theft and vandalism. These crimes reduce scientific and public access to scientifically significant and instructive fossils and destroy the contextual information critical for interpreting the fossils. As described in Title 43 CFR Subparts 8365.1-5 and 8360.0-7, willful disturbance, removal and destruction of scientific resources or natural objects on federal lands is illegal and there are penalties for such violations. Often, the most pronounced damage is the loss of the context and other significant scientific data, the worth of which is difficult to evaluate in monetary terms. With the passage of the Paleontological Resources Preservation Act in 2009 (16 U.S.C. 470aaa et seq.), paleontological theft has penalties under federal law.

Public Safety

Abandoned Mine Lands

The Abandoned Mine Lands (AML) program is tasked with identifying and mitigating physical and environmental hazards on lands affected by mining practices. Typical hazardous material issues within the planning area are associated with past mining activities, illegal dumping, and accidental material releases from transport vehicles.

Not all AML sites include conditions that are hazardous to humans or the environment. However, the physical hazards that may be encountered at AML sites include basic trip-and-fall hazards from debris, obscure mine shafts, dilapidated mine buildings and equipment, harmful chemicals or contaminated soils, unused explosives, and open mine adits with oxygen-depleted or toxic environments. The potential for injuries and deaths from these hazards increases with the growth of the western population and recreational use of public lands. Therefore, sites easily accessed by the public are given first priority for implementation of mitigation or closure measures.

Hazardous conditions at AML sites can include both on-site and off-site impacts. Mine wastes on AML sites may affect or preclude the growth of vegetation and give rise to fugitive dust with hazardous heavy metal constituents when disturbed. Water quality issues may come from the direct flow of water laden with heavy metals out of mine adits, or leaching from mined materials contributing undesirable heavy metal constituents to nearby stream and river subbasins. The heap leach process uses cyanide to remove gold or other desirable metals from mined materials. Heavy metal constituents can adversely affect many aquatic species and also may adversely affect avian and mammalian species around such mine sites and drainages via direct and indirect routes of intake. The metals associated with mining activities in the planning area are primarily gold, silver, lead, zinc, copper, and arsenic.

Zortman/Landusky Mine

The abandoned Zortman/Landusky Mines in the Little Rocky Mountains consists of two mine sites. The mines are near the towns of Zortman and Landusky and are located on a mixture of patented mining claims (private lands) and BLM lands. Pegasus Gold Corporation and Zortman Mining, Inc. operated the mines from 1979 through 1998, when the operator filed for bankruptcy protection and proceeded with closure of the mines.

An Environmental Impact Statement was jointly prepared with MDEQ to review and analyze reclamation plans for the site, and a Record of Decision, issued in May 2002, selected a final mine reclamation plan (BLM and MDEQ 2002). The reclamation was estimated to cost more than the funding available from reclamation bonds posted by the company; however, with supplemental funding from the BLM and the State of Montana, the reclamation earthwork was completed in May 2005, but a funding shortfall remained for future water treatment.

Upon conclusion of the bankruptcy process, the BLM invoked its CERCLA authority in June 2004 when the BLM issued an Action Memorandum for Zortman and Landusky Mines Time-Critical Removal (BLM 2004c) in order to continue water treatment in the absence of a mine operator. The BLM is the lead federal agency for conducting removal actions at the site under its CERCLA authority.

An Engineering Evaluation and Cost Analysis (EE/CA) (BLM 2006d) and accompanying action memorandum (BLM 2006e) were completed in September 2006. The purpose of the EE/CA was to reassess the existing and anticipated water quality site conditions, evaluate the performance of the current removal actions, and to assess the costs and amounts of funding available to continue or where needed, improve the water collection and treatment practices. The EE/CA was the next step in continuing removal actions needed to protect public health, welfare, or the environment. It addressed the management of Operable Units OU1, OU2, and OU3 which treat mine drainage, treat leach pad waters, and reclaim reactive mine waste units, respectively. The EE/CA includes an assessment of the potential human and ecological harm from the water currently being released from the site, or that would be released if any of the capture or treatment systems, or reclaimed waste units, were modified. The present capture and treatment systems are optimal and no large-scale changes in water treatment technology are warranted. The CERCLA site continues to be monitored for reclamation and remediation success.

One issue of relatively recent concern is contamination from some iron-rich seeps that occur in Swift Gulch, north of the Landusky Mine. The water quality from these seeps has declined since the mine closure in 1998. Ongoing water treatment facility construction and analysis within the gulch is the current focus of the DEQ's technical working group with representation from the BLM and the Fort Belknap tribes.

On October 5, 2000, the BLM withdrew 3,505 acres in the Zortman/Landusky mine reclamation area from location and entry under the Mining Law to facilitate reclamation of the mines, including long-term water treatment. A five-year extension of the withdrawal was granted on October 5, 2005, and a second extension was granted effective October 5, 2010.

Hazard Class Dams

The BLM has a designated Safety of Dams Coordinator to ensure hazard rated dams are properly managed. Condition assessments are performed as required by the latest version of the BLM 9177 (Dam Safety) Manual and associated handbooks. Emergency Action Plans that provide for public safety have been completed and are updated annually. The Emergency Action Plans are available for public review in the Montana State Office, the BLM field office in which each dam is located, and in county emergency services offices.

The planning area has 134 hazard rated dams, which means they have a minimum 25 foot hydraulic height or impound 50 acre-feet or more. This total includes 131 dams rated low hazard, of which 82 are in the Glasgow Field Office, 14 are in the Havre Field Office, and 35 are in the Malta Field Office. Three dams are rated as high hazard: Anita Reservoir in Blaine County, BR-12 Reservoir in Blaine County, and PR-19 Reservoir in Phillips County.

Hazardous Materials

To protect human health and the environment and comply with applicable laws and regulations, the BLM Hazard Management and Resource Restoration Program has the following objectives:

1. Identify and control imminent hazards or threats to human health and the environment from hazardous substance releases on public lands.
2. Promote working partnerships with states, counties, communities, other federal agencies, and the private sector to prevent pollution and minimize hazardous waste on public lands.

3. Provide hazardous materials management training to BLM employees and educate public land users concerning laws, rules, and standards.
4. Require potentially responsible parties to undertake response actions and to pay their fair share or face cost recovery.
5. Encourage public collaboration in environmental decision making.
6. Inventory, assess, and manage the cleanup of hazardous substance release sites on public lands that present a potential risk to human health and the environment and promote healthy ecosystems.
7. Ensure that solid and hazardous waste treatment, storage, and disposal facilities that might affect public lands are properly located, designed, and constructed, consistent with the law.
8. Reduce hazardous waste produced by BLM activities and from authorized uses of public lands through waste minimization programs that include recycling, reuse, substitution, and other innovative, safe, and cost-effective methods to prevent pollution.
9. Ensure that authorized activities on public lands comply with applicable federal, state, and local laws, regulations, policies, guidance, and procedures.
10. Ensure appropriate review of authorized activities and application of effective management controls to correct weaknesses.

As the demand for oil and gas increases, so does the potential for hazardous materials spills from well drilling and development, pipelines, compressor stations, service vehicles, and other associated activities. Like many industries, oil and gas operators use specific chemicals in their drilling, recovery, and manufacturing processes including hydraulic fracturing. Although industrial operations are regulated to minimize any potential spills, accidents will likely never be completely eliminated. Concerns related to the use of chemicals have been topics of conversation in regard to oil and gas development based upon potential human health and environmental health impacts. The Hazard Management and Resource Restoration Program will continue to manage and respond to foreseeable hazards on BLM-administered lands, emphasizing protection of public health, safety, and the environment; waste minimization; and compliance with all laws, policies, and regulations.

Hazardous materials management also involves the prevention of illegal hazardous material actions on BLM lands; the regulation, authorization and proper use of legal hazardous materials on BLM lands; and timely, safe responses to hazardous materials incidents on BLM lands.

Some dumping occurs on BLM lands in the planning area. Much of the activity is intentional, small quantity waste dumping which may include hazardous substances, household waste, petroleum products, solid waste, and agricultural materials. Dumping may occur anywhere on BLM lands, but is generally concentrated around recreation areas and along roadways. These dumping incidents may not fit the specific category of hazardous waste dumping, but the dumped materials are usually screened for hazardous components, then all of the materials are removed and disposed of properly. Instances of significant or hazardous dumping in the planning area are fairly limited, which is attributed to the relatively low population density around the BLM lands.

BLM Law Enforcement Rangers have responded to a number of vehicular accidents that involved the accidental release of hazardous materials or petroleum products from transport vehicles. The hazardous materials management program may become involved with a particular response action or cleanup when the release affects BLM lands.

In recent years, the BLM has responded to a number of dumped methamphetamine lab or related drug wastes. Methamphetamine drug lab wastes frequently include highly toxic chemicals, flammable materials, and potentially explosive materials which present a direct health and safety hazard to individuals who may inadvertently come across them and also present a hazard to wildlife. Discarded drug paraphernalia is also a concern due to potential skin puncture/disease transmission hazards.

Hazardous materials may legitimately be brought onto BLM lands for weed control or resource development. The types of hazardous materials used for weed and insect control include pesticides (herbicides and insecticides). The general types of hazardous materials that may be used include petroleum products (fuels and lubricants), solvents, surfactants, paints, explosives, batteries, acids, gases and antifreeze.

Recreation

The most popular outdoor recreation activities statewide for Montana residents are (in decreasing order) walking, wildlife watching, hiking, biking, swimming, picnicking, nature photography, fishing, motorcycling, hunting, camping, golfing, horseback riding, and boating (MFWP 2003). Most recreation users participate in dispersed recreation activities, either individually or in small groups. While Montana resident and non-resident recreationists generally participate in the same outdoor activities, the top non-resident recreational activities are wildlife watching, day hiking, and picnicking.

Large tracts of BLM land in the planning area provide a wide variety of seasonal recreation opportunities for both residents and non-residents. Hunting dominates the scene in the fall, with snowmobiling, cross-country skiing, and ice fishing occurring during the winter. Springtime activities include fishing, sightseeing, and photography. Camping, picnicking, driving for pleasure, sightseeing, fishing, hiking, boating, dispersed OHV use, and varmint hunting dominate recreation during the summer months. OHV use is an important consideration at many of the recreation sites. Overall, BLM land supports some type of recreational activity during all times of the year with the heaviest use occurring during fall hunting seasons.

The Camp Creek and Montana Gulch campgrounds in the Little Rocky Mountains are the only two fee recreation sites in the planning area. Several smaller developed recreation sites are distributed throughout the area that attract non-resident tourists and provide recreation for local residents as well. Many fishery reservoirs offer trout and/or bass while some reservoirs have northern pike. Winter months provide opportunities for ice fishing. Access to most recreation facilities and areas is by the primary transportation corridors, including U.S. Highways 2 and 191, and various state highways.

To a limited extent, BLM lands provide access to the Milk and Missouri rivers where fishermen can catch catfish, walleye, sauger, sturgeon, paddlefish, pike and bass, and hunters can hunt deer, elk, pronghorn, waterfowl, and upland game birds. However, most of the Milk River shoreline is privately owned which limits access, especially for hunting. MFWP provides some marked fishing access sites where legal streamside access is available along the river.

Montana's population in the western and southcentral counties is increasing, while most of the eastern and northern counties lost population during the 1990s. These unequal changes have caused increased demand for recreation facilities in high growth areas and decreased ability to pay for existing facilities in areas that have lost residents. Further, Montana residents are aging and wages are low, so accessibility and affordability are becoming important facets of outdoor recreation planning. As the population ages, there is likely to be less demand for strenuous outdoor recreation activities and more demand for activities like walking, golfing, fishing, and motorized recreation.

Tourism is an important component of Montana's economy, and it creates a significant demand for outdoor recreation facilities. State and regional tourism marketing efforts are directed at attracting higher value, lower impact non-resident visitors to maximize tourism revenues while minimizing the impact of tourism on Montanans. Since demand for both motorized and nonmotorized recreation access will likely continue to increase, facilities will be needed to address this demand effectively while simultaneously managing Montana's natural and cultural assets in a sustainable manner (MFWP 2003).

Montana Gulch Campground Photo by Kathy Tribby

Although visitor use information is lacking or incomplete for some areas, BLM lands in the planning area received a minimum of 54,000 recreation visits in 2012. The major recreation activity categories in the area, in order of approximate total use percentage, are shown in Table 3.37.

Table 3.37
Major Recreation Activities in the HiLine Planning Area

Activity	*Percentage of Total Use*
Hunting	42%
Sightseeing, picnicking, watching wildlife	16%
Fishing	13%
Driving for pleasure	11%
Camping	9%
Hiking, horseback riding, bicycling	3%
Winter sports	1%
Off-road vehicle activities	3%
Snowmobiling	1%
Water sports	1%

Source: BLM Recreation Management Information System (RMIS), 2012.

Recreation Management Areas

BLM lands are classified into one of three Recreation Management Area categories, as follows:

Special Recreation Management Areas

Special Recreation Management Areas (SRMAs) have recreational values with development potential and need more intensive recreation management because outdoor recreation is a high priority, thus requiring a greater recreation investment. Major investments in facilities within Special Recreation Management Areas can be excluded where the BLM's strategy is to target demonstrated, undeveloped, recreation-tourism market demand. Here, recreation management actions are geared toward meeting primary recreation-tourism market demands to sustain distinctive recreation setting characteristics. However, major investments in visitor services can be authorized both to sustain those distinctive setting characteristics and to maintain visitor freedom to choose where to go and what to do; all in response to demonstrated demand for undeveloped recreation.

The planning area presently has five Special Recreation Management Areas (North Missouri Breaks, Sweet Grass Hills, South Phillips, Little Rocky Mountains, and South Valley) as shown in the Recreation section of Chapter 2 and on Map 2.9.

Extensive Recreation Management Areas

Extensive Recreation Management Areas (ERMAs) also have recreational values with development potential but require less intensive recreation management than Special Recreation Management Areas. Management of these areas focuses on supporting and sustaining the principal recreation activities and the associated qualities and conditions of the area, but these activities are commensurate with management of other resources and resource uses. Recreational uses that are not compatible with other resources may be restricted or constrained to achieve the interdisciplinary objectives of the area.

The planning area presently has three Extensive Recreation Management Areas (Havre, Phillips and Valley) as shown in the Recreation section of Chapter 2 and on Map 2.9.

Public Lands Not Designated as Recreation Management Areas

Any BLM lands not designated as a Special Recreation Management area or an Extensive Recreation Management Area are Lands Not Designated as Recreation Management Areas (LND). This category applies to most of the BLM lands that are managed for traditional dispersed recreational use with little or no facility development.

Special Recreation Permits

The Code of Federal Regulations (CFR) is the legal authority that allows the BLM to manage the permit program under Section 43 CFR Parts 2930, et al. "Commercial use" is defined as the recreational use of the public lands for business or financial gain. When any permittee, employee, or agent of a permittee, operator or participant makes or attempts to make a profit, salary, increase his business or financial standing, or supports in any part, other programs or activities from amounts received from or for services rendered to customers or participants in the permitted activity, as a result of having the SRP, the use will be considered commercial.

Under the authority of the Federal Lands Recreation Enhancement Act (FLREA) the BLM utilizes the Special Recreation Permit (SRP) system to satisfy recreation demand within allowable use levels in an equitable, safe and enjoyable manner while minimizing resource impacts and user conflicts. Fees for SRPs are intended to recover at least part of the cost of issuing and administering the permit plus provide a fair return to the government for the opportunity to make a profit while using BLM-administered public lands.

BLM Managers have discretion over whether to issue a Special Recreation Permit. Decisions are based on the following factors to the extent that they are relevant:

a) Conformance with laws and land use plans,
b) Public safety,
c) Conflicts with other uses,
d) Resource protection,
e) The public interest served,
f) Whether in the past the applicant complied with the terms of a permit or other authorization from the BLM and other agencies, and
g) Such other information that BLM finds appropriate.

The BLM issues SRPs for specific recreational uses of BLM land and related waters. The permits are a means to manage visitor use, protect natural and cultural resources, and serve as a mechanism to accommodate commercial recreational uses. Four types of use require permits: commercial, competitive, organized groups/events, and individual or group use in special areas. Most SRPs within the planning area are issued for commercial outfitting and guiding to hunt big game, but occasionally SRPs are issued for photography, wildlife viewing, horseback trips, fishing and organized group events.

The HiLine District currently administers approximately 14 ongoing commercial SRPs for outfitted upland game bird and big game hunting as well as fishing. Outfitting and guiding is one of the uses permitted by the BLM to help satisfy public demand for recreational use of BLM land. Some outfitters and guides are ranchers or farmers who provide recreation services as a means of economic diversification. Others operate seasonal businesses as outfitters and employ some local residents as guides. These seasonal businesses, operating primarily between September and December, are permitted to lead a variety of activities, including bird, upland bird, waterfowl, prairie dog, deer, elk, and pronghorn hunting. A few permitted outfitters also provide visitors an opportunity for horseback riding and other backcountry recreation activities. In recent years, there has been an increase in applications for short-term or one-year SRPs to hold special events or organized group events on BLM land. Special events include activities such as organized trail rides and bow target shoots. Organized group SRPs are mainly related to eco-tourism activities such as bird-watching tours, guided bus tours, and guided nature hikes. These activities normally take place during the spring and summer months.

Renewable Energy Resources

Renewable energy includes biomass, geothermal, solar power, and wind. As demand has increased for clean and viable energy to power the nation, consideration of renewable energy sources available on BLM lands has come to the forefront of land management planning. In cooperation with the National Renewable Energy Laboratory (NREL), the BLM assessed renewable energy resources on BLM, Bureau of Indian Affairs, and U.S. Forest Service lands in the western United States (BLM and DOE 2003).

Developing renewable energy projects depends on market trends and market value. The demand for renewable energy is illustrated by development projects throughout the west on public and private lands. The importance of renewable energy sources increases as nonrenewable energy prices increase and as the need grows for more and cleaner energy sources.

The BLM has received inquiries from several individuals and companies regarding renewable energy projects. The primary limiting factors in site selection include access to power transmission interconnects, acquisition of permits, and power purchase agreements between the producer and owner of the powerlines.

Biomass

Biomass technology creates energy from plants and plant-derived materials. The BLM/NREL study (BLM and DOE 2003) did not identify the planning area as one of the top 25 BLM potential areas for biomass resources. To date, no proposal has been submitted to the BLM for developing biomass energy resources on BLM lands in the planning area.

Geothermal Resources

Geothermal energy is energy that comes from heat stored within the earth. The energy is generated within the earth's core, about 4,000 miles below the surface, and is created by the radioactive decay of minerals, a process that occurs in all rocks. In certain states, Nevada is a good example, the BLM administers geothermal leases that involve public land. Geothermal resources found on federal mineral estate are considered leasable minerals. As such, the same laws and regulations governing other leasable minerals cover exploration and development of geothermal resources. Use of low temperature geothermal resources is most common in warm-water heating systems in homes and businesses. Although not yet widespread, low temperature geothermal use is increasing as prices for other types of energy increase. Due to a variety of geologic processes, shallow geothermal resources underlie substantial portions of many western states, including lands in the planning area. However, there is presently a low level of interest in developing Montana's federally administered geothermal resources.

Geothermal resources are rated by temperature:

- low temperature – less than 194°F.
- moderate temperature – 194-302°F.
- high temperature – greater than 302°F.

The State of Montana has more than 50 geothermal areas and at least 15 high temperature sites. High temperature areas in western Montana are located near Helena, Bozeman, Ennis, Butte, Boulder and White Sulphur Springs. Seven locations have surface temperatures above 149°F. and 20 locations have surface temperatures above 110°F. The estimated deep reservoir temperatures for some Montana sites are over 350°F.

Four principal Montana geothermal sites are located in the planning area at Landusky, Lodgepole, Mountain View, and Sleeping Buffalo.

The Little Rocky Mountains area contains considerable warm water (average 75°F.) derived from the Madison Group at surface or shallow depths. Drilling in the surrounding area may increase the available flow to 100,000-250,000 L/min (Sonderegger and Bergantino 1981). The waters at the Lodgepole spring are warm enough for significant direct heating (86°F.), but no current commercial development of the resource is occurring. The springs at Landusky have a temperature of 69°F. and a flow rate of 628 gpm.

The Mountain View geothermal site, a well located in western Toole County, has a temperature of 114.5°F. The depth and flow information are unavailable for this site.

The Sleeping Buffalo "springs" were discovered by a 1928 oil well which intersected pressurized hot water and gas. This well was cased and left in place, and the 108°F. water (with gas) flowed to the surface at 700 gallons per minute. A large resort complex was built around the well in the 1930s and became a popular destination resort. A new well,

"Legion Health Plunge 2A," was drilled in 1958 to a depth of 3,200 feet. This well (API 25071-06384) is completed in Mission Canyon Limestone.

Solar Power

Solar energy on BLM land was studied in a six-state area (Arizona, California, Colorado, Nevada, New Mexico, and Utah). The BLM and U.S. Department of Energy released a Final Programmatic EIS for the six-state area in July 2012 (BLM and DOE 2012), and the BLM issued a Record of Decision amending land use plans in those six states in October 2012. The study includes BLM lands with solar insolation levels greater than 6.5 kWh/m2/day and slopes of less than 5%. Solar insolation levels in the planning area range from about 4.13 kWh/m2/day to 5.02 kWh/m2/day.

Solar Insolation

Insolation is a measure of solar radiation energy received on a given surface area in a given time. It is commonly expressed as average irradiance in watts per square meter (W/m^2) or kilowatt-hours per square meter per day ($kWh/m^2/day$).

Concentrating Solar Power

Concentrating Solar Power (CSP) technology uses sunlight concentrated on a single point to generate power. The BLM/NREL study (BLM and DOE 2003) indicates that the potential for this type of renewable energy lies primarily in states to the south and southwest of Montana. No BLM lands within the planning area were identified as having potential for this type of energy source. To date, no proposal has been submitted to the BLM for developing CSP facilities on BLM lands in the planning area.

Photovoltaics

Photovoltaic (PV) technology makes use of semiconductors in PV panels (modules) to convert sunlight directly into electricity. The BLM/NREL study (BLM and DOE 2003) did not identify the planning area as one of the top 25 potential areas for PV potential. To date, no proposal has been submitted to the BLM for developing PV facilities on BLM lands in the planning area.

Wind

The BLM/NREL study (BLM and DOE 2003) did not identify the planning area as one of the top 25 potential areas for wind energy potential; however, due to the increasing interest in wind energy potential in the west and the associated applications for wind energy on BLM lands, the BLM prepared a Final Programmatic EIS on Wind-Energy Development on BLM-Administered Lands (BLM 2005). The Programmatic EIS categorized BLM lands into areas having low, moderate, or high potential for wind energy development from 2005 through 2025 on the basis of their wind power classification. Wind power classes range from 1 (lowest) to 7 (highest). Wind resources in Class 3 and higher could be developed economically with current technology over the next 20 years.

The seven wind power classes are further grouped into three distinct levels: high, moderate and low potential for wind power resources (Table 3.38 and Appendix O). Included in the low potential are the poor and marginal wind power classes; the fair wind power class is included in the moderate potential; and good, excellent, outstanding and superb are grouped within the high potential category. The percent of high potential acres managed by the BLM is 6% of the entire planning area (366,000 acres); 22% of moderate potential is managed by the BLM (1,841,000 acres); and 16% of low potential is managed by the BLM (235,000 acres).

The Western Renewable Energy Zones – Phase 1 Report identified two qualified resource areas (QRAs) in the planning area (WGA and DOE 2009). Qualified resource areas represent those lands with the greatest energy density within a contiguous area. The QRAs are located in the western and central part of the planning area (Appendix O). One of the QRAs (MT_NW) includes the Sweet Grass Hills and Kevin Rim ACECs and areas west and southwest of the ACECs. The other QRA (MT_NE) includes BLM land in the Little Rocky Mountains and areas northwest and southwest of the mountains. The QRAs include about 3,052,200 acres, of which 1,723,000 acres (56%) are within the planning area and about 31,000 acres (1%) are BLM land (Table 3.39).

Table 3.38
Wind Power Classes Converted to Development Potential

Wind Power Class	*Resource Potential (Utility Scale)*	*50m Wind Power Density (W/m^2)*	*Development Potential (20 Years)*	*Percent of Planning Area (All Ownerships)*	*Percent of Development Potential that is BLM Surface Ownership*
1	Poor	0-200	Low	9%	16%
2	Marginal	200-300			
3	Fair	300-400	Moderate	52%	22%
4	Good	400-500	High	39%	6%
5	Excellent	500-600			
6	Outstanding	600-800			
7	Superb	>800			

Table 3.39
Qualified Resource Areas for Renewable Energy
(Acres)

Name	*Total Area*	*Planning Area*	*BLM Land*
MT_NW	2,001,870	1,092,856	15,999
MT_NE	1,050,316	630,150	15,125
Total	3,052,186	1,723,006	31,123

Approximately 2,248,000 acres of BLM surface lands are open to commercial wind energy development without use limitations, and approximately 189,000 acres are subject to exclusion limitations. The wind energy development potential across the HiLine planning area is shown in Table 3.40.

Table 3.40
Wind Energy Development Potential

Wind Potential	*Total Surface (acres)*	*BLM Surface (acres)*	*% BLM*
High	6,145,000	365,000	6%
Moderate	8,275,000	1,839,000	22%
Low	1,452,000	233,000	16%
Total	15,872,000	2,437,000	15%

Wind energy development in the proximity of the Interstate 15 corridor, where a new transmission line is being constructed to make the produced wind energy available for the power grid, is currently limited to isolated development on private lands. However, the potential does exist for increased commercial wind energy development, including facilities located on BLM lands. Currently, the BLM does not have any pending authorizations for wind site testing and monitoring or wind farms. The Programmatic EIS (BLM 2005) will be used by the BLM when considering development of commercial wind energy projects on BLM lands in the planning area.

Social

This section discusses the social conditions in the planning area, with a particular emphasis on the counties where the majority of the BLM surface and subsurface acreage is located. The planning area encompasses over 2.4 million acres in Blaine, Chouteau, Glacier, Hill, Liberty, Phillips, Toole and Valley Counties. The majority of the surface and subsurface acreage is located in the eastern part of the planning area in Blaine, Phillips and Valley Counties. The information presented in this section complements the historic overview discussion in the Cultural Resources section and the information provided in the Economics section. Data for the planning area as a whole and the State of Montana are included for comparison purposes. This section is organized in the following manner: (1) social trends that have and are occurring in the study area; (2) social and demographic data on study area counties; (3) stakeholders and stakeholder values; and (4) environmental justice. A discussion concerning protection of human health and the environment is included in the Public Safety section, under Hazardous Materials.

Social Trends

This section focuses on social trends and attitudes that affect BLM land management. One trend is the increasing popularity of BLM land for recreation. A comprehensive report on recreation by Cordell, et al. (1999) indicates demand in the Rocky Mountain West for recreation activities will increase substantially by the year 2020 with non-consumptive wildlife activities, sightseeing and visiting historic places having the greatest increases. Another trend is a concern over maintaining access to BLM land if access through private land is required to reach the BLM land. In addition, the general public's loss of access to some private land is putting more pressure on the BLM land. These changes are linked to the pursuit of a quality recreation experience and occur for a variety of reasons: lands are purchased for recreation or other reasons and are closed to others; lands are leased to outfitters for exclusive use; and private lands and roads are closed to avoid problems with safety, fire, fences, weeds, litter, and open gates.

Another trend that is occurring in the nation and Montana is the aging of the population. In 2010, the population of individuals in the planning area counties that were 65 and older ranged from 10.6 % in Glacier County to over 20% in Phillips and Valley Counties. For the state as a whole, the percentage of population 65 or older is expected to increase to 18.7% by 2020 (NPA Data Services 2008). The percentage of people 65 or older is actually increasing more rapidly in states like Montana because young people are more likely to leave for advanced education, military service and employment opportunities not available locally.

Changes in the management of BLM land are just one aspect of a broader debate on environmental and resource management that is occurring locally, nationally and globally. Social values for lands and natural resources can take many forms such as commodity, amenity, environmental quality, ecological recreation, and spiritual. While the commodity value has been prevalent in the past, a study examining public attitudes toward ecosystem management in the United States found "generally favorable attitudes toward ecosystem management (defined as maintaining and ensuring sustainability) among the general public" (Bengston, et al. 2001).

In the rural West, in places where land use has been relatively unrestricted, concern is being expressed by some individuals and groups regarding the control and management of BLM land. People with these concerns feel that change in BLM land management is being driven by government officials and environmental advocacy groups who do not have a true understanding of the lands or the people living nearby who depend upon these lands for their livelihood and recreation. Of particular concern is the loss of uses of the land such as hardrock mining, livestock grazing, and off-highway vehicle use. People with these concerns seek to balance what they consider to be environmental extremism with economic and human concerns. They may feel that local elected officials who deal with their problems on a daily basis are better equipped to make decisions about BLM land.

There has been increasing interest in and discussion about bison and possible bison reintroduction across the State of Montana. A diversity of viewpoints about this issue range from strong support to strong opposition as documented in the scoping comments for the Statewide Bison Management Plan Environmental Impact Statement (MFWP 2012a). During the MFWP scoping phase the primary issues and concerns included:

- bison distribution and movement;
- population control and management;

- fencing and confinement concerns;
- public safety concerns regarding human-bison interactions and vehicle-bison collisions;
- private property damage of cropland and fences as well as concern over whether wild bison on private land could limit owner's private property rights;
- transmission of disease between bison, livestock and other wildlife;
- hunting of bison and impact that bison may have on hunting of other species;
- genetic purity of wild bison;
- legal status and classification of wild bison;
- how grazing leases and other public land uses may be impacted if wild bison are restored;
- ecological impacts – both positive and negative;
- economic and community impacts such as possible tourism and hunting benefits and/or loss of current agricultural revenue; and
- role of tribes, federal government and other agencies and organizations in management and program costs.

The above list is meant to help show the range of issues that arose during the scoping process. This does not necessarily relay the wide variety of values and viewpoints as to the individuals/groups that may support or not support bison reintroduction. Based upon Montana Fish, Wildlife and Parks scoping comments (MFWP 2012a), some of the views and values associated with bison management and bison reintroduction include: the view that there is a sacredness to wild bison; protection of wildlife and wildlife habitat should be a priority for public lands; bison should be valued as a native wildlife species in Montana; value of agriculture and the potential negative economic impacts of bison reintroduction should be recognized; as well as prioritizing private property rights over bison reintroduction. Closer to the study area, similar comments were received during scoping for the Charles M. Russell National Wildlife Refuge Comprehensive Conservation Plan (USFWS 2012). The range of views, values, and issues of concern help highlight the complexity surrounding bison management and bison reintroduction across the State of Montana. While this discussion is at a statewide scale, similar concerns and views were noted in the Malta Resource Management Plan Scoping Summary Report (BLM 2007a). This discussion on bison management and bison reintroduction provides some of the context for this study area in terms of highlighting the range of views and values present including support for wildlife habitat conservation, desire for a strong agricultural economy, provision of hunting and fishing opportunities, and the multitude of different desires for land management. The following sections provide additional information about the study area and some additional discussion on the views and values associated with land management.

Social Study Area Counties and Communities

The 2010 population of the planning area was 61,084, a decrease of 2.4% since 2000. During the decade 1990-2000, the planning area's population grew 1.2%. The population in the planning area is expected to increase 7.1% between 2010 and 2020 and increase 7.8% between 2010 and 2030 (Table 3.41). Across the planning area counties the percentages of male and female residents was relatively equal except for Toole County, which had a higher percentage of males (55.7%). This increased percentage of males is mostly due to a correctional facility that is located in Toole County. Individuals under 18 years old, 25-44 years old, and 45-64 years old tended to comprise larger percentages of the population across the planning counties (Table 3.41). It is important to note that the information presented on population and demographics is based upon the resident population and does not reflect any migratory or transient work populations. In other words, communities and the counties may see a difference in population and demographics due to a transient work force related to energy development. Additional information is provided below for the three counties that have the majority of surface and subsurface BLM acres.

Blaine County

Blaine County is located along the HiLine in northcentral Montana adjacent to the Canadian border. It is bordered by Hill and Chouteau Counties to the west, the Missouri River to the south, and Phillips County to the east. The Upper Missouri River Breaks National Monument, which is managed by the BLM, occupies the southern part of the county but is not part of this planning effort. Blaine County is home to the majority of the Fort Belknap Indian Reservation which is located in the southeast portion of the county. About 12% of Blaine County is federal land (including the BLM and U.S. Fish and Wildlife Service), 20% is Indian Reservation land, 7% is state land and 61% is private land. The BLM manages 299,201 surface acres and 615,688 subsurface acres in the Blaine County portion of the planning area. (These figures do not include the Upper Missouri River Breaks National Monument.)

Table 3.41
HiLine Planning Area Population and Demographics

	Population							
	1990 CENSUS[1]	***2000 CENSUS[1]***	***2010 CENSUS[1]***	***Projection 2020[1]***	***Projection 2030[1]***	***% change 2000-2010[2]***	***% change 2010-2020[2]***	***% change 2010-2030[2]***
Montana	799,065	902,195	989,415	1,094,712	1,156,494	9.7%	10.6%	16.9%
Blaine County	6,728	7,009	6,491	6,907	7,199	-7.4%	6.4%	10.9%
Chouteau County	5,452	5,970	5,813	5,708	5,433	-2.6%	-1.8%	-6.5%
Glacier County	12,121	13,247	13,399	14,063	13,752	1.1%	5.0%	2.6%
Hill County	17,654	16,673	16,096	18,272	18,955	-3.5%	13.5%	17.8%
Liberty County	2,295	2,158	2,339	2,408	2,378	8.4%	2.9%	1.7%
Phillips County	5,163	4,601	4,253	4,276	4,234	-7.6%	0.5%	-0.4%
Toole County	5,046	5,267	5,324	5,715	5,711	1.1%	7.3%	7.3%
Valley County	8,239	7,675	7,369	8,074	8,178	-4.0%	9.6%	11.0%
Planning Area Total[2]	62,698	62,600	61,084	65,423	65,840	-2.4%	7.1%	7.8%

	Age: Percent of Population[3]					***Sex: Percent of Population[3]***	
	Under 18 years	***18 to 24 years***	***25 to 44 years***	***45 to 64 years***	***65 years and over***	***Male***	***Female***
Montana	22.6%	9.6%	23.8%	29.2%	14.8%	50.2%	49.8%
Blaine County	30.0%	9.0%	20.9%	26.6%	13.5%	50.0%	50.0%
Chouteau County	26.7%	7.4%	19.6%	29.0%	17.3%	49.2%	50.8%
Glacier County	31.6%	10.0%	22.7%	25.2%	10.6%	48.9%	51.1%
Hill County	26.8%	10.7%	22.9%	26.9%	12.7%	50.5%	49.5%
Liberty County	22.0%	8.0%	20.6%	29.7%	19.8%	48.1%	51.9%
Phillips County	23.1%	5.5%	18.4%	32.7%	20.3%	49.3%	50.7%
Toole County	20.7%	7.9%	26.0%	31.5%	13.9%	55.7%	44.3%
Valley County	23.2%	5.4%	19.4%	31.3%	20.7%	49.7%	50.3%

Sources: [1] U.S. Census Bureau, Decennial Censuses of Population (Title varies per Census), 1890-2010; Compiled June 2013 by the Census & Economic Information Center, MT Department of Commerce (www.ceic.mt.gov)
[2] Calculated from data above
[3] 2010 Census, U.S. Census Bureau

Blaine County had a 2010 population of 6,491, a 7.4% decrease since 2000. The population is expected to continue to decline in the future. Of the planning area counties, Blaine has one of the lower percentages of population 65 and over, and the second highest percentage of Native Americans. Chinook, the county seat, had a 2010 population of 1,203, a decline of 13.2% since 2000. Havre, the largest town along the HiLine with a 2010 population of 9,310, is located about 20 miles west of Chinook in Hill County. Blaine County is home to the larger part of the Fort Belknap Indian Reservation. In 2007, Blaine County had 655 farms and ranches with an average size of 3,588 acres (U.S. Census of Agriculture 2007). Farming or ranching was the primary occupation of 56% of those identifying themselves as farm or ranch operators.

Phillips County

Phillips County is located along the HiLine in northern Montana adjacent to the Canadian border. It is bordered by Blaine County to the west, the Missouri River to the south, and Valley County to the east. The Charles M. Russell and UL Bend National Wildlife Refuges, which are managed by the U.S. Fish and Wildlife Service, are located in southern Phillips County. A portion of the Upper Missouri River Breaks National Monument is also located in the southwestern part of the County. Phillips County is home to a small part of the Fort Belknap Indian Reservation. About 41% of Phillips County is federal land (including BLM, Bureau of Reclamation and U.S. Fish and Wildlife Service), 4% is Indian Reservation land, 6% is state land and 49% is private land. The BLM manages 1,029,362 surface acres and 1,744,612 subsurface acres in the Phillips County portion of the planning area. (These figures do not include the Upper Missouri Breaks National Monument.)

Phillips County had a 2010 population of 4,253, a decline of 7.6% since 2000. The county lost over 10% of its population between 1990 and 2000 due to the closing of gold mines in the Little Rocky Mountains. The population of Phillips County is projected to have a minimal (less than 1%) increase in population from 2010 to 2020; however, overall from 2010 to 2030 there is a projected decrease in population.. Malta, the county seat, had a 2010 population of 1,997, a decrease of 5.8% since 2000. Phillips County has one of the highest populations in the planning area of persons aged 65 years and older, 20.3% of the population in 2010. In 2007, Phillips County was home to 556 farms and ranches with an average size of 3,608 acres (U.S. Census of Agriculture, 2007). Farming or ranching was the primary occupation of 65% of those identifying themselves as farm or ranch operators.

Valley County

Valley County is located along the HiLine in northeastern Montana adjacent to the Canadian border. It is bordered by Phillips County to the west, the Missouri River to the south, and Roosevelt and Daniels Counties to the east. The Charles M Russell National Wildlife Refuge and Fort Peck Dam are located in southern Valley County. Valley County is home to the eastern edge of the Fort Peck Indian Reservation. About 46% of Valley County is federal land (including BLM, Bureau of Reclamation and U.S. Fish and Wildlife Service), 9% is state land and 44% is private land. The BLM manages 1,013,209 surface acres and 1,351,730 subsurface acres in the Valley County portion of the planning area.

Valley County is the easternmost county in the planning area. The 2010 population was 7,369, a decline of 4.0% since 2000. Valley County's population is projected to increase by 9.6% from 2010 to 2020 and by 11% from 2010 to 2030. The county seat and largest city in the county is Glasgow, with a 2010 population of 3,250, a less than 1% decrease in population since 2000. Valley County has one of the highest populations in the planning area of persons aged 65 years and older, 20.7% of the population in 2010. In 2007, Valley County was home to 770 farms and ranches with an average size of 2,677 acres (U.S. Census of Agriculture, 2007). Farming or ranching was the principal occupation of 58% of those identifying themselves as farm or ranch operators in Valley County.

Stakeholders and Stakeholder Values

Understanding the social conditions of the study area also includes understanding the views and values held by individuals or groups that are affected by or interested in natural resource issues (stakeholders). Some of this was discussed previously. This section's discussion attempts to provide a broad overview of the range and variety of views and values held by those interested in BLM management. Stakeholders base their views toward BLM resources, resource uses, and management actions on the values they hold. Oftentimes these values are put forth as an individual's

or group's focus of interest, the basis for the agenda they bring forth, and/or determines what an individual or group finds valuable.

There is considerable complexity involved in fully understanding the views and values of stakeholders. This is due, in part, to the fact that individuals and groups can hold multiple values, and at times those values could be in conflict with each other and it is up to that individual or group to prioritize those values in order to address the issue at hand. One way to understand possible views and values toward BLM resources, resource uses, and management actions is to identify a range of values that can be held by an individual or group. There are several ways one can discuss the range of possible value typologies, including work done by Brown and Reed (2000). Brown and Reed (2000) developed a list of thirteen value typologies as a way to understand stakeholder values toward natural resources. The adaptation of Brown and Reed's list presented below highlights the variety of values a person may hold toward BLM resources, resource uses, and management. The thirteen value typologies adapted from Brown and Reed (2000) are listed below along with an associated statement describing the value.

- Aesthetic – I value the BLM resources and uses because I enjoy the forest scenery, sights, sounds, smells, etc.
- Biological diversity – I value the BLM resources because it provides a variety of fish, wildlife, plant life, etc.
- Life-sustaining – I value BLM resources because they help produce, preserve, clean and renew air, soil, and water.
- Recreation – I value BLM resources and resource uses because it provides a place for outdoor recreation activities.
- Moral/ethical – I value BLM resources in and of themselves for their existence, no matter what I or others think about those resources.
- Historical/cultural – I value BLM resources and resource uses because they have places and things of natural and human history that matter to me, others or the nation and/or I value BLM resources and resource uses because it is a place for me to continue and pass down the wisdom and knowledge, traditions, and way of life of my ancestors.
- Therapeutic – I value BLM resources and resource uses because it makes me feel physically and/or mentally better.
- Scientific/learning – I value BLM resources because we can learn about the environment through scientific observation or experimentation.
- Spiritual – I value BLM resources because they provide a sacred, religious, or spiritually special place to me or because I feel reverence and respect for nature there.
- Economic – I value BLM resources and resource uses because they provide timber, fisheries, minerals, grazing, or tourism opportunities that provide economic benefit.
- Subsistence – I value BLM resources because they provide necessary food and supplies to sustain my life.
- Future – I value BLM resources because they allow future generations to know and experience these resources.

While the above list of value typologies is not exhaustive, it does provide a glimpse at the variety of values individuals or groups may hold toward BLM resources and resource uses. All of these are valid values and many of us hold several to all of them. Conflicts surrounding BLM resources, resource uses, and management often stem from how individuals/groups prioritize their values – one may prioritize his/her value of recreational opportunities over his/her historical value of an area. Additionally, these are broad and somewhat simplistic value typologies and there can be conflicts within a value typology such as conflict between people's values of different recreational opportunities. What people value and how they prioritize their values helps to determine their quality of life and if the values they prioritize exist in the surrounding area. Quality of life is often associated with communities, community infrastructure, relationships among residents, educational opportunities, and the like. Additionally, quality of life can be associated with the amount and quality of available resources such as recreation opportunities and resolution of problems related to resource activities. Other, less tangible beliefs that could affect social well-being include individuals having a sense of control over the decisions that affect their future, and feeling that the government strives to act in ways that consider all stakeholders' needs.

As a way to discuss the variety of values that relate to the HiLine BLM resources, resource uses, and management, we have grouped similar value priorities and categorized these as stakeholder groups. These are generalized groupings and an actual individual or group likely falls into multiple groups. Moreover, one should not consider these stakeholder groups as homogenous. In other words, even within the categorized stakeholder groups differences in values may still occur. The categorized stakeholder groups, however, provide a useful way to discuss similar value priorities and set up a

way to discuss potential impacts to those values. Based upon local understanding of the views and values associated with HiLine BLM resources, resource uses, and management as well as based upon the comments received during this planning process the following stakeholder groups were categorized: groups and individuals that prioritize ranching, ranching livelihood and agricultural lifestyle, groups and individuals that prioritize local communities and local community benefits, groups and people that prioritize recreational opportunities (including motorized and nonmotorized), groups and individuals who prioritize resource protection, groups and individuals who prioritize resource use, and Native Americans. Again, it should be noted that these groups are not mutually exclusive and examples of households that fit into all categories are likely to be present. Below we discuss these stakeholder groups as a basis for the impact discussion in Chapter 4.

Groups and Individuals that Prioritize Ranching, Ranching Livelihood and Agricultural Lifestyle

Ranching is an important part of the history, culture, and economy of the HiLine. The Great Northern Railway brought European immigrants to the northern Great Plains to homestead. While the Homestead Act was signed in 1862, many settlers arrived in Montana during a ten-year period from 1908-1918 prompted by the advertising campaign of the railroads. By 1918, many ranches and farms were crippled by the drought and onslaught of grasshoppers and settlers left the land. See the Historical Overview in the Cultural section, the Livestock Grazing section and the Economic section of this chapter for more information on livestock grazing and BLM grazing permits.

Many of the farmers and ranchers in the planning area are third and fourth generation farmers and ranchers who enjoy living off the land, being self-employed, working outdoors, and living a rural lifestyle. They pride themselves in "keeping the ranch in the family" and conserving and improving the land. Many farmers and ranchers view their farming and ranching enterprise not only in economic terms, but also consider the ecological and cultural "products" that their farm or ranch contribute to society. They are very concerned about maintaining the health of the range because their livelihood and lifestyle depend on it and about enhancing the ability of younger people to set up a family ranching operation because the local ranching communities and rural schools depend on this. The closeness to the land and link with their parents and grandparents makes ranching a precious opportunity to provide children with a heritage filled with values that many families wish to duplicate. Lessons taught by drought, floods, wildfire, predators, depressed markets, and life and death are learned through ranching experiences.

Ranchers and farmers face many challenges today, including changing federal regulations, aging rancher populations, economic issues, trends in agricultural practices, and changing land use. In the past, many small farms and ranches have been consolidated into larger units that can better compete in the marketplace. In addition, many ranchers have diversified their income by seeking supplemental work off the ranch, providing outfitting and guest ranch services, and/or diversifying their output.

Concerns expressed by groups and individuals that may fall under this stakeholder group include continuation of current BLM management for livestock grazing as well as maintaining motorized access to grazing allotments, and future designation of relinquished allotments as reserve common allotments.

Scoping comments from those concerned with livestock grazing include: *Grazing in the Malta area is an integral part of the area's economy and should receive special consideration as its own planning issue. With good water development and sound grazing management plans that include a rest rotation, grazing can benefit the area. More emphasis should be placed on range management and grazing.*

Groups and Individuals that Prioritize Recreational Opportunities – Including Motorized and Nonmotorized

Recreation is a component of most lifestyles in the planning area and is important to many residents. Recreationists are very diverse and changes in management can affect the people who engage in the various activities differently. Recreational activities include OHV use, hunting, fishing, wildlife watching, sightseeing and hiking. See the Recreation section of this chapter for more information on recreation areas and activities.

Some scoping comments on recreation concerned the potential loss of activities such as OHVs on roads, primitive roads and trails and traveling off road to retrieve game. Some commenters discussed the importance of motorized recreation to their lifestyles.

Scoping comments from OHV proponents include: *I believe off road travel should be allowed for hunting. There are a large number of people who are not in shape due to age, etc., to walk several miles and drag an animal back to a vehicle. I've talked to several who are quitting hunting for this reason. With no hunting, us landowners will be overrun with deer and antelope. As far as damage from the land, you can find very little that came from off road travel.*

The HiLine is well known for its hunting and fishing opportunities. In addition, visitors/tourists are increasingly drawn to the area to observe wildlife.

Scoping comments from groups and individuals that may fall in this stakeholder group include: *Hunting, angling, and general outdoor recreation has a substantial economic and historical legacy on the public lands. Please recognize the cultural values of hunting, fishing, and sustainable fish and wildlife and the need for maximum measures to ensure their future and not sacrifice it for energy production.*

Many outfitting guides specialize in providing accommodations and services for hunting, fishing and other recreational activities. While outfitting provides additional jobs to the economy and supplemental income to many ranches, some locals are concerned that outfitters are to blame for the closure of private access to public lands, thus giving them unparalleled access to prime hunting. They feel that landowners, present or absentee, are blocking road access and outfitters are paying for the privilege to access public lands through private lands.

One scoping comment indicated*: Identify public land that cannot be accessed by the public where outfitting takes place and seek opportunities to secure access to these areas.*

Groups and Individuals Who Prioritize Resource Protection

A variety of groups and individuals give resource protection in the planning area a high priority. The following concerns were among those received from groups and individuals that may fall in this stakeholder group during scoping: habitat for wildlife including special status species, riparian health, noxious weed management, energy and mineral development, transportation management, and special management designations.

One scoping comment indicated: *The Malta RMP planning area is an American treasure. Not all of the public will see it that way, of course. For some it will be a "wasteland" or a land with "nothing out there." Others will view it as a revenue source, principally from oil and gas, wind power, or grazing. But increasingly, people recognize the prairie of northern Montana as a dramatic, scenic and historic landscape still embracing significant natural tracts and offering tremendous potential for prairie restoration.*

Groups and Individuals Who Prioritize Resource Use

Some groups and individuals including many local residents have expressed concerns about the potential limitations to oil and gas and other types of development within the planning area. Some indicated that oil and gas development, along with wind powered development, would bring an economic boost to the area, including jobs and revenue. Others indicated that these resources can be developed in an environmentally friendly manner.

One scoping comment indicated: *The oil and gas need to be developed so we have lower energy costs and also are creating revenue. Any time we can produce something from our natural resources, for example, cattle from the grass or oil and gas from the ground, we are creating wealth for the United States. It does this because the money is spent here and we don't have to import the products.*

Groups and Individuals that Prioritize Local Communities and Community Benefits

The planning area is rural and largely unpopulated, with an agricultural-based lifestyle that is highly prized by the residents. Some of the qualities the residents find most satisfying are the good people, small close-knit communities,

natural beauty and wide open spaces, and the feeling this is a good place to raise children. Residents have indicated a willingness to forego amenities found in more urban environments (e.g., more available medical care, higher incomes and employment levels, etc.) to pursue what they consider a high quality of life. The area experiences a low crime rate, fewer social problems than larger urban areas, and plentiful uncrowded outdoor recreation opportunities.

Small rural communities can be tied to the BLM and other public lands in a variety of ways. Local businesses and governments depend upon BLM employees to support businesses and public services. Use of public lands for recreation activities, livestock grazing, minerals/energy development, and other activities can provide economic and leisure-time opportunities.

While planning area residents feel this way of life is desirable, they observe with real concern the rate of population outmigration from the area and the lack of opportunity for employment. These values and concerns can lead to conflicts in resource issues. Generally, residents are in favor of economic growth through resource development or other industry because it would provide employment for them or their children and would promote overall economic well-being. On the other hand, they wish to continue to enjoy the outdoor recreational opportunities associated with a sparse population and a largely pristine environment.

One scoping comment indicated: *It is vital to the local stakeholders that issues directly impacting their properties, livelihoods and communities be handled appropriately. While all uses should be considered the BLM must ensure that the balance between more recently developed uses such as recreation, and other uses that have endured over the years and support the local economy, be given special consideration.*

Native Americans

Indian tribes with an interest in the planning area include the Turtle Mountain Band of Chippewa Indians, the Fort Belknap Indian Community, the Chippewa Cree Tribes, the Northern Cheyenne Tribe, the Fort Peck Assiniboine and Sioux Tribes, the Little Shell Tribe of the Chippewa Indians, the Crow Tribe, the Blackfeet Nation, the Nez Perce (Nee-Me-Poo) Tribe, and the Confederated Salish and Kootenai Tribes. These tribes are either located within or close to the planning area or, on occasion, visit locations within the planning area that are of particular cultural and spiritual significance. Areas of particular spiritual interest to many of the tribes include the Sweet Grass Hills in the western part of the planning area and the Little Rocky Mountains in the central part of the planning area. Other sites within the planning area that have cultural and religious significance include vision quest sites, ceremonial and/or dance grounds, rock art sites and plant gathering areas. See the Cultural section of this chapter for a more detailed discussion of the cultural features and Native American history of the planning area.

Three Indian reservations are located in the planning area, and one is located directly to the east of the planning area. The Blackfeet Reservation is located on the western edge of the planning area predominately in Glacier County, and encompasses 2,371 square miles. The Native American population of the reservation was 8,944 in 2010. Browning is the hub of the reservation, with a population of 1,016 in 2010. Ranching and farming are major uses of reservation land.

The Rocky Boy's Reservation is located in Chouteau and Hill Counties, encompasses 171 square miles, and is home to members of the Chippewa-Cree Tribe. In 2010 the Native American population of the reservation was 3,221. Box Elder is the largest community within the reservation with a population of 87 people in 2010. Many community and tribal services are located in Box Elder. Tribal government, education, and medical/social services employ many of the tribal members.

The Fort Belknap Indian Reservation is located in Phillips and Blaine Counties and is home to the Gros Ventre and Assiniboine Tribes. The reservation encompasses 1,014 square miles and 2,704 Native Americans lived on the reservation in 2010. There are several unincorporated communities on the reservation including Fort Belknap Agency, Lodgepole, and Hayes. The 2010 populations of these communities were 1,293, 265, and 843 respectively. Many community services are located in Harlem, which had a 2010 population of 808. Harlem is located just north of the reservation. The Tribes and Bureau of Indian Affairs (BIA) are the largest employers on the reservation.

The Fort Peck Reservation is located directly east of the planning area. The reservation is home to the Sioux and Assiniboine Tribes. The reservation encompasses approximately 3,289 square miles and was home to 6,714 Native

Americans in 2010. Tribal governments and associated services are located in Poplar, which had a population of 810 in 2010. The largest community on the reservation is Wolf Point, with a 2010 population of 2,621.

According to scoping comments, the Sweet Grass Hills are of religious importance to many of the northern plains tribes, contain many medicinal and ceremonial plants, and should be protected The Sweet Grass Hills were designated as an ACEC in 1992 and withdrawn from mineral entry for twenty years in 1996. An effort headed by a member of the Blackfeet Tribe is underway to place the Sweet Grass Hills on the National Register of Historic Landmarks. One commenter in the scoping process stated that the "Sweet Grass Hills is our church."

One scoping comment indicated: *There are four Indian reservations—home to seven tribes—within or close to the RMP area. Other tribes have close historical ties to the region. The BLM should reach out to Native interests to ensure that sites of cultural and historical importance are respected and protected.*

Environmental Justice

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, states "each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations…" (Executive Order 12989). Therefore, based upon Council on Environmental Quality (CEQ) guidance under the National Environmental Policy Act (CEQ 1997) and BLM Environmental Justice principles outlined in BLM H-1601-1 Land Use Planning Handbook, the Environmental Justice considerations for this planning action include the following:

- identification of low-income and/or minority populations;
- determination of disproportionately high and adverse human health effects on low-income, minority populations and/or Indian tribes;
- determination of disproportionately high and adverse environmental effects on low-income, minority populations and/or Indian tribes;
- identification and implication of differential patterns of consumption of natural resources by low-income, minority and/or Indian tribes; and,
- provision of opportunities for full involvement of low-income, minority and/or Indian Tribes in BLM decision making processes.

Low-income populations are determined by the U.S. Census Bureau based upon poverty thresholds developed every year. Minority populations as defined by Council on Environmental Quality (CEQ) guidance under the National Environmental Policy Act (CEQ 1997) include individuals in the following population groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic. A minority population is identified where "(a) the minority population of the affected area exceeds 50 percent or (b) the minority population percentage of the affected area is meaningfully greater…" (CEQ 1997). Additionally, "[a] minority population also exists if there is more than one minority group present and the minority percentage, as calculated by aggregating all minority persons, meets one of the above-stated thresholds" (CEQ 1997).

Data for the identification of low-income is from the U.S. Census Bureau, Small Area Income and Poverty Estimates (SAIPE). The SAIPE program produces yearly single-year poverty estimates for states, counties, and school districts and is considered the most accurate for these geographic scales, especially for areas with populations of 65,000 or less (U.S. Census 2014a). Minority populations are identified using the U.S. Census Population Estimates program which provides estimates for the resident population by age, sex, race, and Hispanic origin at the national, state and county scales. Estimates from SAIPE and the Population Estimates program are used in federal funding allocations.

The analysis was conducted at the county level due to the large geographic area as well and the availability of the most current data; however, implementation-level analysis may need to be employed that is much more localized in nature. The aforementioned data is used to determine whether the populations residing in the eight-county study area constitute an "environmental justice population" through meeting either of the following criteria:

- At least one-half of the population is of minority or low-income status; or
- The percentage of population that is of minority or low-income status is at least 10 percentage points higher than for the entire State of Montana.

CEQ guidance does not provide specific criteria for determining low-income populations as it does for minority populations, so for this planning effort the BLM uses the criteria for minority populations, which are discussed above, as the criteria for low-income populations. We identify low-income and minority population percentages that are "meaningfully greater" as at least 10 percentage points higher than for the entire State of Montana.

Table 3.42 shows that Blaine, Chouteau, Glacier, and Hill Counties have American Indian/Alaska Native populations that meet at least one criterion above and would be considered as having a minority environmental justice population. The remaining counties do not meet the criteria above for minority environmental justice populations even when considering the aggregated minority percentages. In terms of low-income, Glacier County meets the "meaningfully greater" criterion by having a poverty percentage of 30.4% which is 14.8 percentage points higher than the State of Montana (15.6%). Based upon the data provided in Table 3.42, there are identified populations that require environmental justice considerations (disproportionate impacts) in this planning process. These considerations will be addressed in the Chapter 4, Environmental Justice section.

Opportunities for low-income, minority, and Indian tribes' involvement in this planning process are documented in the scoping discussion and in Chapter 5, Consultation and Coordination.

Table 3.42
Percent HiLine Planning Area Population that is Minority or Below Poverty Statistics, 2012 Estimates

	Race and Ethnicity: Percent of Population[1]								***Poverty Measures[2]***	
	White	***Black or African American***	***American Indian and Alaska Native***	***Asian***	***Native Hawaiian and Other Pacific Islander***	***Two or More Races***	***Hispanic***	***Aggregated Minority Percentage***	***Percent Below Poverty***	***Median Household Income***
Montana	89.7%	0.6%	6.5%	0.7%	0.1%	2.5%	3.1%	13.5%	15.6%	$45,030
Blaine County	48.1%	0.2%	49.4%	0.3%	0.0%	2.0%	2.1%	54.0%	23.5%	$36,250
Chouteau County	77.3%	0.2%	20.3%	0.4%	0.1%	1.8%	1.8%	24.6%	17.6%	$39,833
Glacier County	32.5%	0.2%	63.7%	0.3%	0.0%	3.2%	2.3%	69.8%	30.4%	$34,508
Hill County	73.3%	0.4%	22.1%	0.6%	0.1%	3.5%	2.7%	29.4%	17.0%	$41,194
Liberty County	98.3%	0.1%	0.2%	0.1%	0.0%	1.2%	0.7%	2.4%	20.7%	$35,414
Phillips County	87.7%	0.0%	8.0%	0.3%	0.0%	4.0%	2.2%	14.5%	16.1%	$38,913
Toole County	91.6%	0.7%	5.2%	0.6%	0.0%	2.0%	3.2%	11.6%	16.6%	$42,057
Valley County	87.5%	0.3%	9.6%	0.5%	0.0%	2.2%	1.6%	14.1%	15.0%	$41,694

Source: [1] U.S. Census Bureau, Population Division, Annual Estimates of the Resident Population by Sex, Race, and Hispanic Origin for the United States, States, and Counties: April 1, 2010 to July 1, 2012.
[2] U.S. Census Bureau, Small Area Income and Poverty Estimates.

Soil Resources

Stable and quality soils in the planning area provide the foundation for other resources (e.g., biological resources) and for resource uses (e.g., livestock grazing). Soils are also an engineering medium upon which roads, trails, facilities, etc. are built. Soil is a living system that is linked to nutrient and hydrologic cycles, energy flows, and other ecological processes.

Indicators of soil resource condition include both visual and nonvisual factors. Visual indicators include evidence of soil loss (water and wind erosion) or transport (mass movement, slope failure, deposition), and changes in soil profile (thickness, structure). Some indicators are indirect. These include changes in vegetation (species, abundance, seral stage), changes in drainage, and changes in land use (grazing, cultivation, development). Changes outside the normal range are identified by comparison to historical observations or to similar (control, reference) areas.

Nonvisual indicators of soil condition include soil chemistry (pH, salinity, sodium absorption ratio (SAR)), physical properties (permeability and infiltration rates, moisture retention), and yield or productivity.

Data sources include soil survey data, rangeland health assessments, field observations, vegetation monitoring, grazing allotment evaluations, and baseline data provided from previous NEPA analyses.

Soils in the planning area are derived mainly from glacial till, weathered sedimentary or igneous bedrock and alluvium from mixed sources. These parent materials, along with variable climate, topography, vegetation, and management create complex and diverse soil patterns, varying greatly in suitability, limitation and productivity characteristics.

Detailed soil surveys have been published by the United States Department of Agriculture - Natural Resources Conservation Service (USDA-NRCS) for Blaine-Soil Survey Area (SSA) 608 (USDA-NRCS 1986), Chouteau-SSA 615 (USDA-NRCS 2003), Glacier-SSA 600 (USDA-NRCS 1980), Hill-SSA 041 (USDA-NRCS 2003), Liberty-SSA 051 (USDA-NRCS 2002), Phillips-SSA 641 (USDA-NRCS 2004), Toole-SSA 101 (USDA-NRCS 2002) and Valley-SSA 105 (USDA-NRCS 1984). These soil surveys were performed by the NRCS according to National Cooperative Soil Survey standards and were conducted at the second and third order of detail. Spatial (State Soil Geographic [STATSGO] and Soil Survey Geographic [SSURGO]) and tabular soil datasets are available on the internet at the following site: http://websoilsurvey.nrcs.usda.gov/app/ . This website provides up-to-date spatial data as well as interpretive ratings and soil characteristics for each soil map unit (SMU).

Suitability and limitations of soils for specific proposed actions (including, but not limited to range improvements, mineral development, roads or rights-of-way locations) are determined by conducting site-specific soil investigations. Soils are investigated to determine erosion hazard and reclamation suitability by evaluating slope and soil properties such as texture, organic matter content, structure, permeability, depth, available water capacity, and salt concentration.

Soils in the planning area are grouped geographically by Major Land Resource Areas (MLRAs) for descriptive purposes (see Map W.10, which is available on the internet at http://blm.gov/8qkd). The following descriptions of MLRA are derived from the USDA Agriculture Handbook 296 (NRCS 2006).

Brown Glaciated Plain (MLRA 52) is generally covered by glacial till plains. Glacial till ranges from a few feet to about 200 feet thick and is generally underlain by clayey and loamy shale. Landscapes range from nearly level to gently rolling and strongly rolling to steep along drainageways. Alluvial deposits are extensive along the Milk River, but occur in narrow and discontinuous strips along other streams and rivers. Shale, siltstone, or sandstone bedrock can be exposed along the valley walls of deeply dissected drainages. Upland potholes, valley bottoms, terraces, and fans are common inclusions. Soils are dominantly well developed, moderately deep to very deep (from 20 to more than 60 inches) and well drained. Textures generally vary from loamy to clayey. The dominant soil orders in this MLRA are Alfisols, Entisols, and Mollisols. The soils in the area dominantly have a frigid soil temperature regime, an ustic soil moisture regime, and mixed or smectitic mineralogy. Natrustalfs (Elloam and Thoeny series) and Haplustalfs (Phillips series) formed in till on till plains. Ustorthents (Hillon and Sunburst series) formed in till on till plains and hills. Argiustolls formed in till on till plains and hills (Bearpaw, Joplin, Scobey, Telstad, and Vida series) and in alluvium on alluvial fans, stream terraces, and hills (Ethridge and Evanston series). Erosion hazards are slight to moderate due to the relatively gentle rolling topography and short slope lengths.

Black Elk Coulee, Blaine County Photo by Craig Miller

Northern Dark Brown Glaciated Plans (MLRA 53A) is covered by glacial till plains. The gently undulating to rolling till plains in this area are interrupted by more strongly rolling and steep slopes adjacent to kettle holes, kames, moraines, and major stream valleys. The dominant soil orders in this MLRA are Inceptisols and Mollisols. The soils in the area dominantly have a frigid soil temperature regime, an ustic soil moisture regime, and mixed or smectitic mineralogy. They generally are very deep, moderately well drained or well drained, and clayey or loamy. Calciustepts (Zahill series), Natrustolls (Niobell series), and Calciustolls (Zahl series) formed in till on till plains and moraines. Haplustolls (Tally series) formed in eolian deposits, alluvium, or glaciofluvial deposits on fans, terraces, and outwash plains and in drainageways. Argiustolls formed in till (Vida and Williams series) and mixed till and alluvium (Bowbells series) on till plains, moraines, and hills. Argiustolls also formed in alluvium or eolian deposits over till (Dooley series), alluvium (Turner series), and alluvium, lacustrine deposits, or glaciofluvial deposits (Farnuf series) on lake plains, fans, and terraces and in drainageways.

Northern Rolling High Plains, Northern Part (MLRA 58A) consists of eroded plateaus and terraces. Slopes generally are gently rolling to steep, with areas of steeply sloping badlands bordering the larger streams and rivers. Marine and continental sediments of the Cretaceous Montana Group underlie this MLRA. The Montana Group includes the Bearpaw shale; Judith River sandstone, siltstone and shale; Claggett shale; Eagle sandstone; and Telegraph Creek sandy shale. Soils are mostly fine textured, high in smectitic 2:1 clays, and shallow to moderately deep (from 10 to over 40 inches). Soils are loamy or sandy where high sandstone ridges occur. The dominant soil orders in this MLRA are Entisols and Inceptisols. The soils in the area dominantly have a frigid soil temperature regime, an ustic soil moisture regime, and mixed or smectitic mineralogy. Ustorthents formed in residuum on hills and ridges (Cabbart, Neldore, and Yawdim series) and in alluvium on fans and terraces (Lambert series). Ustifluvents (Havre series) formed in alluvium on fans, terraces, and flood plains. Haplustepts (Delpoint and Yamacall series) formed in alluvium, eolian deposits, and residuum on terraces, fans, and hills. Natrustalfs (Gerdrum series) and Haplustolls (Shambo series) formed in alluvium and glaciofluvial deposits on fans and terraces and in drainageways. These soils can have severe erosion hazards and have poor reclamation suitability because of the dominance of steep and very steep slopes (greater than 20% slope) and extreme physical properties such as high clay content, slow permeability, and shallow depth and sparse vegetative ground cover. Soils are generally low in organic matter and high in sodium and soluble salts.

Northern Rocky Mountain Foothills (MLRA 46), Northern Rocky Mountains (MLRA 43A), and Central Rocky Mountains (MLRA 43B) are characterized by rugged hills and low mountains to rugged glaciated mountains and thrust-and-block faulted mountains. The bedrock formations range from Precambrian to Cretaceous in age. Rocks consist of shale, siltstone, sandstone, limestone, dolomite, argillite, quartzite, gneiss, schist, and granite. These areas receive more

precipitation than the other MLRAs (15 to over 20 inches annually); therefore, vegetative cover is higher. Soils are shallow to very deep, very poorly drained to well drained, and have most of the soil texture classes. The dominant soil orders in these MLRAs are Mollisol, Entisol, Andisols, Inceptisols, and Alfisols. Mineralogy is mixed or smectitic. Erosion hazards are slight to severe. Shallow soils are difficult to reclaim after surface-disturbing activities.

Table 3.43 lists the dominant STATSGO soil map units in the planning area and the dominant associated MLRA and acreages. These units total 69% of the entire surface acreage in the planning area (all ownerships).

Table 3.43
STATSGO Soil Map Units

Map Unit ID	*Map Unit Name*	*MLRA*	*Acres*
MT036	Vida-Bearpaw-Zahill	52	472,342
MT058	Bowdoin-Marvan-Vaeda	52	111,480
MT071	Leavitt-Burnette-Babb	46	159,916
MT088	Cabbart-Badland-Neldore	58A	104,668
MT102	Cabbart-Delpoint-Rock Outcrop	58A	123,783
MT141	Cowood-Rock Outcrop-Rubble Land	43A	120,500
MT186	Kobar-Ethridge-Marias	52	417,703
MT191	Fairfield-Martinsdale-Cabba	46	336,258
MT245	Harlem-Havre-Lallie	52	196,013
MT257	Harlem-Havre-Lardell	52	195,615
MT270	Hedoes-Castner-Belain	46	377,197
MT277	Hillon-Neldore-Cabbart	52	527,792
MT343	Loberg-Garlet-Evaro	43A	190,954
MT385	Marvan-Vaeda-Marias	52	144,867
MT395	Michelson-Redchief-Adel	46	128,981
MT418	Neldore-Bascovy-Rock Outcrop	58A	235,839
MT422	Neldore-Dilts-Rock Outcrop	52, 58A	449,908
MT423	Neldore-Hillon-Rock Outcrop	52, 58A	148,482
MT425	Neldore-Rock Outcrop-Marvan	52	103,373
MT428	Neldore-Elloam-Sunburst	52, 58A	455,133
MT429	Neldore-Rock Outcrop-Bascovy	58A	343,453
MT453	Phillips-Elloam-Thoeny	52	1,017,617
MT526	Scobey-Kevin-Hillon	52	2,101,449
MT564	Telstad-Joplin-Hillon	52	1,873,105
MT593	Vaeda-Ustic Torriflluvents-Harlem	52	133,608
MT635	Williams-Bearpaw-Vida	52	217,329
MT639	Williams-Zahill-Cabba	46	144,041
MT685	Zahill-Bearpaw-Vida	46	113,307

Source: STATSGO, USDA-NRCS 2007.

Water Erosion

Water erosion is a function of many factors including: soil erodibility; slope gradient; length of slope; rainfall amount, duration, and intensity; and vegetation cover. Erosion hazard is the susceptibility of soil to erosion.

The soil erodibility factor (Kw) quantifies soil detachment by runoff and raindrop impact. This erodibility factor is an index used to predict the long-term average soil loss, from sheet and rill erosion. The Kw factor applies to the whole

soil, which includes rock fragments and is based primarily on the percentage of silt, sand, and organic matter, soil structure, saturated hydraulic conductivity, and rock fragments. Values of Kw range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet erosion by water (USDA-NRCS 2007).

Slope gradient is the difference in elevation between two points, expressed as a percentage of the difference between those points. Representative Value (RV) Slope indicates the expected slope value for a given SMU (USDA-NRCS 2007). For example, the Lisam-Dilts clays, 8% to 35% slopes SMU has a RV slope of 22%.

Kw and RV Slope for each named component in a SMU can be found in the respective Soil Survey or on USDA-NRCS's Soil Data Mart on the internet at http://soildatamart.nrcs.usda.gov/.

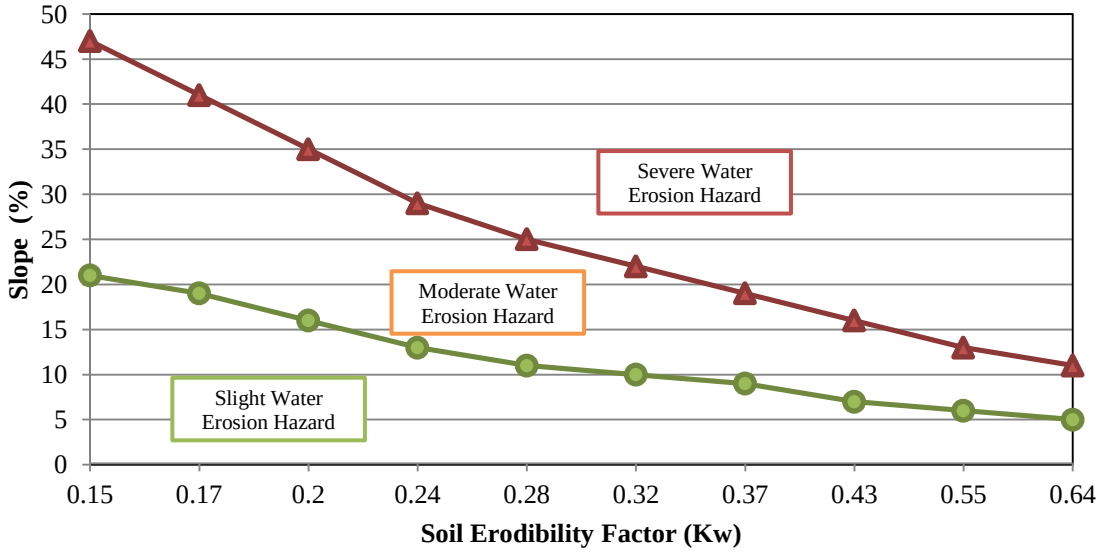
The water erosion hazard for bare non-compacted soil is estimated by using the formula: Water Erosion Hazard = Kw factor x RV Slope. Water erosion hazard is divided into three rating classes: slight (0 to < 3.21), moderate (3.21 to 7), and severe (> 7). Table 3.44 depicts the approximate surface and subsurface acreage amounts associated with each of these classes. Figure 3.12 shows water erosion hazard by soil erodibility factor and slope. A map that displays the water erosion hazard ratings by SMU (Map W.11) can be found on the internet at http://blm.gov/8qkd.

Table 3.44
Water Erosion Hazard Ratings
(Acres)

Erosion Hazard Rating Class	*BLM Land*	*Federal Mineral Estate*
Slight	1,254,858	2,270,022
Moderate	206,992	395,147
Severe	816,467	1,513,174

Source: GIS calculated acres using USDA-NRCS's SSURGO datasets (Kw-dominant condition x RV slope-dominant condition) downloaded from Soil Data Mart in April and August 2007.

Figure 3.12
Water Erosion Hazard by Soil Erodibility Factor and Slope



Wind Erosion

Wind erosion is a critical issue following the removal of protective vegetation which results in the displacement or loss of topsoil in some areas, increased sediment deposition in other areas, and impacts to ambient air quality from elevated dust levels.

The wind erosion index (WEI) is a numerical value indicating the susceptibility of soil to wind erosion, or the tons/acre/year that can be expected to be lost to wind erosion. This index is divided into three rating classes: slight (0, 38, 48, 56), moderate (86), and severe (134, 160, 180, 220, 250, 310).

A close correlation exists between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion (USDA-NRCS 2007).

WEI for each named component in a SMU can be found in the respective Soil Survey or on USDA-NRCS's Soil Data Mart on the internet at http://soildatamart.nrcs.usda.gov/.

Table 3.45 depicts the approximate surface and subsurface acreage amounts associated with each class. A map that displays the wind erosion hazard ratings by SMU (Map W.11) can be found on the internet at http://blm.gov/8qkd.

Table 3.45
Wind Erosion Hazard Ratings
(Acres)

Erosion Hazard Rating Class	*BLM Land*	*Federal Mineral Estate*
Slight	1,068,818	1,789,134
Moderate	1,294,165	2,283,438
Severe	23,740	90,276

Source: GIS calculated acres using USDA-NRCS's SSURGO datasets (WEI-dominant condition) downloaded from Soil Data Mart in August 2007.

Reclamation Suitability

Reclamation is the reconstruction of topographic, soil, and plant conditions after disturbance, which may not be identical to the predisturbance site, but which permits the degraded land mass to function adequately in the ecosystem of which it was and is a part (Munshower 1994). The needs of modern society necessitate that disturbed areas be returned to some type of stable ecosystem (not actively eroding) as rapidly as possible (Munshower 1994). Reclamation is not the restoration of a site; instead, the long-term objective of reclamation is to set the course for eventual ecosystem restoration (BLM 2007b).

Reclamation suitability criteria are based upon the inherent ability of the soil to recover from degradation often referred to as soil resilience. The ability to recover from degradation means the ability to restore functional and structural integrity after a disturbance. Both the rate and degree of recovery need to be considered. Soil functions that are important include sustaining biological activity, diversity and productivity; capture, storage and release of water; storing and cycling nutrients and other elements; filtering, buffering, degrading, immobilizing and detoxifying contaminants; and providing support for plant and animal life.

Factors for reclamation suitability include relative risk of water and wind erosion, salinization, sodification, organic matter and nutrient depletion, effective precipitation, and the loss of adequate rooting depth to maintain desired plant communities. Steep slopes increase the vulnerability to water erosion. Low available water capacity, shallow rooting depth, and excess salt or sodium can reduce plant diversity, resistance to stress, and seedling survival. Inadequate precipitation limits seedling survival and species selection for reclamation.

Table 3.46 depicts the approximate surface and subsurface acreage amounts associated with each class. A map that displays the SMUs with a poorly suited rating (Map W.12) can be found on the internet at http://blm.gov/8qkd.

Table 3.46
BLM Reclamation Suitability in Montana
(Acres)

Reclamation Suitability Rating Class	***BLM Land***	***Federal Mineral Estate***
Well Suited	444,658	875,197
Moderately Suited	457,610	853,079
Poorly Suited	1,533,484	2,422,506

Source: GIS calculated acres using NASIS datasets in an Access Database Template given by USDA-NRCS (Montana State Office -Bozeman) in August 2007.

Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and that is available for these uses. It has the combination of soil properties, growing season, and moisture supply needed to produce sustained high yields of crops in an economic manner if it is treated and managed according to acceptable farming methods. In general, prime farmland has an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, an acceptable level of acidity or alkalinity, an acceptable content of salt or sodium, and few or no rocks. Its soils are permeable to water and air. Prime farmland is not excessively eroded or saturated with water for long periods of time, and it either does not flood frequently during the growing season or is protected from flooding (7 CFR 657.5 (a)). Approximately 15,462 acres of potential prime farmland soil mapping units are on BLM lands and approximately 131,598 acres are on the federal mineral estate (designated by the USDA-NRCS). Most of the prime farmland occurs along stream and river valleys and terraces as well as on gently sloping upland areas. To meet the criteria of a prime farmland unit, most soils on BLM lands would require additional moisture, such as dependable irrigation water which is lacking on BLM lands.

Unique farmland is land other than prime farmland that is used for the production of specific high value food and fiber crops. It has the special combination of soil quality, location, growing season, and moisture supply needed to economically produce sustained high quality and/or high yields of a specific crop when treated and managed according to acceptable farming methods. Examples of such crops are citrus, tree nuts, olives, cranberries, fruit, and vegetables (7 CFR 657.5 (b)). By definition, no unique farmlands occur within the planning area.

Solid Minerals

Leasable

Mineral resources are managed under the Mineral Leasing Act of 1920. Coal is a leasable solid mineral with occurrence potential in the planning area; however, no leases have been issued, no production is occurring, and the potential for development is considered to be low enough that there is no interest in obtaining leases. Factors contributing to this lack of potential include the poor coal quality as well as the prominence of thin, discontinuous beds which are not amenable to surface mining. Much of the coal in the planning area is contained in beds less than five feet thick.

In the western portion of the planning area, small portions of western Liberty, northern Chouteau, and southwestern Blaine Counties contain the only assumed recoverable coal deposits. These coal deposits are contained in the Upper Cretaceous age Eagle, Judith River and Hell Creek formations and in the Tertiary age Fort Union formation. Past coal production in the area was predominantly from numerous, very small underground operations. An estimated 850,000 tons of coal was mined for local use from the Big Sandy and Milk River coal fields in Blaine County between 1890 and 1960 (USBOM 1966).

In the eastern portion of the planning area, coal beds are present in the Cretaceous Kootenai, Eagle, Judith River, and Fort Union formations. Coal has been reported at one location in the Jurassic Morrison formation on the flank of the Little Rocky Mountains uplift near Zortman. Generally, the coal in the planning area is classified as sub-bituminous in grade with a British Thermal Unit (BTU) rating of 8,300-11,500 BTUs per pound. The most likely area for development would be associated with a small area of Fort Union coal in Valley County. The coal there is near the western limit of the Scobey Lignite Field and contains the only surface minable coal identified in the planning area.

The planning area has no occurrence potential for phosphate, potassium, sodium, asphaltic material or oil shale resources.

Locatable

The General Mining Law of 1872, as amended, allows the location and maintenance of mining claims on those federal mineral estate lands open for mining claim location and patent. The BLM manages the Mining Law program on federal mineral estate, including lands where the surface is private and the claimant does not receive written consent from the surface owner. BLM management includes authorizing and permitting mineral exploration, mining, and reclamation actions. For exploration or operations other than casual use, the operator is required to submit a Notice or a Plan of Operations under regulations at 43 CFR 3809. These regulations require all operations to be conducted in a manner that prevents unnecessary or undue degradation.

Management actions may recommend closures to mineral entry by withdrawing areas from further location of mining claims or sites and may apply mitigation needed to protect other resource values when conducting activities under the operation of the mining laws.

Potentially locatable metallic (gold, copper, lead, zinc and silver deposits), nonmetallic (bentonite), and precious to semi-precious (diamond/kimberlite) minerals exist in the planning area (based on historical mining, geology, and known deposits). Areas of occurrence of precious metal deposits (gold and silver) are confined to portions of the Sweet Grass Hills and the Little Rocky Mountains. Approximately 19,671 acres in the Sweet Grass Hills and 3,505 acres in the Little Rocky Mountains are currently withdrawn from locatable mineral entry, subject to valid existing rights, which means that no new mining claims can be filed on those lands and valid existing claims must be honored.

Several igneous intrusions about the size of a city block are found near the Missouri River Breaks region of Phillips and Blaine Counties. These intrusions originated at extreme depth from within the earth and are called diatremes. The composition of these diatremes is similar to kimberlite, which contains diamonds in South Africa and other diamond producing areas. To date, sampling and analysis of these diatremes has not revealed any occurrence of diamonds. Several mining claims have been located in this area and presumably have been located on these diatremes.

Bentonite is composed of clay minerals from the montmorillonite group. The clay commonly has great ability to absorb water and swell from 10 to 15 times its dry volume. Swelling properties of the individual clay minerals determine the commercial use of the deposit. Deposits of bentonite are generally created from metamorphism of volcanic ash deposited in a marine environment. The geologic formations that contain the most noted bentonite deposits are the Bearpaw shale of the Montana Group, and the Mowry shale in the Colorado Group. Although bentonite does occur in other formations, these are considered to have the necessary thickness and physical properties to contain commercial deposits. The Bearpaw shale in Phillips and Valley Counties contains commercial bentonite deposits. Mineable bentonite in the Glasgow area is from a middle member of the Bearpaw formation. The upper and lower bentonite beds in this formation are each two to three feet thick. The upper bed has the best quality, but is the most difficult to mine due to limestone and iron concretions.

Bentonite can be considered locatable, leasable or salable (under the mining and mineral leasing laws) depending on quality of the material and whether the mineral estate is public domain or acquired. At present there are no bentonite leases or sale permits within the planning area.

Commercial mining of bentonite has occurred across the state since the turn of the century. Up until the late 1970s the general use of bentonite in the Phillips and Valley Resource Areas was pit-run bentonitic shale for sealing stock ponds and lining canals.

In 1976, Federal Bentonite opened a small processing plant southeast of Glasgow. The bentonite mining claims were leased from the Brazil Creek Bentonite Company of Glasgow. This was an open pit mine with plant processing capacities of approximately 200,000 tons annually. The final product was used for production of taconite pellets (used in iron ore refining). The plant was in production until 1979 and processed less than a million tons of bentonite. Although the plant was shut down, bentonite was mined from 1983 through 1985. Federal Bentonite produced approximately 180,000 tons during that three-year period. The bentonite was solar dried and shipped in bulk by rail.

In 1978, after several years of exploration, American Colloid opened a bentonite processing plant in Malta. This was an open pit operation with the capabilities of processing approximately 250,000 tons annually. The final product was used for drilling fluid additives or in the production of taconite pellets for the iron industry. The bentonite deposits were just south of Malta, located along outcrops of the Bearpaw shale. Up to the time the plant closed in 1986, American Colloid had processed approximately one million tons of bentonite. The plant was forced to close due to lack of a market for oil and gas drilling mud additives and taconite pellets. In 1988, American Colloid withdrew its patent application on 28 mining claims due to lack of a market for bentonite.

Although no active mining of bentonite is occurring in the Glasgow area, 450 active, unpatented mining claims located for bentonite are controlled by S&B Industrial Minerals Inc., North America. In the past few years, work has included exploration drilling and a Plan of Operations for a small five acre bentonite mine. Any future mining would require a large infusion of capital investment and a clear market indication for any significant operation to be feasible.

Major markets for bentonite 20 to 30 years ago were the Canadian oil and gas industry and the Great Lakes iron ore (taconite) industry. At present there is no increase in demand from either industry. The surge in oil and gas production in northeastern Montana and northwestern North Dakota has occurred with no new bentonite projects being initiated in the planning area, and the taconite industry in the Great Lakes region is nearly defunct. The distance from this source area to available markets is the primary limiting factor.

Table 3.47 shows current active mining claims by county.

Table 3.47
Active Mining Claims

	Active Mining Claims		***Commodity***	
County	***Lode***	***Placer***	***Lode***	***Placer***
Blaine	40	0	gold	
Chouteau	0	**0**		
Glacier	0	0		
Hill	0	0		
Liberty	15	0	gold	
Phillips	32	201	gold	bentonite
Toole	6	0	gold	
Valley	0	450		bentonite

Source: BLM LR2000 (2009).

Salable

Salable minerals were designated under the Materials Act (July 1947), which authorizes the disposal of petrified wood and common varieties of sand, gravel, stone, pumice, cinders and clay through a contract of sale or free use permit. Uncommon varieties of these same minerals are locatable under the Mining Law. Management actions for salable minerals determine areas open or closed to mineral material development and identify mitigation needed to protect other resource values.

Salable minerals include, but are not limited to, sand, gravel, stone (e.g., decorative stone, limestone, and gypsum), clay (e.g., shale), limestone aggregate, and common clay; all of which occur within the planning area. These commodities are classified as industrial minerals and typically are characterized as high bulk, low value. As long as the development potential remains limited and the unit valuation remains low, mineral materials are not expected to be significant contributors to the mineral industry sector of the local economy.

The planning area contains deposits of sand and gravel that originated from fluvial and glacial sources. The BLM issues permits for the use of these materials. Most of the commercially developed gravel sources are privately owned. The

primary users of federally owned mineral material deposits are state and county governments which remove material under free use permits issued by the BLM.

Tertiary gravels make good material for road surfacing and construction projects. Most deposits contain adequate fines for roadwork, though some may require crushing. Some of the quaternary terrace deposits consist almost entirely of limestone pebbles and cobbles, and may not be as durable as deposits containing more igneous material.

The deposits of glacial origin contain a large percentage of igneous material. The amount of fines is variable depending on the specific depositional environment. The till or moraine material has a high clay content and makes a good low permeability liner for ponds and canals.

In the past, chemical grade limestone has been mined from the Beaver Creek area in the Little Rocky Mountains for use as caustic lime at the Zortman/Landusky Mine.

Extensive deposits of bentonitic shale (common clay) occur throughout the planning area. This material is useful in construction projects where low permeability barriers are required such as for reservoirs or irrigation canals. When active, the Zortman/Landusky Mine used bentonitic shale as liner material for cyanide leach pad and pond construction. Several hundred thousand cubic yards of bentonitic shale have been mined from BLM lands within 10 miles of the Zortman/Landusky Mine. This production ended when the mine closed and future use of similar material is not anticipated to be significant.

The entire planning area typically experiences a relatively low and steady level of salable minerals disposal activity. The primary commodity produced within the planning area is sand and gravel. Table 3.48 shows current gravel pits by county and estimated average annual production.

Table 3.48
Active Gravel Pits on BLM Land in the Planning Area

County	*Mineral Materials Sites*	*Average Annual Production (estimated) (cubic yards)*
Blaine	4	5,000
Chouteau	1	1,000
Glacier	0	0
Hill	0	0
Liberty	0	0
Phillips	9	10,000
Toole	4	5,000
Valley	9	5,000

Source: BLM LR2000 (2009).

Special Designations

Areas of Critical Environmental Concern

Existing ACECs

Azure Cave ACEC

The Azure Cave ACEC (141 acres) was designated in 1994 to protect cave resources and potentially the northernmost bat hibernaculum in the United States. Azure cave is a limestone solution cavern located near Zortman in the Little Rocky Mountains (shown on Map K.1 in Appendix K). The cave has national significance because of its bat

hibernaculum values. A colony of nine bat species including little brown myotis (Myotis lucifugus) and least brown bat (Myotis leibii) occupies the cave during the winter.

Azure Cave is located at an altitude of 4,465 feet. The inner temperature is 41°F. The entrance is a 20-foot diameter opening on the south side of a steep canyon. At the rear of the entrance, a 6-foot-high passage leads into the top of a large room (Big Room); a 70 foot drop is required to reach its floor. Big Room has two pits leading downward to the lower level; the pits are about 40 feet deep and require rope for descent. Most of the lower level is horizontal and contains several rooms connected by small crawlways. One crawlway leads upward to a series of small rooms and dome pits. Many of the rooms are party clay filled, and most of the crawlways are plugged with red clay after a short distance. Several false floors in the cave are probably due to cementation of the upper clay by vadose water and then excavation of clay under the false floors. Many stalagmites are built on these false floors. The cave reaches a depth of -220 feet and has 1,580 feet of mapped passage (Campbell 1978).

The cave contains a significant amount of speleothems. The lower level has many stalactites and stalagmites, some of which are more than 6 feet long. Cave popcorn and flowstone decorate the walls of the cave. In one room, very large clusters of helectites are found that are probably the best in Montana. The cave is still active and wet; the formations are still growing. A large colony of bats occupies the cave during the winter (Campbell 1978).

Azure Cave was again surveyed in 1979 (Chester, et al. 1979). An additional 298 feet of passage was mapped, bringing the length of the cave to 1,878 feet. They identified this as one of two known caves in the Northwest that contains hibernating bats. Because of the cave importance as a hibernaculum the report also recommended that entry by the public take place only between June 15 and August 15 each year during the absence of hibernating bats (Chester, et al. 1979).

Unrestricted access to the cave could represent a hazard to people inexperienced with caves and cave features, so only experienced cave explorers with knowledge of vertical caving techniques are allowed in it after receiving a permit from the BLM.

The lands were transferred to the BLM from the National Forest System by Public Land Order No. 3938 on February 23, 1966. This order withdrew 139.41 acres around the entrance to the Azure cave for the protection of public recreation values and the significant cave values and resources it contains. This withdrawn area is within the ACEC boundary. The withdrawal removed the land from all forms of appropriation under the public land laws, including the mining laws (30 U.S.C. Chapter 2) and reserved it under the jurisdiction of the Secretary of the Interior for the protection of public recreation values. The withdrawal does not alter the applicability of the public land laws governing the use of the land under lease, license, or permit, or governing the disposal of their mineral or vegetative resources other than under the mining laws.

Big Bend of the Milk River ACEC

The Big Bend of the Milk River ACEC (1,972 acres) was designated in 1994 to protect and manage archaeological resources, including the Henry Smith and Beaucoup sites, which represent bison hunting and prehistoric ceremonial use of the Northwestern Plains. The Henry Smith site is managed for interpretation and the Beaucoup site is managed for research.

The Big Bend area of the Milk River, northeast of Malta (shown on Map K.2 in Appendix K), has a high density of archaeological resources, many with rare or unique characteristics and scientific values. The cultural resources are between 1,000 and 2,000 years old and provide an exceptional opportunity for the study of relatively pristine sites encompassing a broad range of cultural functions established during a short period of prehistory. Sites include prehistoric bison kills in the form of traps, jumps and pounds with associated drivelines; prehistoric ceremonial and religious locales such as petroglyph boulders, medicine wheels, intaglios and burials; and complex habitation and resource exploitation manifestations characterized by large numbers of stone circles and cairns.

Two archaeological sites have been determined eligible for the National Register of Historic Places (NRHP) (24PH188 and 24PH189). Collectively termed the Beaucoup Site Complex, the two sites represent the nearly intact archaeological remains of Besant and Avonlea bison hunting cultures in primary archaeological context.

The Henry Smith Buffalo Jump Site (24PH794), an Avonlea bison kill site, is also considered eligible for NRHP listing. This site contains bison kill areas, drive lines, meat processing areas, petroglyph boulders and numerous concentrations of tipi rings and intaglios.

Vegetation types in the area include grassland, grassland-sagebrush and woodland. The latter type occupies a narrow strip of land along the Milk River and in coulee bottoms. Tree and shrub species include chokecherry, common snowberry, creeping juniper, plains cottonwood, silver sage, big sage, rose, silver buffaloberry, willow, box elder and a half shrub, fringed sagewort. Grass species include blue grama, green needlegrass, western wheatgrass, inland saltgrass, little bluestem, needleandthread, plains muhly, and prairie junegrass. The ACEC has no known endangered, sensitive, or threatened plant species. It may contain small patches of noxious plants (Canada thistle, leafy spurge, and knapweed).

Topography in the area varies from gentle rolling grasslands to level terraces along the Milk River, to river breaks composed of exposed shales, clays, and sandstones.

Bitter Creek ACEC

The Bitter Creek ACEC (60,701 acres) was designated in 2003 for its scenic diversity and variety of vegetation types and wildlife habitats. The ACEC (as shown on Map K.3 in Appendix K) is the same area as the Bitter Creek WSA in Valley County. Since this is a WSA, current management of this area is guided by BLM Manual 6330-Management of BLM Wilderness Study Areas, until Congress determines its eligibility into the National Wilderness Preservation System. If Congress does not designate this area as wilderness, a plan for management of the ACEC would be developed through a public process and initiated within two years. Following release by Congress and until an ACEC management plan is completed, the ACEC would be managed under BLM Manual 6330 as an extensive recreation management area where a limited commitment of resources will provide dispersed and unstructured recreational activities.

Numerous cultural sites are known to occur in the vicinity of the ACEC. Prehistoric inhabitants of this area were semi-nomadic hunter-gatherers. They were dependent on the abundant bison, pronghorn, deer and elk of the region as well as seasonally important plant species. They left behind chipped stone tools, fire hearths and tipi rings. These prehistoric features are still visible in the ACEC. This region was later homesteaded and cultural features associated with farming and raising livestock are also in the area.

Major recreation interests include hunting, wildlife viewing, hiking, sightseeing, nature study, and photography. Other recreational uses include camping, backpacking, and visiting homesteads. This area is managed for sparse use which is appealing to individuals who value challenge, remoteness, harsh conditions, risk taking, pioneering, self-reliance, and minimal social encounters. This semi-primitive nonmotorized area diversifies the recreation opportunities in northeastern Montana.

Seventy percent of the soils consist of shallow to moderately deep Lisam and Dilts soils on shale uplands. Surface runoff is rapid and water erosion hazard is severe. Thirty percent of the soils are mainly Phillips, Elloam and Thoeny. They are deep, well drained soils on glaciated uplands. Surface runoff is medium and water erosion hazard is moderate.

The Bitter Creek ACEC is located in the glaciated Missouri Plateau. Land characteristics of this area include rolling terrain, denuded badlands, and lush riparian areas. The major drainages support shrubs, willows, and cottonwood trees. Large plateaus converge into rugged eroded breaks. There are some high cliffs and classic badlands type areas. A “blow-out” type of landscape exists where the shale soils are held in place by horizontal juniper, buffaloberry, and a variety of small shrubs.

The Bitter Creek ACEC contains a variety of plant communities in healthy condition, including riparian, wetland, shortgrass prairie benches, woody draws, and shale badlands. The ACEC is within the Grama-Needlegrass-Wheatgrass (Bouteloua-Stipa-Agropyron) Potential Natural Vegetation type (Kuchler 1966) and is representative of this type in late successional status. The wooded draws include buffaloberry, Rocky Mountain juniper, green ash, chokecherry, and less commonly aspen.

The dominant vegetation of the stream channels is a sedgerush and/or streambank willow community at the wettest zone with rose-snowberry, buffaloberry and silver sagebrush with western wheatgrass, green needle grass, Canada wildrye

and other deep rooted perennial grasses at the upper terrace level. Tree cover is very limited; species include green ash, plains cottonwood and peachleaf willow.

Minimal visual intrusions do not detract from the scenic experience. Scenic qualities include the vast, unhampered domain; lack of facilities such as paved roads, buildings, and billboards; and spatial organization such as line, form, visual compositions that dominate the landscape. These visual compositions can be defined as vegetation characteristics, geological features, visual clarity, and social imprints.

The entire ACEC is within the Willow Creek watershed. No perennial streams are located in this area and existing waters in reservoirs and seasonal runoff contain high levels of salts. Willow Creek, Bitter Creek, Chisholm Creek, and Eagles Nest Coulee are the primary stream courses in the ACEC.

The Bitter Creek area combines a lack of road development with a variety of habitats that support diverse grassland wildlife species. Included in this area are excellent examples of prairie riparian, wetland, grassland, woody draw, and breaks habitats. Migratory game, upland game and nongame birds; raptors; game and nongame resident wildlife; fur-bearing species; predatory wildlife species; amphibians and reptiles are present in the area either yearlong or seasonally. The predominant wildlife species in the area are ones that migrate. Game species include mule deer, pronghorn antelope, sharp-tailed grouse, and Greater Sage-Grouse. The sensitive species that could use the area at some time during the year include peregrine falcon, ferruginous hawk, loggerhead shrike, northern goshawk, Baird's sparrow, canvasback, common loon, long-billed curlew, Swainson's hawk, and burrowing owl.

A watchable wildlife area is situated on the eastern rim where hawks and eagles can be seen soaring over the ACEC. This rim differs in elevation by as much as 600 feet from the floor of the ACEC.

Kevin Rim ACEC

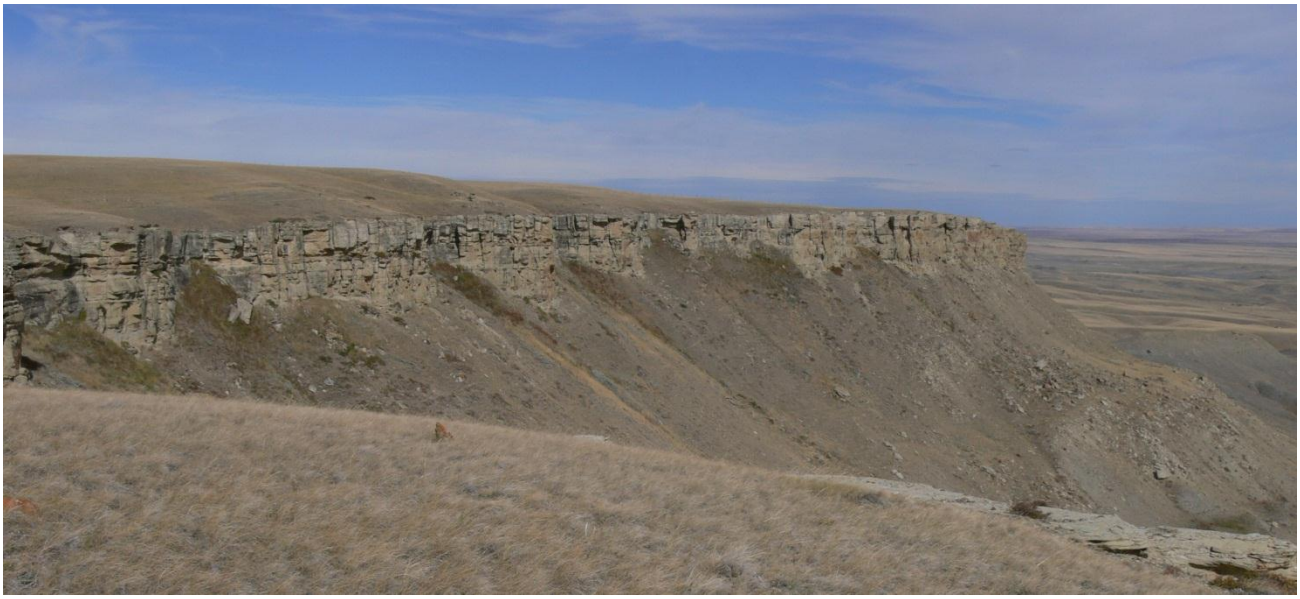
The Kevin Rim ACEC (4,557 acres) was designated in 1988 to protect, maintain, and/or enhance the peregrine falcon habitat, other sensitive raptor habitat, and cultural resources while encouraging other types of multiple use activities to the extent they are compatible with the ACEC designation. This ACEC is located in Toole County, and is shown on Map K.5 in Appendix K.

Archaeological resources in the ACEC are significant. Kevin Rim is a major escarpment located near numerous lakes and ponds. The area offered excellent buffalo hunting opportunities during prehistoric and early historic times. The rim was used for jumps which involved driving the buffalo over the edge to be killed by a fall of over 60 feet. The buffalo were then processed and consumed on the plains below as evidenced by hundreds of occupation sites along the base of the rim and extending outward for several miles. Most of the sites consist of stone circles, or tipi rings, and many of these are quite extensive (one site covers 160 acres and contains almost 300 tipi rings).

Most of the oil and gas resources within the Kevin Rim area are located in the Kevin-Sunburst field and the Amanda gas field. The discovery well for the Kevin-Sunburst field was drilled in March of 1922. By 1930, approximately 400 oil and gas wells had been drilled. By this time the margins of the field were fairly well defined (except for the west side) and it was quite obvious this area contained a large volume of oil and gas.

Kevin Rim serves as a primary breeding and nesting area for a number of raptors including state sensitive species such as the golden eagle and ferruginous hawk. Other raptors using the rim include the prairie falcon and rough-legged hawk. The steep, south facing walls of the rim provide optimum habitat for raptor breeding and nesting and is an uncommon feature in this area of gently rolling plains. Yearlong raptor use of the rim also occurs. Most raptors, including those using the rim, are quite susceptible to disturbance. This is especially crucial during the breeding and nesting period and may be a significant factor limiting maximum raptor use of the rim.

Kevin Rim also has potential high value habitat for peregrine falcons. No known use of the rim is presently occurring. However, peregrine falcons have used a nest site on Kevin Rim in the past. The rim has been identified as a peregrine reintroduction site.



Kevin Rim ACEC Photo by Craig Miller

Mountain Plover ACEC

The Mountain Plover ACEC (24,762 acres) was designated in 2003 to provide natural habitat for the mountain plover, a prairie bird. The ACEC is located in south Valley County, Montana and is shown on Map K.4 in Appendix K. The eastern corner of the area is in the Milk River Basin, approximately 20 miles west-southwest of Glasgow, Montana.

This ACEC contains breeding habitat for mountain plovers. The area is unique because the hardpan areas along Beaver Creek provide habitat for mountain plovers away from traditional habitat associated with prairie dogs. The area contains approximately 160 mountain plovers, which is greater than 1% of the global population of this species. The area is also recognized as a Globally Important Bird Area by the National Audubon Society because of the numbers of breeding mountain plovers in the area.

Numerous cultural inventories have been conducted in south Valley County which have resulted in the discovery of cultural sites. These are generally small prehistoric sites consisting of stone tools, remnants of fire pits or hearths, stone cairns, and tipi rings. The area also contains cultural features associated with farming and raising livestock.

Dispersed recreation opportunities exist within this area being used primarily for hunting and OHV travel. The primary season of use is September 1 through December 1.

A common soil along the watercourses is a Vaeda silty clay. This nearly level and gently sloping soil (0 to 3%) is on fans and terraces. The Vaeda series consists of deep, well-drained soils that formed in alluvium deposited by water from ancient rivers. Permeability is very slow. The available water capacity is low or moderate. They have a high content of sodium (alkali) which causes a dispersed condition, and intake of water into the soil is restricted. This soil is subject to rare flooding. Surface runoff is medium to rapid. The hazard of wind erosion is slight and the hazard of water erosion is moderate. A common term to describe these soils is “hardpan.” Mountain plovers were found to primarily use these areas.

Surrounding the Vaeda silty clay soils are predominantly Lisam-Dilts clays with Thebo-Lisam clays, with 5 to 35% slopes. The ACEC consists of undulating to strongly rolling soils on uplands. The soils occur in an unpredictable pattern on the landscape. In places cobbles and stones are on the surface. Surface runoff is rapid. The hazard of wind erosion is moderate and the hazard of water erosion is severe.

The major upland vegetation types that occur in this area include the grass, big sagebrush/grass, and saltbush types. Clubmoss does not cover any appreciable amount of land in this area. Nuttall's saltbush is the dominant plant on broad

alluvial valleys associated with sedimentary badlands. Associated grass species include Sandberg bluegrass and western wheatgrass. Important forbs include prickly pear, wild onion, and wild parsley. Greasewood is often associated as a fringe type.

Mountain plovers primarily use the Nuttall's saltbush habitat on the valley bottoms. On the gentle rises on either side of the valleys is the wild buckwheat habitat. Both habitats have an extremely low vegetative height profile (4 inches) and large amounts of bare ground, primarily found in the bottom lands of the major drainages. Other habitats used by the mountain plovers included bentonitic soils dominated by a sparse growth of knotweed species, low rises in the bottom lands containing almost pure stands of blue grama, and shale soils with western wheatgrass. This latter habitat occurs on the ridge sides among the horizontal juniper habitat. Other similar appearing areas of vegetation (or lack of vegetation) are elsewhere in south Valley County and also in north Valley County, but are not as extensive.

This ACEC is within the Little Beaver Creek watershed. The area drains into Willow Creek, which flows into the Milk River downstream of Glasgow. Water quality is limited by salt content and high sedimentation rates due to the sparsely vegetated shale uplands. Grub Reservoir is the only large waterbody and covers 250 acres.

Prairie Dog Towns within the 7km Complex ACEC

The Prairie Dog Towns within the 7km Complex ACEC (16,403 acres) were designated in 1994 to provide additional management of prairie dog habitat for black-footed ferret reintroduction and long-term ferret recovery, associate species (mountain plover, burrowing owl, and ferruginous hawk), recreational viewing, and prairie dog shooting. The ACEC is shown on Map K.6 in Appendix K.

The Prairie Dog 7km Complex is in the southern portion of Phillips County. This area contained a significant amount of high quality habitat for endangered black-footed ferret. Prairie dogs are essential as the primary prey species for the black-footed ferret. The 7km Complex is based on the USFWS habitat assumptions for ferret management: the area encompasses two or more prairie dog towns that are not more than 7 kilometers apart (Biggins, et al. 1989).

The black-footed ferret, thought to be nearly extinct, was rediscovered at Meeteetse, Wyoming late in 1981 and a successful captive breeding program allowed USFWS to plan reintroduction of the ferret in its natural environment. In 1986, the Montana Black-Footed Ferret Working Group proposed eight possible reintroduction sites (Clark, et al. 1987). In 1987, they narrowed the selection to the top four Montana sites which were all in or associated with the Phillips Resource Area. The four sites were further evaluated after additional inventory data in 1988, and a paper by Clark and Minta (1989) selected this as the best possible site for reintroduction of the ferret in Montana.

The area still contains many acres of prairie dogs, but the overall acreage of prairie dogs is greatly reduced due to the presence of plague, and the ferret reintroduction effort has not succeeded here because of the reduction in prey.

Sweet Grass Hills ACEC

The Sweet Grass Hills ACEC (7,419 acres) was designated in 1992 to protect habitat which has high potential for reintroduction of the peregrine falcon; protect areas of traditional spiritual importance to Native Americans; and protect seasonally important elk and deer habitat and aquifers in the area that provide potable water to local residents. The area is also unique because of its gold, coal, silver and copper mining history. The ACEC is comprised of West and Middle Buttes, which are located in northeastern Toole County, and East Butte, which is located in northern Liberty County. The entire ACEC lies within the Sweet Grass Hills TCP. The ACEC is shown on Map K.7 in Appendix K.

The Sweet Grass Hills are important to the Blackfeet, Chippewa-Cree and Gros Ventre tribes for their traditional use. Numerous published and unpublished sources document this importance. For example, the Sweet Grass Hills were noted as important to traditional Blackfeet religious activities in the Congressional report on the American Indian Religious Freedom Act hearings in 1978. The Gros Ventres are reported to have used Middle Butte and Porcupine Butte for vision quests in the late 1880s. Modern religious use of Mount Brown by members of the Rocky Boy's Reservation is documented in BLM files. The Sweet Grass Hills offer the solitude and undisturbed environment which are key elements for traditional uses. Documented archaeological sites on the summit of Mount Royal and on the slopes of West Butte consist of the remains of structures regarded by Plains archaeologists as vision quest structures.

Soil types include loamy and clayey soils on fans and footslopes of mountains and foothills; loamy and clayey soils on forested mountains; loamy and loamy-skeletal soils on bedrock ridges and footslopes of mountains; and medium texture soils on terraces, footslopes, and fans.

Gold prospecting was widespread on East Butte near the turn of the century. The principal areas of placer mining were on Tootsie Creek and on the south slope of East Butte.

At the Sweetgrass Mine on East Butte, several tons of copper, lead, zinc, and 651 ounces of silver were produced before it was abandoned. In 1966, the Anaconda Company smelted 100 tons of a high silica ore containing lead, copper, silver, and traces of gold from the vicinity of the Brown-eyed Queen Mine.

Historical records and physical evidence indicate exploration interest in lode and placer deposits on all three buttes within the Sweet Grass Hills at various periods through the early 1960s. Approximately 2,000 ounces of gold from placers near Gold Butte within the Middle Butte complex is the only reported production (BLM 1996b).

Contemporary exploration in the Sweet Grass Hill commenced in the early 1970s. Several companies have had exploration interest in all three buttes, particularly in the Tootsie Creek area of East Butte, up through to the early 1990s. In 1993, the BLM completed the validity examination of 14 unpatented mining claims on East Butte as a result of the area being segregated for evaluation of Native American traditional interests and hydrologic concerns. The results indicated eight of the claims meet the test of discovery under the mining law and were valid. (BLM 1996b). The BLM currently has no Notices for exploration or Plans of Operation in the Sweet Grass Hills. The area is currently withdrawn from mineral entry and location. The withdrawal will expire in 2017.

Sweet Grass Hills ACEC Photo by Kathy Tribby

Stone and riprap have been extracted from quarries in the intrusives in the Sweet Grass Hills. An inactive riprap quarry is located on a patented mining claim in Section 32, T. 36 N., R. 5 E. The Bureau of Reclamation has a withdrawal in Sections 29 and 32 for preserving riprap sources needed for reclamation projects. However, no riprap sources were ever developed on the withdrawn lands.

The Sweet Grass Hills also provide excellent habitat for elk, mule deer and white-tailed deer. The forested habitat, topographic relief, and lush drainages are unique to the prairies of northern Montana. Elk inhabiting East Butte tend to concentrate during winter on the east side in the general locale of Mount Lebanon. Here they use the windswept (mostly warmer, southerly exposures) slopes where grasses are available, while bedding in the nearest timber where thermal cover provides protection. Elk on West Butte use southern exposures in the winter.

Mule deer also prefer the south-facing windblown slopes during the winter, concentrating at the prairie timber edges; however, mule deer are scattered throughout the Hills and heavy concentration areas are hard to pinpoint. Deer also form smaller wintering groups than elk; therefore, winter concentration areas are more numerous and scattered. Mule

deer use drainage bottoms, hay and alfalfa croplands during all seasons of the year. The use of some of the higher elevation timbered areas, dominated by public lands, is highest during the summer.

White-tailed deer are common to all drainages extending from the hills. The rank deciduous-shrub vegetation lining these drainages creates excellent cover as well as forage for whitetails. The heads of some of these drainages lie midslope in the hills and the deer habitat can extend for over 5 miles down their length. Hay cropland can be important feeding sites for the whitetails.

Potential ACECs

Frenchman Breaks ACEC

The Frenchman Breaks ACEC (42,020 acres) is nominated to protect scenic values, fish and wildlife resources (crucial mule deer winter range, diversity of wildlife and native fish), and an unfragmented fragile landscape.

The Frenchman Breaks are located mostly in extreme northeastern Phillips County and partially in northwestern Valley County (see Map K.8 in Appendix K). The area provides habitat for a variety of wildlife species and important winter habitat for several big game species. For further information on this potential ACEC, see Appendix K.

Grassland Bird/Greater Sage-Grouse Priority Areas ACEC

The Grassland Bird/Greater Sage-Grouse Priority Areas ACEC (461,220 acres) is nominated to protect habitat for Greater Sage-Grouse, Sprague's pipit, and other sagebrush and grassland-dependent species and protect this habitat from fragmentation.

The Grassland Bird/Greater Sage-Grouse Priority Areas are located in north Valley and Phillips Counties (see Map K.14 in Appendix K). The area provides relatively unfragmented habitat for multiple special status species birds including USFWS candidate species Greater Sage-Grouse and Sprague's pipit, and BLM sensitive species long-billed curlew, Baird's sparrow, McCown's longspur and chestnut-collared longspur. For further information on this potential ACEC, see Appendix K.

Greater Sage-Grouse Protection Priority Area ACEC

The Greater Sage-Grouse Protection Priority Area ACEC (930,265 acres) is nominated to protect habitat for Greater Sage-Grouse and other sagebrush-dependent species and protect this habitat from fragmentation.

The Greater Sage-Grouse Protection Priority Area is located in southern Valley and Phillips Counties (see Map K.15 in Appendix K). The area provides a large expanse of high quality Greater Sage-Grouse habitat. For further information on this potential ACEC, see Appendix K.

Little Rocky Mountains ACEC

The Little Rocky Mountains ACEC (27,177 acres) is nominated to protect prehistoric and historic archaeological resources and spiritual and traditional resources. Located in western Phillips County, the area is shown on Map K.17 in Appendix K.

Cultural resources consist of both prehistoric and historic archaeological resources, and spiritual and traditional resources. For further information on this potential ACEC, see Appendix K.

Malta Geological ACEC

The Malta Geological ACEC (6,153 acres) is nominated to protect paleontological resources. The proposed ACEC location (Map K.9 in Appendix K) has a high likelihood for the presence of rare and significant vertebrate and non-vertebrate fossil remains.

The area is known in the local, national, and international paleontological community for producing some of the more unique vertebrate specimens. For further information on this potential ACEC, see Appendix K.

Woody Island ACEC

The Woody Island ACEC (32,869 acres) is nominated to protect habitat for grassland-associated birds, including Montana BLM species of concern.

The Northwest Woody Island ablation moraine is a block of intact grassland habitat entirely on public land (22,411 acres) which is located in northern Blaine County and bordered by Canada to the north. The portion in Phillips County (9,699 acres) is also entirely on public land. It is separated from the Blaine county portion by six miles of mostly private land and is located two miles south of Canada. See Map K.10 in Appendix K.

Zortman/Landusky Mine Reclamation ACEC

The Zortman/Landusky Mine Reclamation ACEC (3,575 acres) is nominated to promote successful reclamation, protect associated infrastructure, and ensure public safety on BLM lands affected by prior mining activities. For further information on this potential ACEC, see Appendix K and Map K.11.

National Historic Trails

Lewis and Clark National Historic Trail

The Lewis and Clark National Historic Trail was designated in 1978 in recognition of the historic expedition by Lewis and Clark in 1804-1806. A portion of the Marias River exploration trail of the Lewis and Clark National Historic Trail (the trail explored by Meriwether Lewis while exploring the Marias River in 1805 during the outbound journey and in 1806 during the Expedition's return journey) crosses BLM land.

Nez Perce National Historic Trail

On October 6, 1986, the Nez Perce National Historic Trail was designated in recognition of the national significance of the 1877 conflict that began in Lapwai, Idaho, and ended at the Bears Paw Mountains where the Nez Perce surrendered on October 5, 1877. A portion of the Nez Perce National Historic Trail crosses BLM land north of the Upper Missouri River Breaks National Monument.

Lewis and Clark National Historic Trail on the Upper Marias River Photo by Craig Miller

Watchable Wildlife Areas

Four Watchable Wildlife Areas are located on BLM land within the planning area: BR-12, Lonesome Lake, Wards Dam, and portions of the Northeastern Plains Birding Trail.

The BR-12 Watchable Wildlife Area is located in northern Blaine County. This 200 acre prairie marsh in the midst of open grasslands is narrow and long, and is a great place to view ducks, Canada geese, golden eagles, ferruginous hawks, Swainson's hawks, shorebirds, and songbirds for much of the year.

The Lonesome Lake Watchable Wildlife Area is located in Chouteau County and is a unique prairie wetland complex. The shallow lake provides a resting spot for migrating waterfowl and shorebirds, especially in the spring. Look for pintails, mallards, blue winged teal, gadwalls, shovelers, willets, American avocets, and dowitchers. Occasionally tundra swans and snow geese have been spotted.

The Wards Dam Watchable Wildlife Area is located in north Valley County near the Bitter Creek WSA. This small prairie marsh provides open water and cattail habitat for a variety of waterfowl such as pintails and pied-billed grebes and other wetland-dependent species. The wetland is surrounded by rolling grasslands teaming with grassland birds such as Sprague's pipits and sharp-tailed grouse.

The Northeastern Plains Birding Trail is comprised of thirteen specific locations within northeastern Montana, of which only two are located on BLM land: one at the Camp Creek Campground within the Little Rocky Mountains and the second within the Bitter Creek WSA north of Glasgow. This vehicle-based trail showcases three National Wildlife Refuges, two campground/recreation areas, several Wildlife Management Areas, a National Historic Site, a National Park, a city park, and numerous tracts of public land.

- The Camp Creek Campground Watchable Wildlife Area within the Little Rocky Mountains is the first island mountain range visible from U.S. Highway 2 for travelers heading west and is a haven for mountain and forest wildlife, from pinyon jays in pines to bighorn sheep in mountain meadows.

- The Bitter Creek Wilderness Study Area north of Glasgow is part of a globally-important bird area that harbors pipits, longspurs, and grassland sparrows, and is the only place on the Northeastern Plains Birding Trail to see the swift fox.

Wild and Scenic Rivers

The BLM has identified and evaluated various river segments to determine their potential inclusion in the National Wild and Scenic Rivers System per Section 5(d) of the Wild and Scenic Rivers Act. Initial screening resulted in a list of 160 river and stream segments on BLM land for further consideration. Additional review focused on whether any of these 160 segments met free-flowing criteria and contained any outstandingly remarkable values, as defined in the WSR Act. Based on the review, 158 rivers and streams were determined to be free flowing, but only one river segment (Marias River) was determined to contain outstandingly remarkable values. The .75 mile segment of the Marias River from State Highway 87 near Loma downstream to the confluence of the Missouri River was found to be free-flowing and possess outstandingly remarkable fish and historic values. Appendix L, the Wild and Scenic Rivers Report of Eligibility and Suitability Determinations, includes a complete list of the rivers and streams that were assessed for free-flowing and outstandingly remarkable values.

Wilderness Study Areas

Bitter Creek Wilderness Study Area

The Bitter Creek WSA is located in Valley County, about 25 miles northwest of Glasgow and 18 miles south of the Canadian border. The WSA contains 60,701 acres in three roadless segments identified as Bitter Creek South, Bitter Creek West and Bitter Creek East.

The WSA consists of flat to rolling terrain varying less than 500 feet in elevation from south to north. Some extensive erosion resulting from glacial melt formed the denuded badland terrain through the center of the WSA. Vegetation consists of prairie grasses, creeping juniper, buffaloberry and other shrubs. Isolated stands of aspen and cottonwood are located in the drainages. The climate is semi-arid, characterized by fluctuations in precipitation and temperature, moderately low rainfall, low humidity, hot summers and cold winters.

Use in the WSA is mostly confined to the occasional outdoor enthusiast and grazing operators. Recreational use has primarily been by seasonal hunters. Some boundary signs have been installed at key access routes. Local demand to specifically use the WSA for wilderness values is minimal per year. The fall hunting season creates extensive use of primitive routes within the WSA and unauthorized cross-country travel. This area is also described in further detail in the *Existing ACECs*, Bitter Creek ACEC section above.

Bitter Creek WSA Photo by Kathy Tribby

Burnt Lodge Wilderness Study Area

The Burnt Lodge WSA lies a mile north of the Missouri River in Phillips and Valley Counties. It is bounded by a combination of a road, private land, state land and BLM land. Except for the road, the boundary is difficult to follow on the ground. The southern border is contiguous with the Charles M. Russell National Wildlife Refuge. The WSA contains 13,727 acres.

Most of this WSA has a natural appearance. The unit has a typical river breaks topography formed by tributaries that drop mostly from the northwest to the river. The steep slopes are badlands, but the majority of the area is covered with low tablelands. Its topography and trees hide the few developments. The primitive routes lie along flat ridgetops that finger into the WSA from the north. Most show old signs of construction, but are seldom used and difficult to follow. A person can drop below the ridges to escape these imprints.

Use in the WSA is mostly confined to the occasional outdoor enthusiast and grazing operators. Recreational use has primarily been by seasonal hunters. Some boundary signs have been installed at key access routes. Local demand to specifically use the WSA for wilderness values is minimal per year. The fall hunting season creates extensive use of primitive routes within the WSA and unauthorized cross-country travel.

Burnt Lodge WSA Photo by Brian Hockett

Vegetation – Rangeland

Fire and grazing were integral components sustaining the native prairie ecosystem prior to European settlement. Current vegetation communities reflect the many influences serving to shape them since then. Existing vegetative land cover in the planning area is displayed on map W.13 available on the RMP website at http://blm.gov/8qkd. Human activities have affected rangeland and forest plant communities primarily through livestock grazing and dryland farming, although a variety of other activities such as timber harvesting, fire suppression, mining, oil and gas development, and introduction of exotic plant species can also be included. These activities have resulted in alteration of the natural fire regime, an increase in woody plant species, and alteration of nutrient and hydrologic cycles. Alteration of the natural fire regime has likely had the greatest influence on native plant communities of any single ecosystem component; however, recent studies indicate that change from a natural grazing scenario, whereby herds of migrating animals used the landscape in a high-intensity, short-duration mode, to most currently managed livestock grazing systems, where grazing tends to be lower intensity but for a longer duration, may have had more impact than previously suspected.

Grassland communities, indicative of the climate, are the most prevalent of all community types across the planning area. Livestock grazing serves to maintain the health and functionality of the native prairie we know today, which provides a diversity of heterogeneous vegetation communities across the landscape.

Generally, most grass species are adapted to frequent fire intervals. It is widely thought that under natural conditions these grassland communities burned every five to seven years. With successful fire suppression over the last century, many grasslands are becoming shrublands, with an associated loss of habitat features provided by grasslands. Additionally, increased shrub growth increases the risk of high severity fires that alter soil and vegetation characteristics, increasing the risk of invasion by noxious weeds. With the addition of woody fuels from encroachment of trees and shrubs, the potential for very hot fires that burn duff and litter down to mineral soil has increased.

Two types of sagebrush communities can be found throughout the planning area. The silver sagebrush type is found in areas with well drained soils, while the Wyoming big sagebrush type is adapted to much drier sites and more clayey soils. Other commonly found species of shrubs include fringed sagewort, rabbitbrush, and winterfat. Large tracts of mature sagebrush communities were likely isolated and uncommon under natural conditions due to the frequency of the natural fire cycle (NRCS 2011). Most existing large tracts of sagebrush likely represent a disclimax, or aberrant plant community brought about from historic heavy grazing and fire suppression.

Other shrub communities occur in areas with unique site characteristics. Black greasewood and fourwing saltbush communities can be found in areas where more saline, heavy clay soils prevail. Woody draw shrub communities exist where soils are more productive and soil moisture conditions are favorable. These communities include chokecherry, currant, buffaloberry, snowberry, and aspen, which are particularly important to wildlife species, as well as green ash, box elder, and redosier dogwood.

The Frenchman Creek, Rock Creek, Milk River, Marias River, and Missouri River areas all have typical breaks type terrain. Breaks topography is rugged and supports relatively little vegetation due to steep terrain, shale and rock outcroppings, and an abundance of coarse clay soils.

Dense clubmoss (Selaginella densa Rydb.) is a major component of most upland vegetation communities, and is considered to be one of the main causative factors restricting improvement in ecological status where it has become dominant in the plant community. Once a site is dominated by dense clubmoss, a threshold is considered to have been crossed from which the plant community is unable to recover without considerable effort. Conversely, it also contributes to the stability of sites from decreases in ecological status and soil erosion. These sites are consequently very static. It is theorized that fire suppression and alteration of the natural fire cycle in an ecosystem where natural fires occurred frequently has in part allowed dense clubmoss to dominate many sites where it otherwise would likely have been suppressed.

Nonnative perennial communities are widespread across the planning area, by far the most common of which is crested wheatgrass, although annual bromes (e.g., cheatgrass) are increasing rapidly. When possible to manage as such, crested wheatgrass pastures can provide early season forage so grazing can be deferred on native rangeland. When intermixed

with native communities, however, it more often than not serves to increase grazing pressure on native species as livestock are reluctant to utilize the early maturing plant.

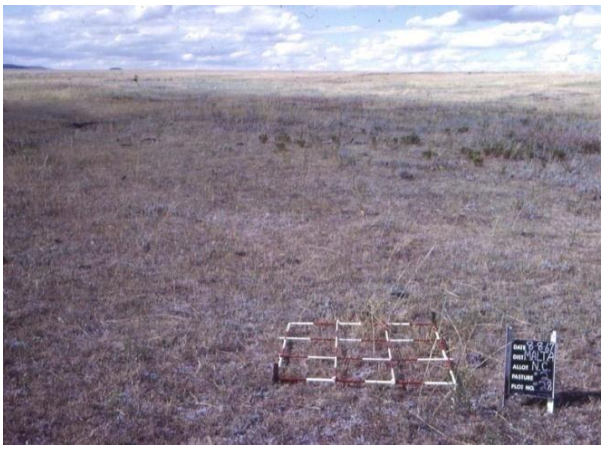
No major changes in existing vegetation composition across the planning area are expected to occur in the foreseeable future; however, some smaller scale, site-specific trends are likely to continue. Sagebrush will likely continue to increase in areas south of the Milk River, primarily in response to fire suppression and management activities that support alteration of the natural fire regime. Although the cause is unknown, a continued decline in woody-draw plant communities, primarily buffaloberry, will likely continue. Competition and encroachment from invasion of weedy species is likely to increase, particularly salt cedar encroachment from the Missouri River basin and knapweeds and leafy spurge from the west and the Milk River corridor. Currently, cheatgrass and annual bromes are rapidly becoming more prevalent in native communities, particularly in those areas occurring downwind of Conservation Reserve Program (CRP) fields (see Figure 3.13).

The first photo in Figure 3.13 was taken in 1967; the second was taken in 2006 at the same location. Note the prevalence of annual bromes in the foreground of the 2006 photo. Visual observations indicate the occurrence of annual bromes across much of the planning area now seems to be the norm, rather than the exception.

The factors that affect vegetation resources can be relatively obvious (e.g., wildfire, floods, logging, mining, and road construction) or more subtle (e.g., fire suppression, livestock grazing, or climate change).

Grasslands are adapted to, and to a certain extent require disturbance. How these disturbances are managed is generally more important than the type of disturbing factor itself.

Figure 3.13
Prevalence of Annual Bromes in 1967 versus 2006



1967

2006

Vegetation - Riparian and Wetland

Riparian and wetland communities are the transition zones between terrestrial and aquatic ecosystems. Riparian areas may be associated with lakes, reservoirs, estuaries, potholes, springs, bogs, wet meadows, and ephemeral, intermittent, or perennial streams. Because of the high productivity of riparian areas, they are very important resources for wildlife and livestock. The lush vegetation in riparian communities provides valuable food and cover. Riparian and wetland systems in the planning area are shown on map W.13 on the RMP website at http://blm.gov/8qkd.

BLM Manual 1737 defines wetlands as “areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support and which, under normal circumstances, do support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands include marshes, shallows, swamps, bogs, muskegs, wet meadows, estuaries and riparian areas.”

Jurisdictional wetlands, those that are regulated by the U.S. Army Corps of Engineers (COE) under Section 404, must exhibit all three characteristics: hydrology, hydrophytes, and hydric soils (COE 1987). It is important to understand that some areas which function as wetlands ecologically, but exhibit only one or two of the three characteristics, do not currently qualify as COE jurisdictional wetlands; thus activities in these wetlands are not regulated under the Section 404 program. Such wetlands, however, may perform valuable functions.

The typical prairie pothole on the glaciated plains is a wetland by the above definition because it supports vegetation adapted for life in saturated soil conditions. The typical pothole does not get flooded every year and often has water for only a short time, but when flooded it will support wetland vegetation.

Vegetative species common to riparian areas vary widely from site to site. Common species which occur in riparian areas are listed in Riparian Dominance Types of Montana (Hansen, et.al. 1988). Riparian communities along the perennial drainages and larger intermittent streams are often dominated by cottonwood and willow with occasional stands of green ash and box elder. The understory often consists of woody plants such as buffaloberry, snowberry, and Woods' rose, and grasses and forbs. The higher terraces adjacent to the floodplains are often dominated by silver sage or greasewood with a grass understory.

The West HiLine RMP/EIS (BLM 1992b), Judith-Valley-Phillips RMP/EIS (BLM 1994a), Rangeland Reform '94 EIS (BLM 1994b), and the grazing regulations (CFR 4100) provided extensive guidance on managing riparian areas in the early 1990s. Standards pertaining to riparian areas were identified in the grazing regulations and were further defined by the Standards and Guidelines (BLM 1997a) as Proper Functioning Condition (PFC). Riparian standard assessments have been accomplished through the watershed planning and permit renewal process that has occurred continuously since 1997.

Extensive riparian habitat inventory and vegetation monitoring has occurred within the planning area since the early 1990s. The areas were assessed using the Montana Wetland Riparian Association (MWRA) form developed by Hansen, et al. at Ecological Solutions Group. All riparian habitats are dependent on a balanced combination of physical (stream bank, channel, and soil characteristics), hydrologic (regular occurrence of surface water), and vegetative (hydrophytic communities) components. If any of those three components are negatively affected, the functional capacity of a riparian habitat may be degraded.

Riparian-wetland areas are properly functioning when adequate vegetation, landform, or large woody debris is present to dissipate stream energy associated with high water flows and flooding, thereby reducing erosion and improving water quality. Vegetation filters sediment and aids in floodplain development, improving floodwater retention and groundwater recharge. Deep soil-binding root masses stabilize stream banks against erosion. Stream channels develop to provide diverse ponding and channel characteristics that support enhanced water quality, fish production, waterfowl breeding, and greater biodiversity.

Riparian areas are invaluable to the function of other resources in the planning area. These areas support the highest densities and diversity of breeding birds, including bald eagle, great blue heron, Swainson's hawk, waterfowl, and numerous migratory birds. They also provide crucial habitat for furbearers such as beaver, white-tailed deer, red fox, and coyote. Riparian and wetland areas are especially important to the livestock industry, in that they often produce 10-15 times the amounts of forage compared to drier upland sites. Riparian areas are also critical for stabilizing stream banks and shading to reduce water temperatures of streams that support trout and other cold water species.

Approximately 962 miles of lotic (flowing water) riparian habitat and approximately 53,667 acres of lentic (standing water) wetland habitats are currently identified on BLM land in the planning area. The estimated miles and acres of the functional condition of streams and wetlands in the planning area are displayed in Table 3.49.

Table 3.49
Functional Condition of Streams and Wetlands in the HiLine Planning Area

Streams in Proper Functioning Condition (miles)	*Streams Functioning at Risk (miles)*	*Streams Nonfunctioning (miles)*	*Wetlands in Proper Functioning Condition (acres)*	*Wetlands Unknown Condition (acres)*
621	309	32	6,785	47,844

Source: BLM data (2007) and National Wetlands Inventory 1987.

It has been determined that an average of about 20% (68 miles) of the Functioning at Risk (FAR) and Nonfunctioning (NF) riparian zones along streams exhibited less than PFC at the time of assessment due to improper livestock grazing. As the functioning condition of riparian zones along streams improves or declines, which has occurred during the current RMP process, the reportable mileage varies. The BLM has implemented actions including riparian fences, livestock reductions, and updated grazing plans on 100% of the lotic riparian areas where the riparian zones were not meeting standards due to improper livestock grazing. Where trend information is available for lotic riparian areas that previously exhibited FAR, the trend is either improving or the riparian zones are moving towards or are now at PFC. Long-term trend is documented in the updated watershed reports and grazing permit renewal environmental assessments.

The lotic riparian miles that are FAR due to causes other than livestock grazing, which is roughly 80% of all FAR stream miles, are not meeting the riparian standard due to soils, weeds, road crossings, water control structures, and/or drought. Weed control measures have been taken over a large portion of the FAR riparian miles but little long-term trend information is available. The naturally occurring reasons for FAR riparian areas, such as soils and drought, are occurring in areas that will require extensive monitoring and science-based control measures that can be feasibly implemented by management.

Riparian areas can be impacted through natural processes or human activities. Natural processes include such things as drought, flood, fire and wildlife use; human-caused activities include livestock grazing, mineral extraction, oil and gas development, farming, and recreation. Improper grazing of riparian areas can affect the streamside environment by changing and reducing riparian vegetation. Roads within or close to riparian areas can also have negative effects on the riparian vegetation. They adversely affect these areas by vegetation removal, dust generation, sediment delivery to streams and associated wetlands, fragmentation by preventing channel migrations, and by increasing human activities such as camping and OHV use.

Vegetation – Special Status Plants

Special status species of plants require particular management attention due to rarity and habitat concerns and include:

- federally listed threatened or endangered species and designated critical habitats;
- federally proposed species and proposed critical habitats;
- federal candidate species; or
- Montana BLM sensitive species.

The HiLine planning area has no federally listed threatened or endangered special status plant species or federally proposed species.

Federal Candidate Species Plants

The USFWS added whitebark pine (*Pinus albicaulis*) to their candidate species list on July 19, 2011. The primary threat to the species is from disease in the form of the nonnative white pine blister rust and its interaction with other threats. Whitebark pine is also threatened by significant mortality from predation by the native mountain pine beetle. Past and ongoing fire suppression is also negatively impacting populations of whitebark pine through direct habitat loss. Environmental effects resulting from climate change also threaten the species through direct habitat loss and by exacerbating the effects of some of the other threats (USFWS 2011).

Whitebark pine is known from Glacier, Chouteau, Liberty and Toole Counties in the planning area. The only documented occurrences of whitebark pine on BLM land are in the Sweet Grass Hills. Kendall (1998) found both whitebark (five individuals) and limber pine (7 individuals) trees with dead, rust infection, and crown kill at similar rates. A subsequent, preliminary visit by the BLM to East Butte in September 2012 found dead, rust infection, and crown kills in both whitebark and limber pines. Two individual trees, one whitebark and one limber, were found to be living with rust infections and have been identified for cone collection and genetic testing for rust resistance. Future visits are planned to continue inventory and evaluation of both whitebark and limber pine on both East and West Buttes of the Sweet Grass Hills.

The Sweet Grass Hills population is currently the most northeastern known population of whitebark pine in the lower 48 states and occurs at lower elevations than other known populations through the U.S.

Montana BLM Sensitive Species Plants

Montana BLM sensitive species occurring in the planning area include five plant species. Table 3.50 shows the species and their general habitat association.

Table 3.50
Montana BLM Sensitive Species Plants
Occurrence in the HiLine Planning Area

Common Name	*Scientific Name*	*Status**	*General Habitat*
Whitebark pine	*Pinus albicaulis*	Candidate	Subalpine and treeline habitats
Longsheath waterweed	*Elodea bifoliata*	Sensitive	Wetland
Dwarf woolyheads	*Psilocarphus brevissimus*	Sensitive	Wetland
Slender bulrush	*Schoenoplectus heterochaetus*	Sensitive	Wetland
Slender-branched popcorn-flower	*Plagiobothrys leptocladus*	Sensitive	Wetland

Source: MT IM-2009-039.
* Candidate – USFWS Federal Candidate ; Sensitive – BLM Sensitive Species

Four BLM sensitive plant species are found in and around water and riparian areas. Not much is known of the status of these species in the planning area. General condition and trend of these habitats could be used to estimate the habitat conditions until the sites can be revisited and site-specific data collected. Effort is needed to inventory for these species and document habitat and trend conditions.

Long-sheath waterweed is known in the planning area from two sites in Phillips County. Six occurrences are known statewide. The aquatic habitat of this species is affected by drought and wetland modification to the lakes and ponds it occupies.

Dwarf woolyheads is found on two sites in the planning area, both in Phillips County, and six sites statewide.

Slender bulrush is known in the planning area from one site in Phillips County. Statewide, it is only known from two sites, the one in Phillips County and a second site in Sheridan County. Surveys in Sheridan County in 2000 failed to find the species. It had been observed as abundant in Sheridan County in the 1940s (Heidel, et al. 2000).

Slender-branched popcorn-flower is known in the planning area from one site in Phillips County. Five occurrences are known statewide.

Visual Resources

Visual resource inventories for the planning area were completed during the development of the Missouri Breaks Grazing Environmental Statement (BLM 1979) and the Prairie Potholes Environmental Impact Statement (BLM 1982). These inventories evaluated the visual features of land, water surface, vegetation, and structures. The evaluations were then used to determine visual resource management (VRM) classes for the planning area.

Visual Resource Management Classes

No VRM Class I ratings are currently assigned to the planning area. This class preserves the existing character of the landscape. It provides for natural ecological changes; however, it does not preclude limited management activity. The level of change to the characteristic landscape should be very low and must not attract attention. All VRM classes for the planning area are shown on Map 2.16.

Approximately 417,334 acres of BLM land (17%) are rated as VRM Class II and include the Bitter Creek and Burnt Lodge WSAs, Little Rocky Mountains, Frenchman Creek area, portions of the Milk River, Sweet Grass Hills, portions of the Marias River, portions of the Missouri Breaks north of the Charles M. Russell National Wildlife Refuge and the Upper Missouri River Breaks National Monument, and small acreages within the Bears Paw Mountains. This class retains the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color and texture found in the predominant natural features of the characteristic landscape.

Approximately 58,213 acres of BLM land (slightly more than 2%) are rated as VRM Class III. This includes small acreages in and around the Milk River, areas south of the Sweet Grass Hills, Kevin Rim, and the Lonesome Lake area. This class partially retains the existing character of the landscape. The level of change to the characteristic landscape could be moderate. Management activities may attract attention, but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

Visual Resource Inventory Classes and Visual Resource Management Classes

Visual resource inventory classes are assigned through the inventory process. Class I is assigned to those areas where a management decision has been made previously to maintain a natural landscape. Classes II, III, and IV are assigned based on a combination of scenic quality, sensitivity levels, and distance zones.

Visual resource management classes are assigned through the resource management plan. The assignment is based on management decisions considering visual values, actions that may result in surface disturbances, and impacts on the visual values.

The remaining 1,961,928 acres of BLM land (81%) are rated as VRM Class IV. This class provides for management activities that require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance and repeating the basic elements.

Water Resources

The BLM manages water resources for resource values (e.g., watershed health, wildlife, riparian) and resource uses (e.g., recreation and water supply) within the framework of applicable laws, regulations, and agency policies. Water resources traverse BLM lands and are affected by BLM management activities.

Hydrology and Watershed

This section addresses both surface water and groundwater quality and quantity. Watershed management is the protection, conservation, and use of natural resources of a specific watershed in a manner that keeps the soil mantel in place and productive. The BLM manages watersheds to ensure that water yield and quality are not degraded and meet the desired uses. Natural or human-caused vegetation and soil disturbance can ratify undesirable watershed responses (e.g., severe flooding or erosion). Surface-disturbing activities could affect watershed health by increasing sedimentation and erosion rates which can affect water quality.

Portions of the middle Missouri, Marias River, and Milk River basins are located within the planning area. Within these basins are 23 subbasins, or fourth order watersheds (Table 3.51). These watersheds are defined by a hydrologic unit code (HUC) that identifies the specific hydrologic unit and consists of a two-digit sequence for each specific level within the delineation hierarchy. Perennial streams, intermittent and ephemeral drainages, and glacial lakes, ponds and pits make up the primary surface water resources within the planning area. The fourth-order watersheds are shown in Figure 3.14.

Surface Water Resources

Perennial Stream: A stream that normally has water in its channel at all times.

Intermittent Stream: A stream that flows only when it receives water from rainfall runoff or springs, or from some surface source such as melting snow.

Ephemeral Stream: A stream or part of a stream that flows only in direct response to precipitation; it receives little or no water from springs, melting snow, or other sources; its channel is at all times above the water table.

Critical watershed areas include soils that have a high potential for salt yield, are subject to severe water and wind erosion when disturbed, have high runoff potential during storm events, are subject to frequent flooding, or have a potential for loss of vegetation productivity under high rates of wind and water erosion. For more discussion on soils susceptible to wind and water erosion within the planning area, refer to the Soils section.

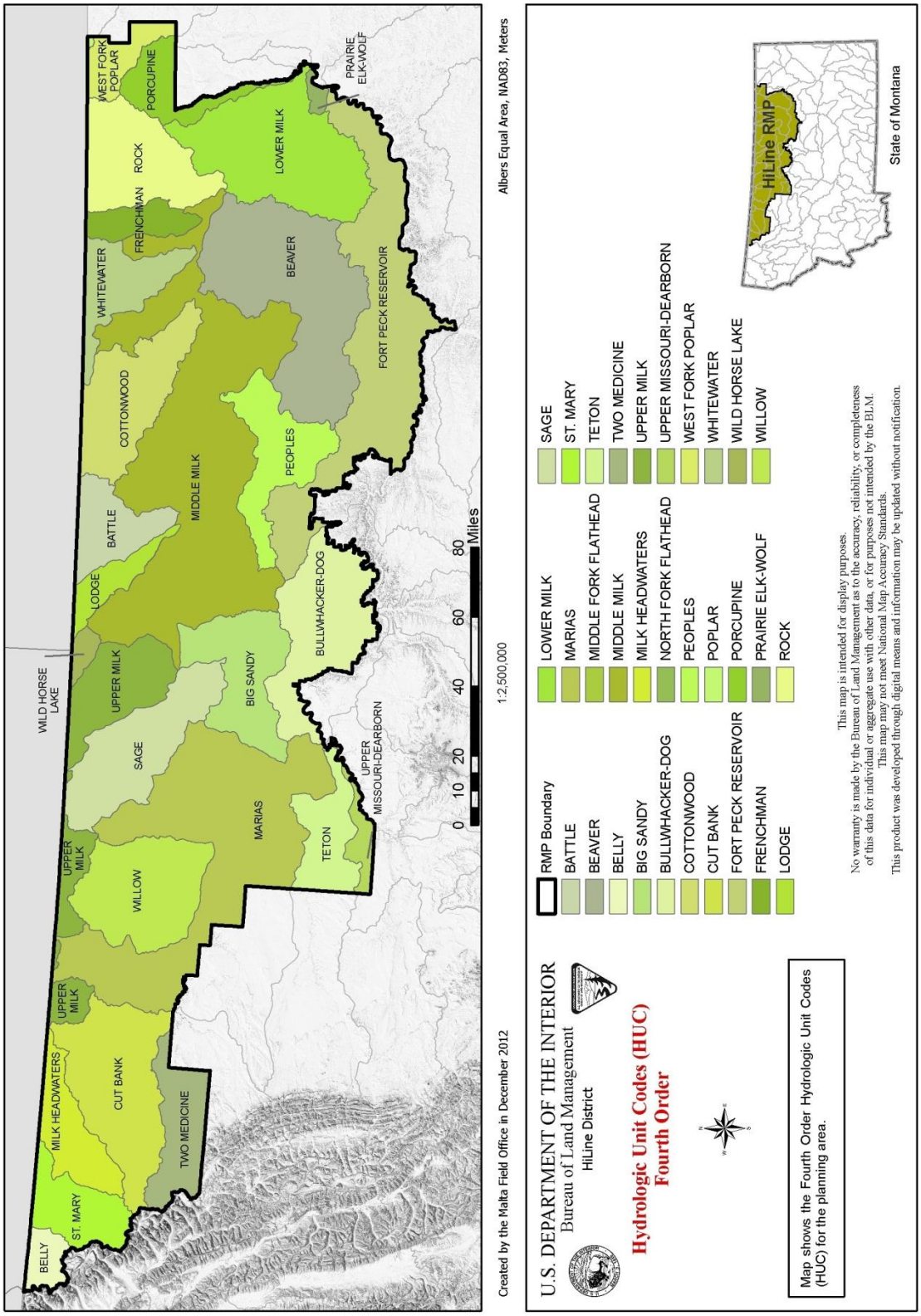
Table 3.51
Fourth Field Hydrologic Unit Code (HUC)
Watersheds in the HiLine Planning Area

Basin/Sub-Basin Name	*Hydrologic Unit Code*	*Total Watershed Area (sq. mi.)*	*BLM Land in Watershed (%)*
Marias			
Two Medicine	10030201	1,320	< 1.0
Cut Bank	10030202	1,230	< 1.0
Marias	10030203	3,680	1.7
Willow	10030204	985	< 1.0
Teton	10030205	1,960	1.6
Middle Missouri			
Bullwhacker-Dog	10040101	1,930	18
Fort Peck Reservoir	10040104	5,350	29
Milk			
Milk Headwaters	10050001	520	0.0
Upper Milk	10050002	1,040	< 1.0
Wild Horse Lake	10050003	91	19.8
Middle Milk	10050004	3,390	10.7
Big Sandy	10050005	851	2.7
Sage	10050006	1,050	< 1.0
Lodge	10050007	244	6.0
Battle	10050008	485	29.8
Peoples	10050009	735	2.8
Cottonwood	10050010	926	24.8
Whitewater	10050011	536	48.5
Lower Milk	10050012	1,740	42.0
Frenchman	10050013	286	32.0
Beaver	10050014	1,750	35.8
Rock	10050015	878	54.2
Porcupine	10050016	750	5.0

Source: U.S. Geological Survey (USGS) 2007, modified by BLM 2007.

Sand Creek, Chouteau County Photo by Steve Zellmer

Figure 3.14
Hydrologic Unit Codes (HUC) Fourth Order



Factors Affecting Water Availability and Use

Water use in the planning area is affected by human factors that relate to water demand and natural factors associated with water availability. The supply of water is extremely variable from place to place across the planning area and can be highly variable from year to year. Average annual precipitation across most of the planning area ranges from less than 10 inches, to more than 20 inches in the Bears Paw Mountains and the westernmost portion of the planning area near Glacier National Park (USGS 2004). The annual precipitation that falls within the planning area is largely consumed by plant transpiration and evaporation from land and water surfaces. Average annual runoff ranges from one inch for Valley, Phillips, Blaine (excluding the southwest corner of the county), and the northern portions of Hill, Liberty and Toole Counties; to 1-5 inches for portions of Blaine, Hill, Liberty, Toole, Chouteau, and Glacier Counties. Average annual runoff for the higher elevation areas of Glacier County ranges from 10 inches to greater than 30 inches. Figure 3.15 depicts average annual runoff in Montana as reported from 1951-1980 (USGS 2004).

Groundwater availability is determined in a large part by the unconsolidated deposits and different rock types that compose the diverse geology of the planning area (described in detail in the Geology section). Large areas of the planning area are underlain by shale and fine grained sandstone of the Cretaceous and Tertiary age that yield small amounts of water, or yield water that is not regularly administered for many beneficial uses due to excess mineralization. Many of the rocks that form the distinct island mountain ranges (Little Rocky Mountains, Bears Paw Mountains and the Sweet Grass Hills) typically yield small amounts of water but do not form principal aquifers. Unconsolidated deposits of the Quaternary (or Tertiary and Quaternary) age, including course-grained glacial deposits, alluvium, and basin fill, generally are the most productive and utilized aquifers in the planning area. Many stock, domestic, irrigation, and public supply wells are completed in these productive aquifers that underlie the narrow river and stream valleys of the planning area. Figure 3.16 depicts other unconsolidated deposits across the planning area such as till and fine-grained glacial lake deposits of the Quaternary age that generally yield small quantities of water to wells (USGS 2004).

The population of the planning area is concentrated along the Burlington-Northern rail line and the Milk, Marias and northern margin of the Missouri River valleys. The 2005 population of the planning area was 60,304, a decrease of 4.9% since 2000 (for more detailed discussion of demographics, refer to the Social and Economic sections). Water demand for most non-agricultural uses is closely tied to this population distribution. Agriculture is one of the planning area's largest industries, with farms and ranches making up approximately 80% of the planning area (USDA Agricultural Facts 2008). The most prevalent off-stream water uses in the planning area, due to the large agricultural industry and relatively dry climate, are pasture irrigation and irrigation of crops (primarily hay production). Table 3.52 depicts the planning area's total population and water withdrawals by county for 2000 (excerpt from USGS 2004).

Table 3.52
Total Population and Water Withdrawals in the HiLine Planning Area by County, 2000

Demographics		*Withdrawals by Category (Mgal/d)*					*Totals*	
County	*Population of County*	*Irrigation*	*Public Supply*	*Self-Supplied*	*Self-Supported Industrial*	*Livestock*	*Total Withdrawals (Mgal/d)*	*Total Withdrawals (acre-ft/yr)*
Blaine	7,009	326.90	.78	.15	0	1.10	328.94	369,470
Chouteau	5,970	44.46	1.21	.18	0	.69	46.54	52,280
Glacier	13,247	111.18	1.92	.21	0.30	.66	114.26	128,340
Hill	16,673	10.85	1.61	.22	0.01	.47	13.15	14,770
Liberty	2,158	30.48	.38	.04	0	.32	31.22	35,070
Phillips	4,601	276.22	.39	.12	0	1.20	277.93	312,170
Toole	5,267	10.74	.88	.03	0.22	.39	12.26	13,780
Valley	7,675	201.53	1.40	.13	0.06	.98	204.11	229,260
Total	62,600	1,012.36	8.57	1.08	0.59	5.81	1,028.41	1,155,140

Source: Modified from USGS 2004.

Figure 3.15
Average Annual Runoff in Montana 1951-1980

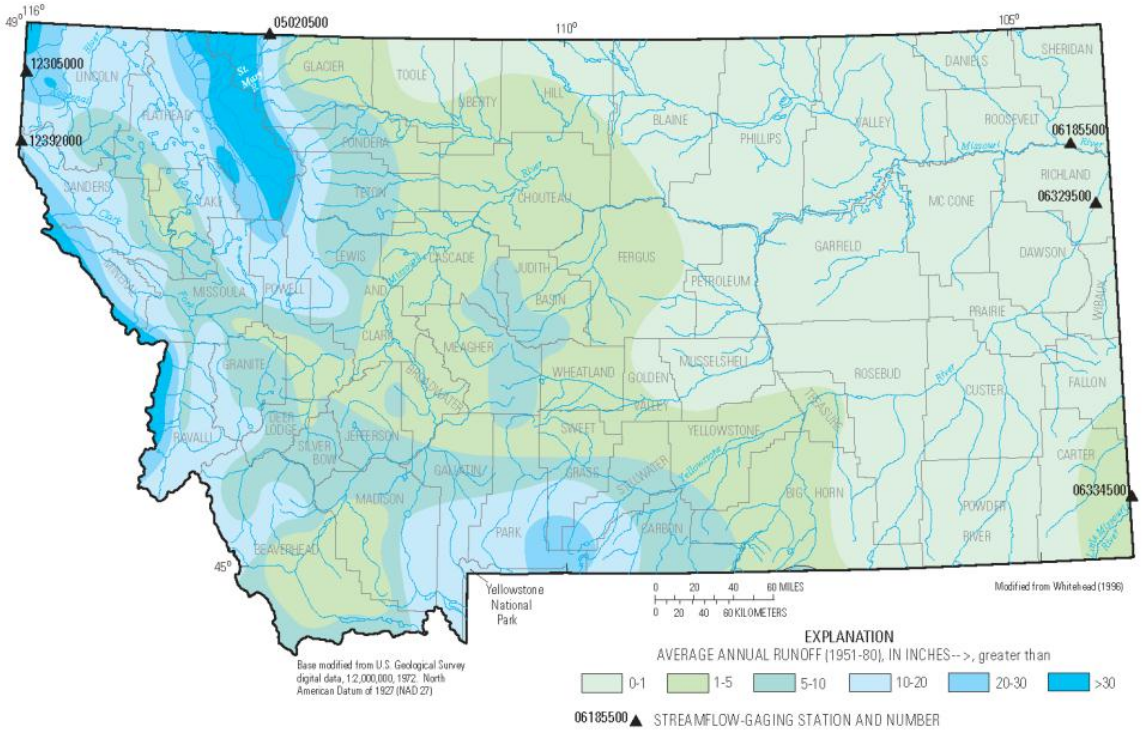
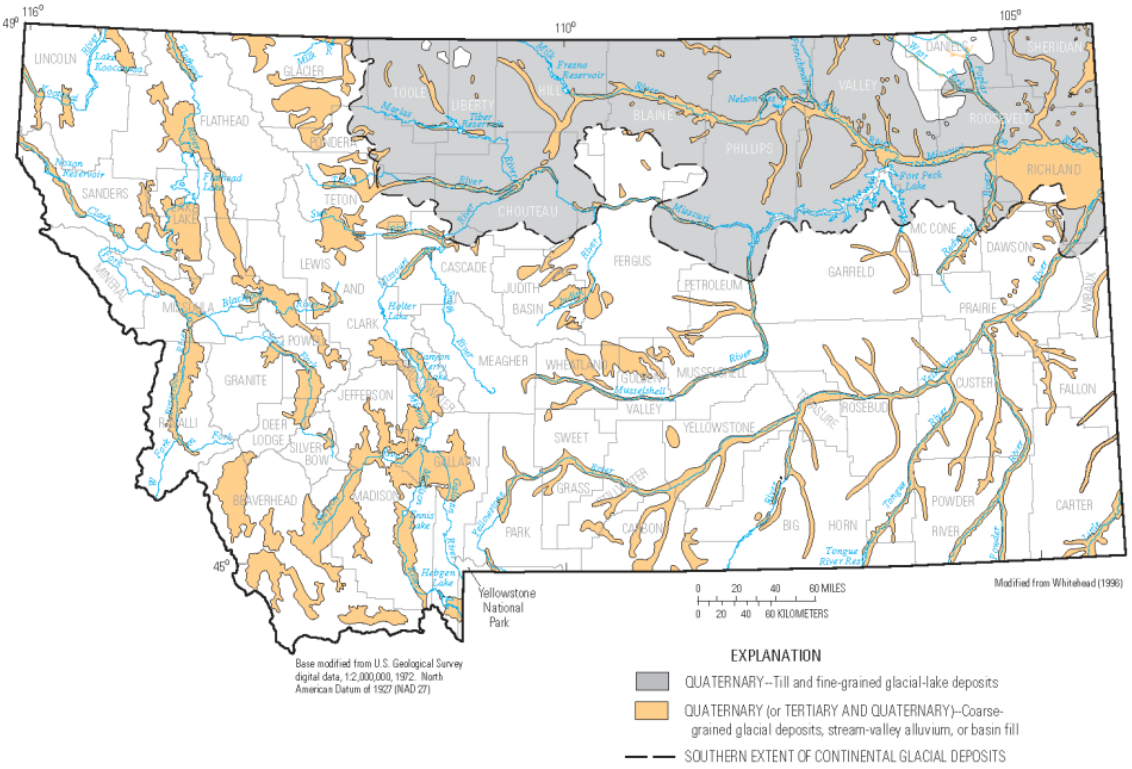


Figure 3.16
General Extent of Unconsolidated Deposits that Yield Water to Shallow Wells



Water in the planning area is used for agricultural, municipal, industrial and recreation purposes. Table 3.53 shows the types and number of water developments located on BLM lands.

Table 3.53
Water Developments on BLM Lands

Type of Improvement	*Glasgow Field Office*	*Malta Field Office*	*Havre Field Office*	*Total*
Reservoirs (number)	1,690	2,292	754	4,736
Wells (number)	22	42	29	93
Pipelines (miles)	66	16	46	128
Springs (number)	26	44	12	82
Water spreaders (acres)	5,755	0	3	5,758
Water savers (number)	0	4	0	4

Source: BLM 2011.

Instream uses of water for recreation and fish and wildlife habitat are important to the planning area's expanding tourism industry. Rivers and reservoirs in the planning area are popular vacation destinations for float trips, fishing, and wildlife viewing. Guided river trips (floats and fishing) are popular on the Missouri and Marias Rivers. Nelson and Fort Peck Reservoirs are prime fishing destinations while the Bowdoin National Wildlife Refuge is a premier bird watching destination due to the combined presence of uplands, open-water, and wetland-riparian habitats.

Factors Affecting Water Quality

Several factors affect water quality; however, the probable sources for impairment fall under two categories: human activity or natural occurrences. Metals are the number one cause of water quality degradation in the planning area, followed by nutrients, stream alteration, and sediment (Montana 303(d)/305(b) Integrated Report, 2012). Water quality is negatively impacted by any activity that destroys or removes the vegetative buffer along stream channels. Resource extraction, livestock grazing, recreation, energy development, and natural events are the main causes of water quality impairment.

Vegetation holds soil in place, absorbs the impact from precipitation, and decelerates overland water flow. Erosion rates are accelerated when fires, grazing, and other activities induce the removal of vegetative cover. The condition of the drainage, streambed characteristics, and channel geometry reflect rates of erosion. Stable channels tend to have consistent streambed grade and well vegetated banks that are neither steep nor deeply incised. Unstable drainages show evidence of downcutting, gullying, and excessive sedimentation and erosion.

Surface Water (Quality)

Surface water quality can be affected by either point or nonpoint source pollution. Point sources (direct discharges of pollutants into surface waters) are regulated by the State under the Montana Pollution Discharge Elimination System (MPDES). Nonpoint source (NPS) water pollution is Montana's single largest source of water quality impairment. NPS pollution is contaminated runoff from the land surface generated by agriculture, forestry, urban and suburban development, mining, and other land use activities that cannot be tied to an exact discharge point. Common NPS pollutants include sediment, nutrients, temperature, heavy metals, pesticides, pathogens, and salt.

The Montana Nonpoint Source Management Plan (MDEQ 2012) informs the state's citizens about NPS pollution problems and establishes goals, objectives and both long-term and short-term strategies for controlling NPS pollution on a statewide basis.

The goal of Montana's NPS Management Program is to protect and restore water quality from the impacts of nonpoint sources of pollution in order to provide a clean and healthy environment. The Memorandum of Understanding Regarding Water Quality Management on Bureau of Land Management Lands in Montana (BLM and MDEQ 2010) is an important component of the Montana NPS Program. This Memorandum of Understanding (MOU) was developed to clarify the process for cooperatively controlling and abating water pollution from BLM lands in Montana. The MOU also provides the mechanism for ensuring project consistency with the State's NPS Management Program.

The 2012 Montana 305(b)/303(d) Integrated Report identifies the known conditions of surface waters across the planning area. Table 3.54 identifies those waters impaired by either point or nonpoint source pollution. It also identifies probable causes of impairment and the probable sources of the pollutant. The HiLine District manages 3,464 miles of perennial, intermittent, and ephemeral streams. Nine percent of this total (308 miles) has been designated as impaired by the State of Montana and EPA. The primary pollutants affecting these streams are riparian alterations, nutrients, metals, sediment, mercury, flow alterations, and habitat alterations. The primary sources are hydrologic and stream bank modifications, riparian and rangeland grazing, natural causes, and crop production. Heavy metals and mercury are the contaminants most associated with unknown and natural pollutant sources. Heavy metal contamination has been generated by local sources such as past resource extraction in the Little Rocky Mountains.

Table 3.54
Impaired Water Bodies by Fourth Level Hydrologic Unit Code

Fourth Level Hydrologic Unit Code	*Stream Segment within BLM Land*	*Miles within BLM Land (% of total stream miles)*	*Probable Impairment Type(s)*[A]	*Probable Impairment Source(s)*[B]
Marias Watershed				
Cut Bank (10030202)	Cut Bank Creek	2.39 (11.3%)	2, 6, 12	2, 9, 10
Marias (10030203)	Marias River	10.47 (14.8%)	14	4, 5
	Pondera Creek/Coulee*	0.75 (0.6%)	3, 5, 16	2, 3
	Corral Creek	1.09 (4.7%)	2	2
Teton (10030205)	Teton River	1.19 (1.0%)	6, 7	2, 6, 10, 11, 13
Middle Missouri Watershed				
Ft. Peck Reservoir (10040104)	Alder Gulch**	3.24 (81.0%)	1, 3, 4, 8	1, 5, 7
	Mill Gulch**	1.55 (91.2%)	1, 2, 3, 4, 8	1, 3, 7
	Montana Gulch**	1.64 (82.0%)	1, 8, 9	1, 5, 7
	Rock Creek**	4.91 (12.5%)	1, 3, 4, 8, 13	1, 5, 7, 8
	Ruby Gulch**	2.08 (71.7%)	1, 4, 8	1, 5, 7
	Sullivan Creek**	0.80 (100%)	3, 5, 6	1, 7
Milk River Watershed				
Middle Milk (10050004)	Milk River (011)	0.20 (0.18%)	4	2, 3, 5, 6
	Milk River (012)	6.52 (11.20%)	4	2, 3, 5, 6
	Milk River (013)	15.13 (14.72%)	4	2, 3, 5, 6
	Milk River (020)*	1.33 (3.5%)	1, 2, 3, 6	2, 3, 5, 6, 10
	Little Box Elder Creek*	0.08 (0.15%)	2, 7, 11, 12	3, 4, 5
Lodge (10050007)	Lodge Creek*	3.74 (4.5%)	2, 4, 6, 10	2, 3, 4, 6, 9
Battle (10050008)	Battle Creek*	5.13 (6.9%)	3, 5, 7, 11, 14	2, 3
Peoples Creek (10050009)	Lodge Pole Creek**	3.85 (89.5%)	1, 3, 4, 14	1, 4, 7
	King Creek**	0.14 (15.6%)	1, 3, 5	1, 7
	Big Horn Creek**	0.89 (86.4%)	1, 9	1, 5, 7
	Swift Gulch Creek**	1.27 (62.9%)	1, 8, 9, 18	1, 5, 7
Cottonwood (10050010)	Cottonwood Creek*	12.35 (21.3%)	1, 3, 7	4, 5, 8
Whitewater (10050011)	Whitewater Creek	31.7 (46.9%)	4	4
Lower Milk (10050012)	Milk River (010)*	4.17 (3.1%)	1, 4, 13	2, 3, 4, 5, 6
	Buggy Creek	15.42 (33.16%)	1	5

Table 3.54
Impaired Water Bodies by Fourth Level Hydrologic Unit Code

Fourth Level Hydrologic Unit Code	*Stream Segment within BLM Land*	*Miles within BLM Land (% of total stream miles)*	*Probable Impairment Type(s)*[A]	*Probable Impairment Source(s)*[B]
	Lone Tree Creek*	22.2 (100%)	2,3	6, 8, 11
	Willow Creek (031)*	6.49 (62.43%)	3, 5, 6, 7	3, 6, 8, 11
	Willow Creek (033)	55.78 (73.3%)	3, 5, 6, 7	2, 3, 8
	Little Beaver Creek *	15.44 (74.95%)	2, 3, 7, 11	8
Frenchman (10050013)	Frenchman Creek*	8.52 (10.33%)	3, 6, 11	2, 3, 4, 6, 8
Beaver (10050014)	Beaver Creek (011)**	5.14 (95.09%)	1	1, 4, 7
	Beaver Creek (013)	1.76 (3.20%)	2, 4	4
	Beaver Creek (014)	17.97 (18.33%)	2, 4	4
	Beaver Creek (020)*	0.80 (0.92%)	2, 3, 5, 15	2, 3, 4
	Big Warm Creek*	2.12 (3.71%)	2, 3, 5, 6, 7, 16	2, 3, 6, 8, 11
	Flat Creek	15.74 (42.64%)	1, 2, 7, 9, 10	4, 5
	Larb Creek*	20.87 (27.21%)	1, 2, 3, 10	2, 3, 4, 5, 12
Porcupine (10050016)	Porcupine Creek	3.04 (6.14%)	2, 16	2
Reservoirs				
Fresno Reservoir (100500208)			5, 6	6
Nelson Reservoir (10050014)			2, 6	2, 6

Source: Montana 303(d)/ 305(b) Integrated Report, 2012.

A Impairment Type: 1 = Metals; 2 = Nutrients-Phosphorus/Nitrogen; 3 = Alt. of Streamside Veg.; 4 = Mercury; 5 = Habitat Alterations; 6 = Flow Alteration; 7 = Sedimentation; 8 = pH; 9 = Arsenic; 10 = Oxygen Depletion; 11 = Algae; 12 = Temperature; 13 = Escherichia coli; 14 = Impairment Unknown; 15 = Uranium; 16 = Salinity; 17 = Sulfates; 18 = Cyanide.

B Impairment Source: 1 = Resource Extraction; 2 = Crop Production; 3 = Rangeland Grazing; 4 = Unknown Source; 5 = Natural Sources; 6 = Hydromodification; 7 = Historical Mining; 8 = Riparian Grazing; 9 = Urban Runoff; 10 = Water Diversions; 11 = Streambank Modification; 12 = Feedlot; 13 = Highways, Roads, Bridges, Infrastructure (New Construction).

* Segment potentially impacted by grazing (including hydrologic modifications such as reservoirs and pits).

** Segment potentially impacted by resource extraction (oil and gas, mining, timber).

Of the thirteen potential water quality impairment sources identified within Table 3.54, only six can be directly related to BLM management: (1) resource extraction, (2) rangeland grazing, (3) historical mining, (4) riparian grazing, (5) hydromodification, and (6) streambank modification. Table 3.55 identifies the primary causes and sources of stream impairments within the planning area.

Five segments in the Little Rocky Mountains (Middle Missouri watershed) are covered under a reclamation plan approved by the BLM and MDEQ (BLM and MDEQ 2002). Two segments, Teton River (Marias Watershed) and Lone Tree Creek (Milk River watershed), are covered by existing Total Maximum Daily Loads (TMDLs). Conditions are expected to improve as pollutant levels are reduced through the implementation of reclamation and management plans.

Various portions of the 15 BLM segments that are potentially impacted by grazing have been assessed for PFC (Table 3.56). The use of PFC as a first tier water quality assessment tool assists in defining appropriate lotic reaches to apply management actions. PFC indicates that BLM-managed segments are in good condition and suggests that the actual source of impairment may be located off of BLM lands. Upward trends suggest that current management may be appropriate for conditions to improve. When last assessed, nearly all of the segments that were FAR expressed an upward trend, except for 12.92 miles of Willow Creek (033), where the trend was identified as Not Apparent, and 0.91 miles of Cottonwood Creek, which exhibited a static trend.

Table 3.55
Primary Causes and Sources of Stream Impairments

	Miles	*% of Total*
Pollutant		
Alt. of Streamside Veg.	166.27	54
Sediment	114.32	37
Nutrients	110.12	36
Mercury	96.82	31
Metals	94.59	31
Flow Alterations	82.36	27
Habitat Alterations	69.89	23
Oxygen Depletion	40.35	13
Algae	29.17	9
Arsenic	19.54	6
pH	14.69	5
Escherichia coli	9.08	3
Unknown	8.98	3
Salinity	7.10	2
Temperature	2.47	1
Cyanide	1.27	<1
Sulfates	1.19	<1
Uranium	0.80	<1
Source		
Unknown	137.20	45
Riparian Grazing	133.18	43
Crop Production	132.77	43
Rangeland Grazing	127.81	42
Natural	116.31	38
Hydrologic Modifications	71.61	23
Streambank Modification	32.00	10
Resource Extraction	25.51	8
Historic Mining	25.51	8
Feedlots	20.87	7
Urban Runoff	6.13	2
Diversions	4.91	2
Highways, Roads, Bridges, Infrastructure (New Construction)	1.19	<1

Source: Montana 303(d)/ 305(b) Integrated Report, 2012

Table 3.56
Condition Assessments for Stream Segments Potentially Impacted by Grazing

Stream	*Proper Functioning Condition (miles)*	*Functioning at Risk (miles)*	*Nonfunction-ing Condition (miles)*
Battle Creek*	4.15	0.21	
Beaver Creek	All		
Big Warm Creek		2.06	
Cottonwood Creek	1.08	7.80	1.43
Frenchman Creek	1.27	7.20	
Larb Creek	16.87	4.03	
Little Beaver Creek		11.43	
Little Box Elder Creek**	NA	NA	NA
Lodge Creek	2.12		
Lone Tree Creek	All		
Milk River (020) in Milk River Watershed		0.19	
Milk River (010) in Lower Milk Watershed		0.92	
Pondera Creek/ Coulee		0.74	
Willow Creek (031)	6.50		
Willow Creek (033)	29.46	12.92	

* 0.14 miles of Battle Creek was removed from BLM management in a land exchange.

** The 0.08 mile long segment of Little Box Elder Creek has not had a conditional assessment completed by the BLM.

Inasmuch as the primary management-related sources of water quality impairment are grazing and riparian-related, the BLM should continue utilizing the upland and riparian Standards for Rangeland Health as primary indicators of BLM's contribution to water quality. Relevant indicators of water quality for the HiLine District (identified in the Standards and Guidelines for Rangeland Health, BLM 1997a) include: pH, sediment, turbidity, temperature, dissolved oxygen, fecal coliform, color, and toxins. Manageable streams should be evaluated at least every five years to ensure that conditions are maintained or moving toward desired conditions. Site-specific BMPs should be designed to improve water quality where current management actions do not appear to be producing desired results.

The EPA has approved the Assiniboine and Sioux Tribes (Fort Peck Reservation) and the Blackfeet Tribe (Blackfeet Reservation) for treatment as a State for purposes of the Clean Water Act Section 303 water quality standards program. The Assiniboine and Sioux Tribes (Fort Peck Reservation) have water quality standards in place. The Tribes' water quality standards are applicable to "waters of the Tribe." All stream segments that have received beneficial use designations (Big Muddy Creek, Big Porcupine Creek, Little Porcupine Creek, Missouri River, Poplar River, Smoke Creek, Tule Creek, and Wolf Creek) are within watersheds outside of the planning area. The Blackfeet Tribe (Blackfeet Reservation) has tribally adopted standards that are not yet approved by the EPA.

Groundwater (Quality)

Groundwater in the planning area occurs in unconsolidated materials (alluvium, glacial outwash, or terrace deposits) and in consolidated rocks such as sandstones, shaley sandstones, coal, limestone, or igneous rocks.

Shallow groundwater, where present, can be found in alluvial deposits along the larger stream valleys and in buried pre-glacial alluvial channels. These unconsolidated, shallow aquifers are generally 20-40 feet below the surface. Yields range from 1-100 gallons per minute (gpm); however, average reported yields are approximately 2-5 gpm. According to EPA drinking water standards, the groundwater quality of these unconsolidated, alluvial deposits exceeds the recommended level of 500 milligrams per liter (mg/L) of Total Dissolved Solids (TDS). Therefore, groundwater use is not recommended for domestic purposes without treatment, but is deemed suitable for agricultural use, including but not limited to watering of livestock. TDS concentrations are usually in the 1,000 to 5,000 mg/L range.

Rock Creek, Phillips County BLM Photo

The Judith River formation underlies most of the eastern portion of the planning area and is a widely used source of groundwater with TDS levels generally ranging from 800 to 2,000 (mg/L). The Judith River formation consists of approximately 500 feet of grayish-white sandstone and light to dark gray sandy shale and clay. These sandstones constitute the water-bearing horizons. The depth to water in the Judith River formation decreases in a northward direction. Wells range from approximately 1,000 feet deep near the Missouri River to 200 feet deep in the northernmost portion of the planning area approaching the Canadian border.

The structural attitude of the Judith River formation dips to the southeast. Most wells artesian flow at the surface in the UL Bend region. Static water levels decrease to the north and can be located 200 feet below the surface in the Whitewater area. Yields range from 2-20 gpm, but most yield 3-4 gpm. Wells near the Canadian border are generally 200-250 feet deep with yields of 3-4 gpm and static water levels reported at 150 to 200 feet below the surface.

The Bearpaw shale outcrops over a large portion of the planning area. The Bearpaw shale is 1,100 feet thick on average and is composed essentially of dark, lead-gray or almost black, clayey shale which forms an infertile, alkaline, “gumbo” soil. The Bearpaw formation contains thin, widely scattered, and isolated sandstone stringers, which seldom yield significant quantities of water to wells. Several springs and seeps occur in the deeply dissected drainages in the planning area. Yields are low, generally less than 1 gpm. Water quality is poor, with TDS levels precluding both livestock and domestic use; however, wildlife occasionally use these springs when other water sources are unavailable.

Aquifers are occasionally present at the contact between terrace gravel deposits and the underlying Bearpaw shale. These aquifers usually appear as low yield springs and seeps (less than 2 gpm) on hillsides above drainages. Water quality is generally suitable for livestock, but not for domestic use.

Other shallow aquifers occur in the area such as those residing in the Eagle Sandstone, but their extent is so limited that they cannot be considered major sources of groundwater.

Groundwater of better quantity is available from deeper aquifers, such as those found in the Madison formation, but the costs associated with development preclude exploitation by anything other than large commercial interests or municipalities.

If current trends continue there will be negligible increases in rural development and in industrial water demand. Historical meteorological data, as well as evidence from the geologic record, suggest that climate conditions have been highly variable in the region and that prolonged cycles of drought are possible.

Increased public demand for recreation may result in a small increased demand for water resources. Current development of potable water facilities for recreational use is negligible due to the high maintenance cost and monitoring requirements.

Improved management of watersheds is expected to lead to gradual and widespread improvements in water quality and watershed condition. Strategies for managing water resources involve multidisciplinary approaches. For example, water quality is expected to improve as impacts of surface-disturbing activities on vegetation cover are reduced through implementation of BMPs in riparian areas. The primary management-related sources of water quality impairment are grazing and riparian degradation. Utilizing BMPs for grazing and surface-disturbing activities, such as energy development and road construction, will protect riparian vegetation, which in turn will provide a buffer between overland flow and the stream channel. Prevalent riparian vegetation would protect stream banks, prevent excess erosion, and increase sediment delivery to surface water channels.

Floodplains

Floodplains are those land areas in and adjacent to streams and watercourses subject to continuous or periodic inundation from flood events with a 1% chance of occurrence in any given year (i.e., the 100-year flood frequency event). When stream banks overflow during or after a storm, the floodplain provides natural storage for the excess water. The 100-year frequency storm is used to determine the limits of the floodplain.

Floodplain function is essential to watershed function, water quality, soil development, stream morphology, and wetland and riparian community composition. Floodplains reduce flood peaks and velocities, thereby reducing erosion; enhancing nutrient cycling; reducing frequency and duration of low flows; and increasing infiltration, water storage, and aquifer recharge. Floodplains enhance water quality by facilitating sedimentation and filtering overland flow. Floodplains support high plant productivity, high biodiversity, and habitat for wildlife.

Hydrologic modifications via water diversions, dams, and channelization have altered the natural flooding regime and have reduced or eliminated floodplain functionality within some watersheds of the planning area. Periodic flooding is essential to riparian communities of active floodplains. In particular, plains cottonwood (Populus deltoides) recruitment is dependent on flood scour and maintenance of the historical magnitude, duration, and flood recurrence interval.

Although available since 1987, the Federal Emergency Management Agency (FEMA) flood maps have not been evaluated to determine the acreage defined within the 100-year floodplain demarcation. Therefore, the extent (in acres) of defined 100-year floodplains occurring on BLM lands within this planning area is unknown.

Floodplains receive special protection under Executive Order (EO) 11988 (1977), which directs federal agencies (including the BLM) to take action to reduce the risk of flood loss, minimize the impact of floods on human safety, health and welfare, and restore and preserve the natural and beneficial values served by floodplains. EO 11988 directs each agency to take floodplain management into account when formulating or evaluating any water and land use plans and requires that land and water resources be appropriate to the degree of hazard involved. Regulations and operating procedures for the licenses, permits, and loan or grants-in-aid programs that agencies administer are to include adequate provision for the evaluation and consideration of flood hazards. Agencies are to encourage and provide appropriate guidance for applicants to evaluate the effects of their proposals in floodplains prior to submitting applications for federal licenses, permits, loans or grants.

Water Rights

The BLM will apply for water rights to water sources on BLM land under the same regulations as all other appropriators. The State of Montana began adjudicating water rights in the early 1980s. The BLM filed claims on all existing water developments and natural sources (reservoirs, springs, potholes, etc.) occurring on BLM land. The BLM manages the land for multiple uses and files water rights to protect these uses. The BLM holds water rights for such beneficial uses as livestock, fisheries, waterfowl, and wildlife. Many BLM reservoirs have more than one water right attached to them so the varying uses listed above will be protected. The current BLM water rights (by purpose) in the planning area are summarized in Table 3.57.

Within the planning area, 27 of the commercial water rights (12 in Phillips County [57.6 total acre feet] and 15 in Valley County [104.7 acre feet]) are provisional permits that claim a volume of water for multiple beneficial uses. The water appropriated pursuant to the permits pertaining to commercial beneficial uses shall be used for multiple purposes including wildlife, waterfowl, stock-watering, and gas and oil well drilling from either April 1 or May 1 to December 31, inclusive, or each year. The appropriations shall not exceed a quantity of 162.3 acre-feet per annum. All appropriations with the purpose of gas and oil well drilling were acquired by the BLM prior to 1976 and the BLM does not intend to acquire additional commercial water rights with such a purpose over the life of this plan. The additional commercial water rights held by the BLM apply to water supply at recreation areas and campsites.

John Retention Reservoir in Valley County BLM Photo

Table 3.57
BLM Water Rights in the HiLine Planning Area

Purpose	*Glacier County*	*Toole County*	*Liberty County*	*Chouteau County*	*Hill County*	*Blaine County*	*Phillips County*	*Valley County*	*Total Water Rights*
Agricultural Spraying	0	0	0	8	0	0	0	0	8
Commercial	0	0	0	2	0	0	16	15	33
Fish and Wildlife	0	0	0	33	0	1	43	22	99
Fishery	0	0	0	0	0	3	0	1	4
Flood Control	0	0	0	0	0	0	10	177	187
Irrigation	0	0	0	0	0	3	3	52	58
Lawn and Garden	0	0	0	1	0	0	0	0	1
Multiple Domestic	0	0	0	0	0	1	0	0	1
Recreation	0	0	0	33	0	0	12	0	45
Stock	0	15	2	40	2	1,617	5,677	2,405	9,758
Wildlife	0	6	2	32	2	1,393	4,830	1,502	7,767
Wildlife/ Waterfowl	0	3	0	2	0	71	350	78	504

Source: Natural Resource Information System and the Montana Department of Natural Resources and Conservation 2009.

Wilderness Characteristics

The BLM maintains an inventory of all lands under its jurisdiction, pursuant to Section 201 of FLPMA. As required by law, the BLM will continue to maintain inventories of lands under its jurisdiction, including lands with wilderness characteristics. Also, consistent with FLPMA and other applicable authorities, the BLM will consider the wilderness characteristics of BLM land when undertaking its multiple-use land use planning.

The existing inventory of BLM land in the HiLine planning area was updated and evaluated to determine whether additional lands other than the existing WSAs have wilderness characteristics. The inventory update process began in early 2011 in response to Secretarial Order 3310. This work continued until Congress passed and the President signed the Full-Year Continuing Appropriations Act for Fiscal Year 2011 that included a provision prohibiting the use of appropriated funds to implement, administer, or enforce Secretarial Order 3310. All work on updating the inventory ceased until additional guidance was received from the Secretary of the Interior on June 1, 2011. The inventory update resumed shortly thereafter and was completed under guidance contained in Instruction Memorandum No. 2011-154. Throughout the inventory update, the criteria for analyzing and determining the presence of wilderness characteristics remained unchanged. Areas with wilderness characteristics must possess sufficient size, naturalness, and outstanding opportunities for either solitude or primitive and unconfined recreation. In addition, it may also possess supplemental values.

The 2011 inventory update identified 26 areas meeting the criteria for wilderness characteristics. These areas include 386,462 acres of BLM land and vary in size from 4,118 to 49,564 acres. The locations of these areas are shown on Map W.9, which is available on the internet at http://blm.gov/8qkd. During the comment period for the HiLine Draft RMP/EIS, the Montana Wilderness Association (MWA) submitted a report and comments based on their own inventories. The MWA document presented information that was new and significantly different from that considered in the BLM's previous inventories. In July 2013, BLM resource specialists completed on-site surveys of three inventory units (Carpenter Creek, Lena and Long Coulee) based on this new information and concluded that the Lena and Carpenter Creek units meet the criteria for wilderness characteristics, bringing the total number of areas with wilderness characteristics to 28 and the total acres to 399,482. Alternative E (Preferred Alternative) in this document was modified to include the new wilderness characteristics units. Copies of the updated inventory forms for all 28 units, including the

three areas proposed by MWA, are available on the internet at http://www.blm.gov/mt/st/en/prog/lands_with_wilderness.html.

The 28 areas that meet the criteria for wilderness characteristics in the HiLine planning area have been combined into five groups based on location, topography, habitat types, and similarity of wilderness characteristics. Following is a brief description of the groups.

Eastern Breaks and Badlands: Areas 49B, 52L and 53

Located in southeast Phillips and southwest Valley Counties, the Eastern Breaks and Badlands areas (16,393 acres) lie between one and six miles north of the Charles M. Russell National Wildlife Refuge. The Plum Creek Road forms the southern boundary of Area 49B and separates it from the Burnt Lodge Wilderness Study Area.

Topography of these areas is diverse with breaks, rolling hills, sandstone capped uplands and badlands. Major types of vegetation are a mixture of short- and mid-grasses, sagebrush, conifers, greasewood and bare soil. Two-track vehicle routes and pasture fences are the most common anthropogenic features present in these areas, but during field reviews conducted in the summers of 2011 and 2013 these features were considered substantially unnoticeable and did not detract from the apparent naturalness of the areas. The areas appear to be in a natural condition.

The broken topography and scattered timber create outstanding opportunities for solitude. A variety of primitive and unconfined recreation activities are available including hiking, backpacking, horseback riding, snowshoeing, and sightseeing for botanical, zoological and geological features. Big game hunting is currently the most popular recreational use occurring in these areas and elk hunting opportunities are considered outstanding for those fortunate enough to draw a permit.

Mule deer, pronghorn and elk are year-long residents. Other values include paleontological resources and prehistoric cultural resources. Prehistoric features include sites such as subsistence gathering and processing areas, rock alignments, spiritual locales, and numerous habitation sites. Historic cultural resources such as the physical remains of sites associated with farming, ranching, mining, and the homestead era are also present in many of these areas.

No inholdings are located in these areas. Livestock grazing is the principal commercial use of these lands.

Intact Prairie Grasslands: Areas 32A, 32B, 33, 84, 90, 91A, 91B, and 93

The Intact Prairie Grasslands areas are located north of the Milk River in northern Blaine, Phillips and Valley Counties (139,654 acres). These large tracts of BLM land are part of a relatively unfragmented landscape dominated by a mix of native cool and warm season grasses intermixed with grasslands, badlands and riparian systems. These areas provide excellent examples of glaciated short- and mid-grass prairies that stand out as some of the most extensive naturally functioning glaciated plains grasslands in North America (Cooper, et al. 2001).

Portions of some of these areas have been cultivated in the past, but all have reverted back to native vegetation. Barely visible linear piles of rock along some old field edges are the only remaining evidence of the previous farming activity. All of these areas contain additional evidence of human impacts such as reservoirs, fences and two-track vehicle routes. During field reviews conducted in the summer of 2011, it was determined that these man-made features were for the most part substantially unnoticeable and did not detract from the apparent naturalness of the areas. The areas appear to be in a natural condition.

Hunting is currently the most popular and prevalent recreational use occurring, with many of these areas offering outstanding opportunities to hunt big game animals and upland birds. Outside of the hunting season, visitor use in most of these areas is extremely light. Unexploited primitive and unconfined recreation activities possible in these areas include hiking, backpacking, horseback riding, snowshoeing, cross-country skiing, photography, bird watching, and sightseeing for botanical, zoological and geological features.

The size and remoteness of these areas combined with their rolling topography provide outstanding opportunities for solitude. Most private lands directly adjacent are either native range or have been seeded or reverted back to grass and are no longer farmed. With the possible exception of big game hunting season, vehicle use of routes in these areas and on adjacent lands is infrequent.

The diversity of native grasses provides excellent grassland bird and waterfowl nesting habitat. Other values include paleontological locations and prehistoric cultural resources such as subsistence gathering and processing areas, rock alignments, spiritual locales, and numerous habitation sites. Historic cultural resources such as the physical remains of sites associated with farming, ranching, railroads, and the homestead era are also present in many of these areas.

Livestock grazing on private and state inholdings is managed in conjunction with adjacent BLM grazing allotments. Existing oil and gas leases may limit the BLM's ability to manage wilderness characteristics in some areas.

Intact Sagebrush Grasslands: Areas 19A, 19B, 19C, 20A, 20B, 49A, 49C, 54, 55, 56, 62, 64 and 94

The Intact Sagebrush Grasslands areas are located south of the Milk River in southern Phillips and Valley Counties (211,056 acres). These large tracts of nearly level to rolling grasslands are sporadically dissected with intermittent streams, coulees and break lands. Large expanses of upland habitat are dominated by Wyoming big sagebrush while terraces adjacent to riparian areas support stands of silver sagebrush. Salt-affected soils in similar landscape positions support black greasewood communities. Scattered cottonwood, willows, boxelder, silver buffaloberry and common chokecherry can be found in major drainages.

All of these areas contain some evidence of human impacts such as reservoirs, fences and two-track vehicle routes. A few plugged and abandoned oil and gas wells are scattered throughout. During field reviews conducted in the summer of 2011 and 2013, it was determined that these man-made features were for the most part substantially unnoticeable and did not detract from the apparent naturalness of these units. From some of the higher vantage points the view stretches on for miles with very little evidence of man's work, even on adjacent ownerships. The areas appear to be in a natural condition.

The rolling grasslands, breaks and coulees provide sufficient topographic screening for visitors to avoid the sights, sounds, and evidence of other people. The size and remoteness of these areas combined with their rolling and broken topography provides outstanding opportunities for solitude.

A variety of primitive and unconfined recreation activities are available, including hiking, backpacking, hunting, horseback riding, snowshoeing, cross-country skiing, photography, and sightseeing for botanical, zoological and geological features. These areas offer outstanding opportunities to photograph and/or hunt native species of grassland and sage-grasslands-obligate grouse in Montana.

Greater Sage-Grouse strutting grounds are found in most of these areas and many of them also contain sharp-tailed grouse dancing grounds. The diversity and cover of native grasses in most of the areas provide quality grassland bird and waterfowl nesting habitat while some of the more open habitat supports black-tailed prairie dogs. Pronghorn and mule deer are year-long residents in all areas, and elk winter range is present in the southern portion of the grassland landscape. Other values include paleontological locations and prehistoric cultural resources such as subsistence gathering and processing areas, rock alignments, spiritual locales, and numerous habitation sites. Furthermore; this area of the intact sagebrush grassland was part of a longstanding tradition of the open range cattle industry, followed by an influx of homesteaders from the 1910s to 1930s. Historic cultural resources reflect this history and are represented by the remains of corrals, livestock activities, and homesteads.

A total of 1,160 acres of private inholdings are located in Area 49C, and 10 sections (6,400 acres) of state land inholdings are scattered throughout the rest of the areas. Livestock grazing on the private and state inholdings is managed in conjunction with adjacent BLM grazing allotments. Existing bentonite mining claims may limit the BLM's ability to manage wilderness characteristics on the surface of portions of Area 62.

Island Mountain Range: Area 1

The Island Mountain Range area is located in northwestern Liberty County and includes about 4,118 acres of BLM land. Undulating mid-grasslands ascend to steep timbered ridges dotted with course talus slopes, which makes this area stand out from the surrounding rolling prairies. While the area is relatively small (i.e., <5000 acres), the majority of the surrounding private and state lands are being managed in a manner that complements current BLM management that is adequate to protect wilderness characteristics. The entire area is closed to use by motorized vehicles. Vehicle use of routes on adjacent private lands is infrequent and is controlled by private landowners.

The area contains several abandoned mine sites and reclaimed vehicle routes. While some of the reclamation work is still visually evident when viewed from the opposing ridge tops, the reclaimed sites are not visible after dropping into the timber, nor are they visible from the many drainage bottoms. Communication towers on top of Mount Royal can readily be seen from outside the area, but for the most part are substantially unnoticeable from within due to topographic and vegetative screening. The area appears to be in a natural condition.

Despite the relatively small size of the area, multiple coniferous forest types combined with steep canyons that drain in different directions provide excellent opportunities to find solitude. Current usage by Native American religious practitioners is indicative of this area's solitude.

A variety of primitive and unconfined recreation activities are available, including hiking, backpacking, hunting, horseback riding, snowshoeing, photography, and sightseeing for botanical, zoological and geological features. Devil's Chimney Cave is a popular hiker's destination in the summer months. In the fall, hunters can pursue upland game birds and deer during the general hunting season. Opportunities to hunt moose and bull elk with firearms are limited, but would be considered outstanding if one was fortunate enough to draw a permit.

Livestock grazing on adjacent private and state lands is managed in conjunction with adjacent BLM grazing allotments. Existing mining claims may limit the BLM's ability to manage wilderness characteristics on a small portion of this area.

The most common big game animal in the Sweet Grass Hills is the mule deer. Densities as high as 22 deer per square mile have been recorded. Mule deer can be found in most areas throughout the year, but tend to prefer similar windswept exposures as elk during the winter with heaviest concentrations at the prairie timber edges. Approximately 350 elk inhabit the Sweet Grass Hills, with about half using East Butte. The management goal for the Sweet Grass Hills is 350 +/- 20%.

Western Breaks and Badlands: Areas 3A, 3B, and 4

Three areas identified as the Western Breaks and Badlands (see Map W.9, which is available on the internet at http://blm.gov/8qkd) are located in southeast Chouteau and southwest Blaine Counties (28,262 acres). They contain vegetation and topography typical of the Missouri River breaks region. Barren clay and sandstone outcrops (badlands) and gumbo soils (shale) with little or no plant cover are common features over portions of these areas. Upland benches are scattered throughout with mid-grasses as the dominant plant community. Nearly level to slightly sloping upland areas support sagebrush grasslands dissected by steep timbered coulees.

Plugged and abandoned wells provide evidence of past oil and gas exploration, but only the wells marked with a metal standpipe could be relocated during the field inspection. Numerous reservoirs and several miles of vehicle routes and pasture fence are scattered across these areas. All reservoirs observed during the field inspection were full of water and appeared to be natural components of the landscape, even though the straight line of the dam was noticeable from some angles. The remaining man-made features were considered to be substantially unnoticeable and did not detract from the apparent naturalness of these areas. Most private lands directly adjacent are either native range or have been seeded back to grass and are no longer farmed. The areas appear to be in a natural condition.

Vehicle use on routes is infrequent and controlled by the adjacent private landowners. Public access to Areas 3A and 3B is non-motorized only from the Cow Island Trail (county road) across state lands. Public access to Area 4 is limited to the very southern tip and could be reached traveling by foot from the Missouri River overland for about 2 miles. The

remoteness of these areas combined with the broken topography and scattered timber creates outstanding opportunities for solitude.

A variety of primitive and unconfined recreation activities are available including hiking, backpacking, horseback riding, snowshoeing, and sightseeing for botanical, zoological and geological features. The areas offer outstanding opportunities to view, photograph, film or hunt antelope, mule deer and bighorn sheep. All three areas lie within bighorn sheep hunting district 680, which is known for producing world-class trophy rams. Cross-country skiing is possible across the benches and along broad ridges, and would offer outstanding panoramic views of the badlands and breaks topography that is unique to the Missouri River breaks.

Portions of these areas provide year-long habitat for Greater Sage-Grouse, mule deer and pronghorn. Other values include numerous paleontological sites and prehistoric cultural resources such as subsistence gathering and processing areas, rock alignments, spiritual locales, and numerous habitation sites.

Historic cultural resources such as the physical remains of sites associated with farming, ranching, and the homestead era are also present. The Western Breaks and Badlands have a diverse and colorful history unique to the area, which also lends to a unique and diverse cultural landscape. It is important to note that physical manifestations associated with prehistoric and historic cultural resources are rarely apparent or visually dominating to the overall landscape.

Livestock grazing on private inholdings is managed in conjunction with adjacent BLM grazing allotments. Existing oil and gas leases may limit the BLM's ability to manage wilderness characteristics. Area 3A and the northern third of Area 4 are categorized as having "high" oil and gas development potential. Area 3B and the remainder of Area 4 are categorized as having "low" and "very low" development potential.

Wildlife

Wildlife Habitat

The BLM is responsible for managing wildlife habitat on BLM lands. State and federal wildlife management agencies are responsible for managing wildlife species populations. MFWP manages resident wildlife populations and migratory game birds in two regions which encompass the planning area (portions of MFWP Regions 4 and 6). The USFWS provides regulatory oversight for all species that are listed, proposed for listing, or are candidates for listing under the Endangered Species Act. The USFWS also administers the Migratory Bird Treaty Act, which protects migratory bird species whether hunted or not, and the Bald and Golden Eagle Protection Act, enacted in 1940, with amendments, which protects these eagle species from take without a permit.

Large blocks of native vegetation in Blaine, Phillips, and Valley Counties and southern Saskatchewan and Alberta, Canada have been noted by conservation organizations and others as providing some of the best remaining prairie in northern Great Plains (Licht 1997; Sieg, et al. 1999; TNC 1999; Cooper, et al. 2001; Predator Conservation Alliance 2005). These assessments note that, in addition to the large blocks of native habitat, these areas also possess relatively large populations of native prairie wildlife including a large black-tailed prairie dog (*Cynomys ludovicianus*) complex. This complex has provided recent opportunities to reintroduce black-footed ferrets. Other areas host some of the largest populations of grassland associated birds in the world (Hendricks, et al. 2007 and 2008).

Reintroduction efforts for swift fox (*Vulpes velox*) in the western portion of the planning area, on the Blackfeet Indian Reservation, and in southern Canada have resulted in the re-establishment of swift fox throughout much of the northern portion of the planning area and populations appear to be expanding (Moehrenschlager and Moehrenschlager 2006).

Portions of the planning area in southern Phillips and Valley Counties also support a large population of Greater Sage-Grouse (*Centrocercus urophasianus*) (Connelly, et al. 2004).

Grasslands and sagebrush shrublands are the dominant vegetative types, with grasslands generally more abundant to the north and sagebrush more abundant to the south. Grasslands and shrublands cover 8,726,000 acres (55% of the planning area and 92% of BLM land). Sagebrush provides crucial winter range for big game and is essential for Greater Sage-

Grouse and other sagebrush associated species such as the Brewer's sparrow (*Spizella breweri*) and sage thrasher (*Oreoscoptes montanus*). Many other species utilize the sagebrush vegetative type, including a number of reptiles and invertebrates. Other shrubs such as greasewood, chokecherry and wild rose provide important forage, hiding, or thermal cover for a variety of wildlife, including deer and elk (*Cervus elaphus*), sharp-tailed grouse (*Tympanuchus phasianellus*), migratory birds, and small mammals. The grasslands habitats, particularly those north of the Milk River, provide important habitat for a suite of grassland birds including Sprague's pipit (*Anthus spraguii*) and Baird's sparrow (*Ammodromus bairdii*). These grasslands are also important habitat for recently reintroduced swift fox (*Vulpes velox*) and pronghorn antelope (*Antilocapra amer*icana) as well as a variety of small mammals. Grassland and shrubland habitats also provide important foraging and breeding habitats for many raptor species such as golden eagles and ferruginous hawks.

Forests and woodlands are less abundant; however, they add structural and biological diversity to the landscape. About 640,000 acres of forests and woodlands in the planning area (includes all ownerships) are located mostly in the isolated mountain ranges (approximately 4% of the planning area and 2% of BLM land). Forests are mainly dry-mesic montane mixed conifer forests of ponderosa pine, Douglas-fir and lodgepole pine with scattered birch and aspen groves. Forest and woodlands provide summer cover for big game and are prime habitats for dusky grouse (*Dendragapus obscures*) and northern goshawks (*Accipiter gentilis*). Veery (*Catharus fuscescens*), red-headed woodpecker (*Melanerpes erythrocephalus*), and ovenbird (*Seiurus aurocapillus*) are also species of interest.

Riparian and wetland vegetative types occur on less than 1% of BLM land; however, it is estimated that 70-85% of the wildlife use riparian habitats for at least a portion of their life cycles. Many amphibian species, as well as muskrat (*Ondatra zibethicus*), beaver (*Castor canadensis*), mink (*Mustela vison*), and various waterbirds and waterfowl, occur in riparian or wetland areas only. Songbirds are attracted to the structural and vegetative diversity for both nesting and migration habitat. Riparian areas are also important for bald eagles.

Montana Partners in Flight has categorized riparian habitats as a top priority for conservation of neotropical migrant birds (birds that breed in the United States and Canada and winter in Latin America) (Montana Partners in Flight 2000). The Prairie Potholes region, which is the most important waterfowl producing area in North America, includes the northern portion of the planning area. Wetland habitat continues to be lost to agriculture and drainage in the Prairie Potholes region. This loss increases the importance of wetland habitat on public lands in Montana, even though they make up less than 1% of the potholes region in North America.

Historic Habitat Reduction and Fragmentation

Historical conditions for biological resources are a function of the interaction of physical factors (e.g., climate, soils, geology, and elevation), and disturbance factors (e.g., fire, grazing, drought). These physical and natural factors combined to produce the biological diversity present in the planning area prior to wholesale changes as a result of Euro-American settlement. Wildlife resources were noted as exceptionally abundant by early explorers. Human actions during the subsequent 200 years substantially changed the pattern, composition, structure, and function of plant and animal communities.

The most pervasive and extensive change to the grassland ecosystems of North America is the conversion of nearly 70% of native grasslands in the Great Plains to agriculture (Samson, et al. 2004). The conversion was facilitated by the Homestead Act of 1862 in the United States and the Canada Dominion Act of 1872. Under the Homestead Act, nearly 1.5 million people acquired and plowed over 309,000 sq. mi. (800,000 km^2) of land, primarily in the Great Plains (Samson, et al. 2004). The impacts of land conversion in the late 1800s and early 1900s were greatest in the tallgrass portion of the Great Plains. The Northwestern Glaciated Plains ecoregion, which encompasses most of the planning area, has experienced less conversion than other areas of the Great Plains, with about 60% remaining in native vegetation (Samson, et al. 2004).

Currently, native vegetation covers about 59% of the planning area, with approximately 25% of the remaining native vegetation managed by the BLM. Much of the direct habitat loss from conversion to agriculture has occurred in the western portion of the planning area. The conversion of native habitats continues throughout the area and may increase as other crops are modified to grow in more arid environments and the demand for bio-fuels grows.

Converting native grasslands to agricultural lands not only resulted in a direct loss of habitats for native wildlife, it began a process of habitat fragmentation. Habitat loss is exacerbated when fragmentation reduces the size and/or isolates remaining habitat patches below the size thresholds necessary to support components of biological diversity or blocks the movement of animals between habitat patches. As large contiguous blocks of habitat are dissected into smaller blocks, they became more isolated from one another by dissimilar habitats and land uses. Over the last 40 to 50 years, range conditions have improved due to improved grazing management practices and livestock operations. Since 1997, the BLM has applied Standards for Rangeland Health to enhance sustainable livestock grazing and wildlife habitat while protecting watersheds and riparian ecosystems.

As blocks of habitat are repeatedly dissected into smaller blocks, adverse impacts including isolation can occur to individual plant and animal species and communities. The impacts of habitat fragmentation to biological resources can occur on multiple scales and can vary by species and the type of fragmentation. Actions that result in habitat loss are exacerbated when fragmentation reduces the size and/or isolates remaining habitat patches below size thresholds necessary to support particular species. Individual species have different thresholds of fragmentation tolerance. Large birds (golden eagle (*Aquila chrysaetos*)) have large territorial requirements and may be able to utilize habitat fragments smaller than their territory, while smaller birds (Sprague's pipit (*Anthus spragueii*)) favor habitat areas that are larger than their territory (Davis 2004).

Linear features including roads, railroads, trails, irrigation systems, and rights-of-way fragment the planning area. Interstate 15 and a network of state highways, county roads, local roads on private and public lands, and the Burlington Northern Railroad dissect much of the planning area. The development of irrigation and flood control reservoirs such as Tiber, Fresno, Nelson and Fort Peck reservoirs and their associated water distribution systems has also contributed to habitat fragmentation in and along the borders of the planning area. Some fences can also fragment habitats by blocking migration routes for some wildlife species such as pronghorn.

Changes in vegetation can also fragment native habitats. Irrigation water has supported the conversion of native plant communities to hay fields, pasture, and cropland, thereby fragmenting habitats for some native species. Roads and OHV use can promote the spread of noxious weeds through vehicular traffic, and noxious weed infestations can further exacerbate the fragmentation effects of roadways. The conversion of large acreages of sagebrush to predominately grassland communities can fragment habitat for sagebrush-dependent species such as the Greater Sage-Grouse. Recent interest in bio-fuel production on private lands has resulted in an increase in the conversion of lands formerly enrolled in the Conservation Reserve Program (CRP) or native grasslands to cropland, further emphasizing the importance of BLM lands and associated private ranch lands for the maintenance of large blocks of native grasslands and shrublands. Habitat fragmentation is most obviously due to the linear features identified in the previous discussion; however, fragmentation also occurs at population centers and other developments where humans live, work, and recreate. Developing private parcels and subdivisions or smaller ranchettes and associated buildings, roads, fences, and utility corridors has also contributed to habitat loss and fragmentation.

The remaining habitats have also been impacted by changes in ecologically important disturbances. Historical disturbances that shaped plant and animal habitats were primarily drought, grazing and fire. Drought occurs at broad scales and is unpredictable. Current variability in precipitation patterns and drought cycles is presumably similar to past patterns, although recent global climate changes may have profound changes in drought occurrences. The loss, fragmentation, and degradation of native grasslands throughout the Great Plains have severely impacted native wildlife associated with grassland habitats.

Large numbers of bison (*Bos bison*) formerly moved nomadically through the planning area in response to changes in vegetation associated with drought, past grazing, and fire. Grazing by bison occurred in large areas as huge herds moved through, and the impacts of these herds on the vegetation, soils, and riparian areas were probably extensive. The interval between grazing episodes may have ranged from one to eight years (Malainey and Sherriff 1996). The number of bison estimated to inhabit the Great Plains prior to Euro-American settlement is 30-60 million animals, but by 1890, only a few thousand animals remained (Knapp, et al. 1999). The last wild bison in the planning area were probably killed in 1885.

Rocky Mountain locusts (*Melanoplus spretus*) often erupted in swarms numbering in the billions and their impact on vegetation was also presumed to be extensive. Managed livestock grazing (mostly cattle) have replaced these grazers and their impact on grassland habitats is much different in scale and duration. Rocky Mountain locusts became functionally extinct by 1900 (Lockwood 2004).

Large fires often occurred, and fire regimes were probably highly variable depending on rainfall and subsequent grass growth (Umbanhowar 1996). The burns also removed much of the vegetation, which resulted in continual shifts in the abundance and distribution of species across large areas with the direction and extent of vegetation response mediated by drought and grazing by bison and/or locusts (Umbanhowar 1996). Only about 4,000 acres of the planning area burn per year and fire is no longer a major disturbance factor in this landscape.

In some areas, land use activities such as agriculture, oil and gas development, fire management, OHV use, recreation, and transportation have contributed to the degradation of remaining wildlife habitats. Examples of habitat degradation include:

- improper grazing management which has changed vegetation composition and increased soil compaction or erosion;
- oil and gas well and associated infrastructure development, which has disturbed soil for well pad and road development;
- increased human activity levels contributing to soil erosion, habitat fragmentation, and wildlife disturbance;
- fire suppression, which has depleted or completely removed the natural fire regime with which habitats evolved;
- improper OHV use, which has spread invasive weeds and disturbed wildlife;
- recreation activities, which have disturbed wildlife; and
- road placements, which have contributed to habitat fragmentation.

Other sections of Chapter 3 provide additional details regarding existing conditions of the resources and resource uses listed above.

Grassland birds, a suite of species adapted to differing grassland habitats resulting from the combination of historical disturbances noted above, have exhibited the steepest, most consistent and widespread decline of any group of birds in North America (Knopf 1994). Black-tailed prairie dogs have been reduced to about 2% of their former numbers (Kotliar, et al. 1999 and references therein), and the associated black-footed ferret was thought extinct until a small population was found in Wyoming in 1981. Grizzly bears (*Ursus arctos*) and gray wolves (*Canis lupus*) have also been extirpated throughout the Great Plains, but remain in the forested western portions of the planning area. Swift fox were also extirpated in the northern Great Plains, but have recently been reintroduced.

The historic impacts to wildlife habitat mentioned above have occurred to various degrees. Consequently, some areas contain habitats which function well and other areas no longer function very well for wildlife habitat. Some areas contain large, contiguous blocks of native habitats and other areas are composed of small, fragmented patches of native habitats.

The changes to native habitats noted above have also benefited some species of wildlife. Ring-necked pheasants (*Phasianus colchicus*), gray partridge (*Perdix perdix*), and wild turkey (*Meleagris gallopavo*) have been introduced and have responded positively to the changes in habitat. They have also become economically important game animals in the area. Raccoons (*Procyon lotor*), striped skunks (*Mephitis mephitis*), red fox (*Vulpes vulpes*), and white-tailed deer (*Odocoileus virginianus*) have also benefited from habitat changes and are more common now than they presumably were in the past.

Habitat management challenges include:

- the maintenance of heterogeneity in habitat composition and structure for grassland and shrubland communities;
- habitat fragmentation;
- invasion and spread of exotic species and noxious weeds;
- lack of a natural historic fire regime;
- competition for forage between native ungulates and livestock;
- restoration of areas damaged by surface-disturbing activities;
- integrating treatments of multiple resource programs to achieve landscape-level objectives; and
- maintaining a distribution and diversity of these communities sufficient to support wildlife, special status species, livestock, and other competing multiple use demands on BLM land.

Wildlife Species

The variety of animals present is high and includes 63% of the total amphibian species, 88% of the total bird species, 80% of the total mammal species, and 68% of the total reptile species common to Montana. See Appendix Q for a complete list of wildlife species.

Mammals

The planning area provides habitat for nearly 100 species of mammals. Although many of these are small mammals (bats, mice and shrews) which play important ecological roles in their associated habitats, the larger mammals (deer, bighorn sheep, elk and pronghorn) are the most economically important group of animals because of the interest in hunting these species. Large predators such as gray wolves, mountain lions (*Puma concolor*), and grizzly bears are limited in their distribution.

Big Game

Pronghorn antelope (*Antilocapra americana*), mule deer (*Odocoileus hemionus*), white-tailed deer, and elk (*Cervus elaphus*) are the most common big game animals. Pronghorn and deer occupy much of the planning area in the summer, but spend their winter in distinct areas (Figures 3.18 and 3.19). Two of these important winter range areas in Phillips County are the Frenchman Creek area and the vicinity of the Burnt Lodge WSA. The Bitter Creek WSA in Valley County and the Sweet Grass Hills ACEC in Liberty and Toole Counties are also important big game winter range areas.

The pronghorn population was estimated at 2.5 million at its peak prior to the settling of Montana. Populations have since declined, primarily due to loss of habitat. Originally, pronghorn were found throughout the plains, foothills and the broad intermountain valleys of Montana. By 1924, it was estimated that only about 3,000 pronghorn were surviving in central and southwestern Montana. By 1965, the population was estimated to have reached 75,000 animals.

Pronghorn are now found throughout the state where adequate habitat remains. The optimum habitat for pronghorn consists of open, rolling sagebrush grassland, as free from human disturbance as possible. Browse, primarily sagebrush, is vital in the pronghorn diet. Pronghorn utilize the sagebrush grassland habitats almost exclusively during the winter (Figure 3.17). Pronghorn from Canada and north of the Milk River migrate along major drainages to winter concentration areas along the Milk River during severe winters. Periodic pronghorn winter die offs have been recorded over the last 40 years due to severe winter conditions. The estimated mortality was nearly half during the 1977-78 winter, with most deaths attributed to malnutrition. Pronghorn residing south of the Milk River will migrate south of the Missouri River in severe winters. Some winters are critical seasons for pronghorn survival. Fencing in pronghorn habitat exacerbates this issue. Bison once played an important role to enhance pronghorn travel, feeding and survival during periods of deep snow. Bison create feeding craters in which the smaller pronghorn can find important forage resources. Bison create trails through patches of deep snow that may be used by pronghorn, increasing their access to forage resources and reducing energy requirements for travel. Most populations of pronghorn are currently stable and near management goals, although there are concerns for pronghorn in northern Blaine and Phillips Counties due to recent population declines.

Mule and white-tailed deer are the most numerous big game animals. Mule Deer typically inhabit drainage bottoms; rough, broken side slopes; upland areas where sagebrush is common; wooded breaks; and mountain foothills (Figure 3.18).

White-tailed deer habitat is relatively rare on BLM land, with most habitats occurring along drainage bottoms with tall brushy vegetation such as those along the Milk, Marias, and Missouri rivers and smaller tributaries. They are often associated with private croplands. White-tailed deer are expanding their range, probably in response to the continued conversion of native rangelands to agriculture.

Populations of both deer species are currently high. During winters of heavy snowfall, sagebrush is often the only available forage plant and becomes crucial to the survival of many mule deer herds. In severe winters deer also congregate on private agricultural lands and can cause severe haystack damage. Deer in the mountains may move to

lower elevations during severe winters. Mule deer populations are also impacted by drought and white-tailed deer populations may also fluctuate due to epizootic hemorrhagic disease (EHD).

Elk distribution across Montana has changed dramatically, from statewide distribution at the time of pre-settlement, to small, remnant herds in remote mountainous areas by the turn of the century. Elk are currently found throughout the state in areas where suitable habitat remains. Elk distribution in habitat along the Missouri River today is the result of transplant efforts and big game management (Figure 3.19). Elk populations are currently above desired levels because of healthy reproductive success and lack of adult mortality.

Bighorn sheep (*Ovis canadensis*) were originally found in mountainous areas and along the Missouri River. Overhunting and disease soon restricted bighorn sheep populations to rugged mountain habitat in the western portion of the planning area. MFWP reintroduced bighorn sheep in the Missouri River Breaks between 1950 and 1980 and in the Little Rocky Mountains in the 1970s. These populations have increased and currently support limited hunting within the Missouri River Breaks area (Figure 3.20). The Little Rocky Mountains population has fluctuated, but meadow restoration projects and reclamation of the Zortman/Landusky Mine are improving habitat conditions.

Other big game species include moose (*Alces alces*), mountain goat (*Oreamnos americanus*), mountain lion, and black bears (*Ursus americanus*). Moose and mountain goat primarily occur in the western portion of the planning area. Mountain lion and black bears occur in suitable habitat throughout the planning area. Moose sightings are on the rise, especially in the Sweet Grass Hills and from wandering individuals in northern Phillips and Valley Counties.

Management of big game populations occurs through regulated hunting by MFWP. The distribution and populations of big game species may be affected by the ability of hunters to access areas where the animals are located.

Seasonal and spatial protective stipulations are currently applied by the BLM around identified seasonal habitat use areas to afford big game and their habitat a level of protection from human disturbance and industrial activities.

Habitat management challenges for big game include:

- habitat degradation (particularly browse forage), fragmentation, and loss;
- incompatible land use practices (land conversion, industrial activities, intensive recreational activities);
- incompatible stock (domestic sheep grazing in or near bighorn sheep habitat); and
- impacts from human disturbance during sensitive periods and barriers to animal migration.

Mule Deer Photo by John Carlson

Figure 3.17
Pronghorn Antelope Winter Range

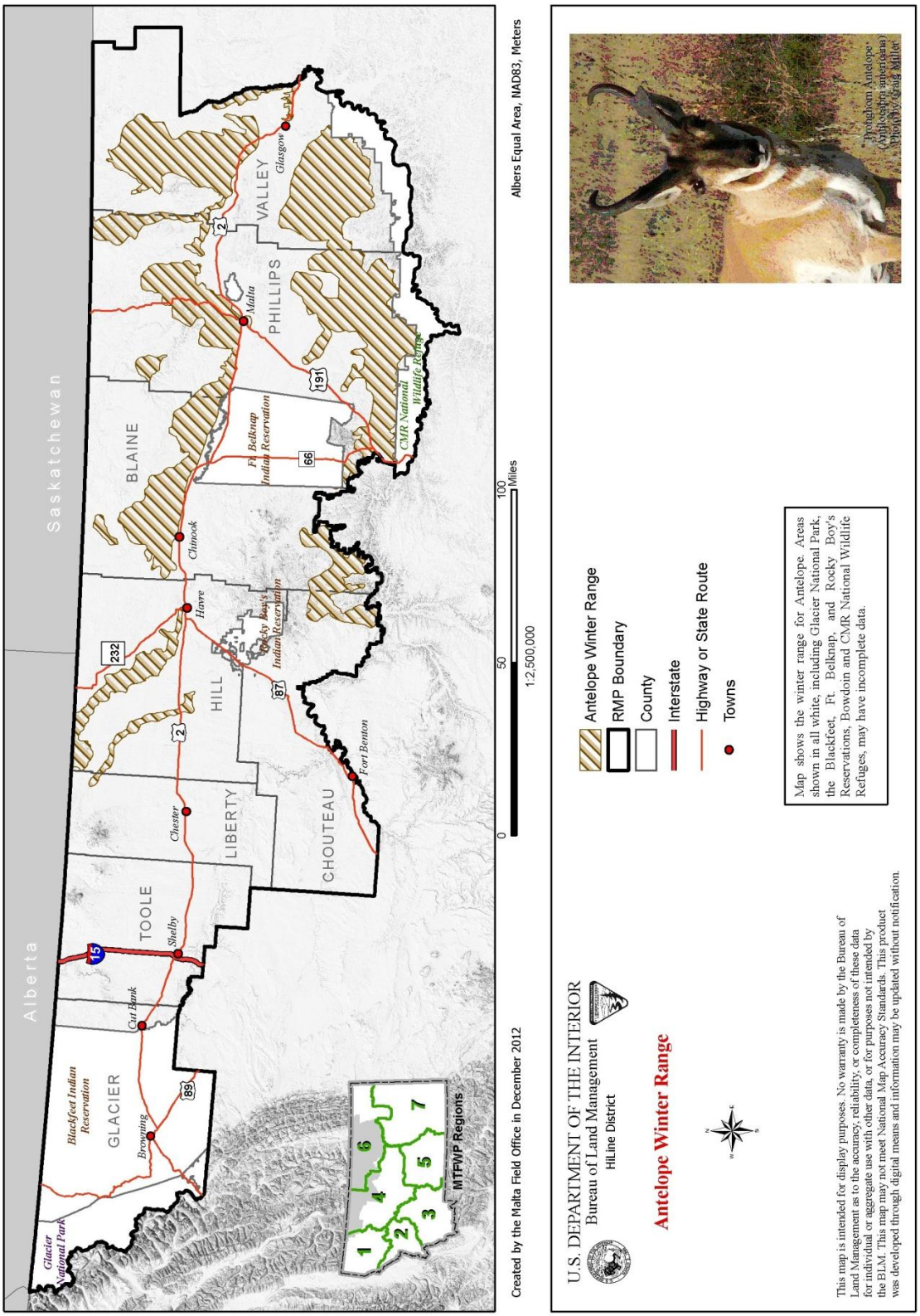


Figure 3.18
Mule Deer Winter Range and Crucial Winter Range

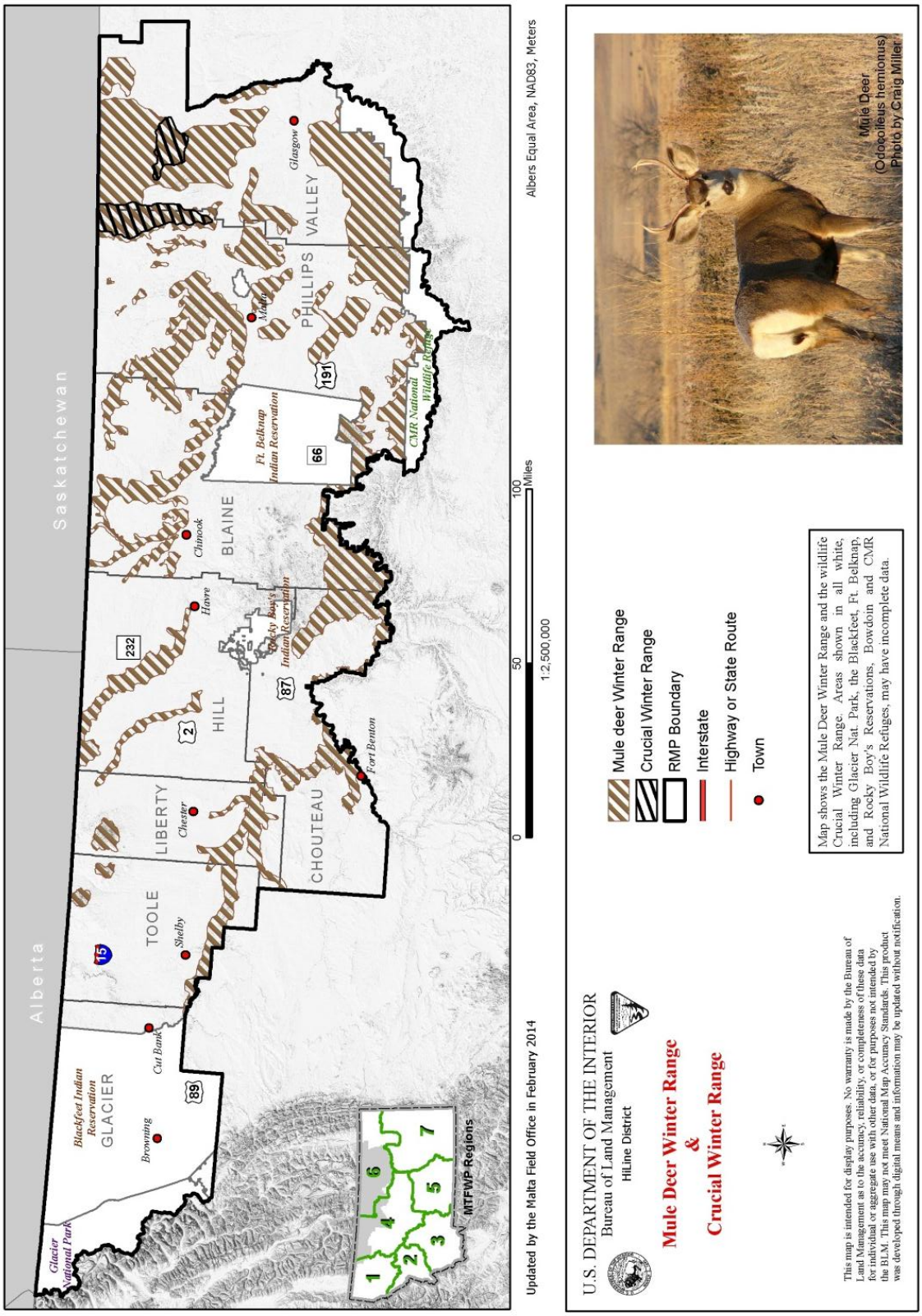


Figure 3.19
Elk Distribution and Winter Range

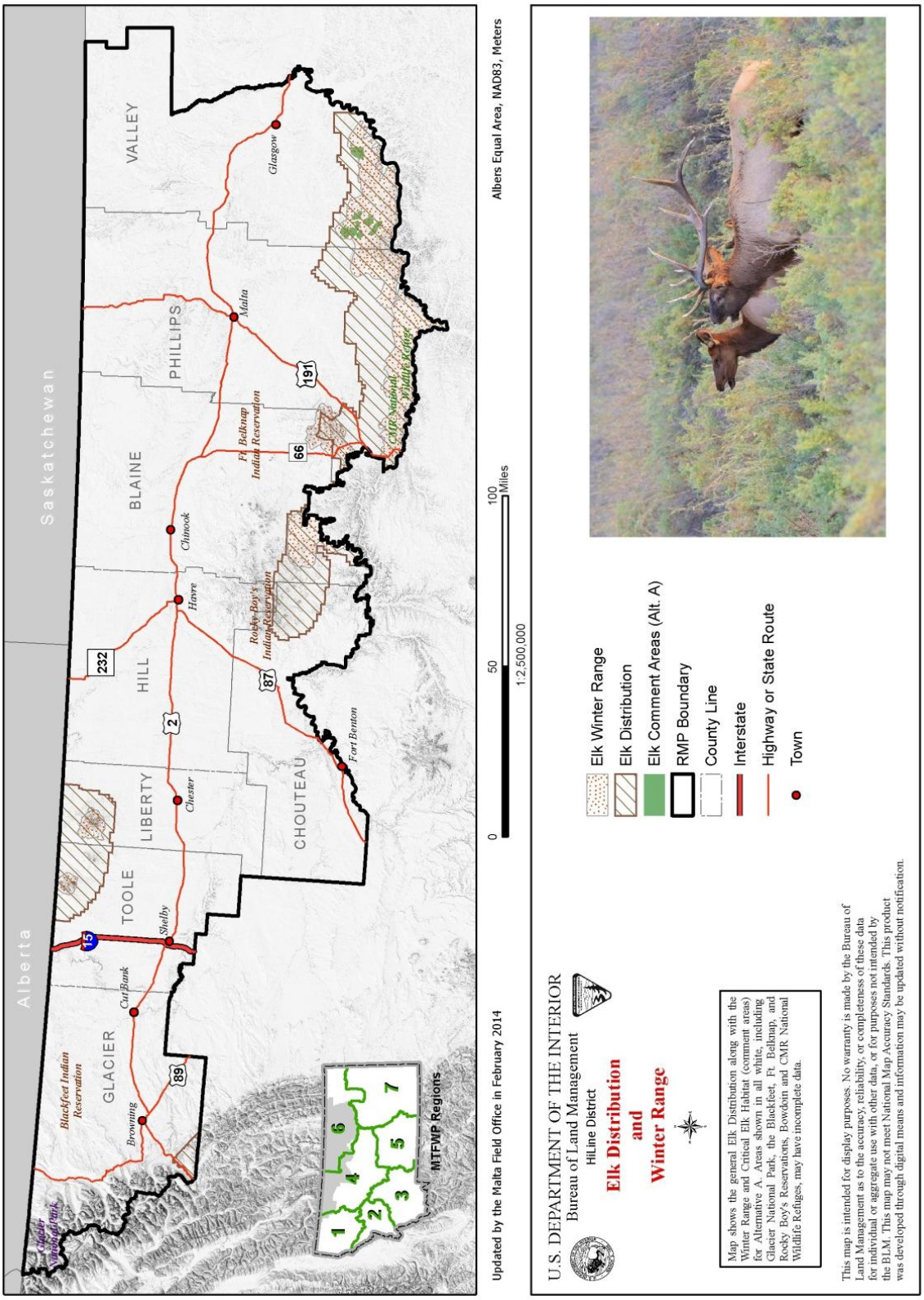
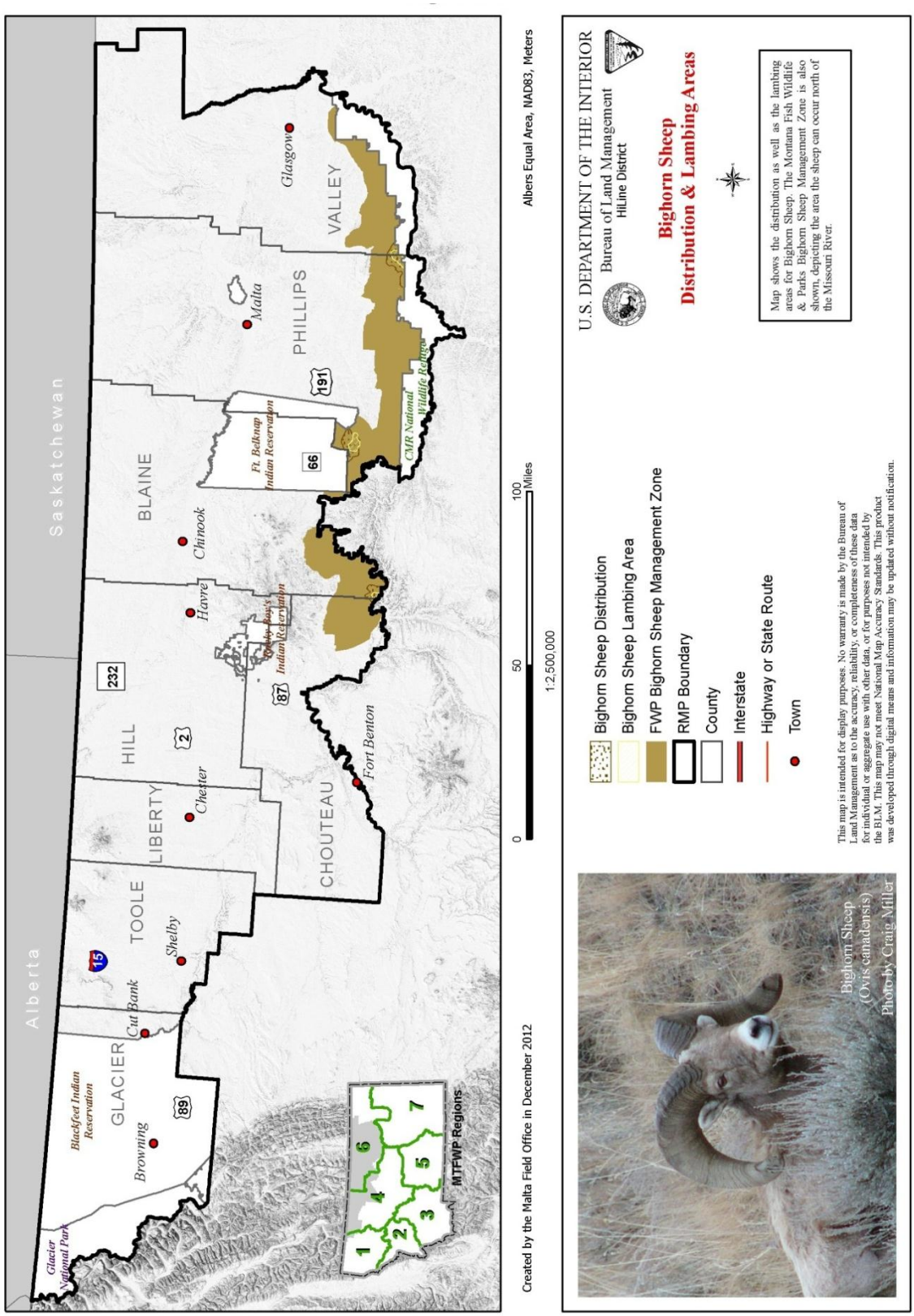


Figure 3.20
Bighorn Sheep Distribution and Lambing Areas



Birds

About 370 species of birds have been observed in the planning area. A variety of habitats provide important breeding, wintering, and migration habitats for many of these species, although some species are rarely found. Grassland-associated species are declining in most other parts of their range and are included in a number of special status species lists at the state and national levels.

Nearly all species of birds in the planning area are protected by the Migratory Bird Treaty Act of 1918. Further emphasis on migratory birds was enacted by Executive Order 13186 which, in part, instructed federal agencies to consider migratory birds, especially special status species, in any environmental review process. In addition, intact grassland and sagebrush environments provide habitat for a variety of upland game birds which are economically important as hunted species.

A number of management plans related to birds have been developed. The Montana Bird Conservation Plan (Montana Partners in Flight 2000) contains conservation actions for Montana's birds. The North American Waterfowl Management Plan (NAWMP) was developed in 1988 because of the decline of waterfowl production in the United States and Canada. The NAWMP plan has been divided into various joint ventures for implementation, with the Prairie Pothole Joint Venture (PPJV) encompassing most of the planning area. A number of bird-associated projects related to waterfowl have been implemented with this joint venture. The BLM is a partner in the PPJV Implementation Plan (PPJV 2005). This plan addresses the conservation needs of four species groups: waterfowl, shorebirds, waterbirds, and landbirds (each with their own national level plan); and outlines goals and objectives for bird conservation that the BLM can integrate into programmatic and site-specific management decisions.

Important Bird Areas (IBAs) are areas designated by the National Audubon Society. IBAs are sites that provide essential habitat for one or more species of bird. IBAs include sites for breeding, wintering, and/or migrating birds. Six IBAs are within the HiLine planning area.

Colonial Waterbirds

Colonial waterbirds nesting in the planning area include black-crowned night-herons (*Nycticorax nycticorax*), double-crested cormorants (*Phalacrocorax auritis*), great blue herons (*Ardea herodias*), eared grebes, (*Podiceps nigricollis*), ring-billed gulls (*Larus delawarensis*), California gulls (*Larus californicus*) and common terns (*Sturna hirundo*).

In addition, black terns (*Chlidonias niger*), Franklin's gulls (*Larus pipixcan*), American white pelicans (*Pelecanus erythrorhynchos*), and white-faced ibis (*Plegadis chihi*) are colonial waterbird BLM species of concern found in the planning area. These birds are important because they nest in large colonies in limited areas and are highly vulnerable to habitat changes and disturbances to the breeding colonies.

Current management actions focus on protecting colonial waterbird colonies from human disturbance. The wetland/ water-associated habitats upon which they depend are maintained through wetland-specific management.

Habitat management challenges for colonial waterbirds include protecting habitat from degradation and loss, and minimizing human disturbance.

Game Birds

The Greater Sage-Grouse, sharp-tailed grouse, ring-necked pheasant, gray partridge, mourning dove (*Zenaida macroura*) and wild turkey are the most popular game birds, with established hunting seasons and limits. Dusky (formerly Blue) grouse and Ruffed grouse (*Bonasa umbellus*) occur in mountain forests and are also hunted.

Greater Sage-Grouse populations are dependent on sage habitats. See the Special Status Species section below for further discussion on Greater Sage-Grouse.

Sharp-tailed grouse occur in grassland, shrub, riparian and woodland habitat types and often use agricultural lands where they coincide with native vegetation. Woody draws and woodlands containing buffaloberry, snowberry, juniper, and wild rose are used extensively for food and cover during the winter. Sharp-tailed grouse continue to be of concern due to

increasing fragmentation of habitat, habitat changes due to loss of buffaloberry shrubs, and disturbance from resource uses.

Mourning doves are common and adaptable to a wide variety of habitat disturbances.

Ring-necked pheasants and gray partridge were introduced into Montana in the 1800s and have done well. Ring-necked pheasants primarily occur where there are grain crops for food, shrub and trees for cover, and cattail and bulrush in wetland areas for winter cover. Gray partridge occur throughout the planning area and are associated with most vegetation types and agricultural lands. They feed primarily on small grain crops, but do consume forbs during the summer.

Wild turkeys are native to North America, but not to Montana, and all populations in Montana are the results of introductions. The establishment and maintenance of wild turkey populations is dependent on the presence of mast crops for food adjacent to areas with large roosting trees.

Populations of all of these species fluctuate, primarily in response to weather events. The large blocks of habitat in the planning area support large populations of these species, which allow them to rebound in response to negative weather events. Populations are generally healthy and provide good hunting opportunities with associated economic input to the local economies during hunting season.

Current management actions focus on avoiding disturbance to game bird species and the habitats upon which they depend. Seasonal and spatial protective stipulations are currently applied around identified lek sites and seasonal habitats to afford protection from human disturbance and industrial activities.

Habitat management challenges for game birds include habitat degradation (loss of important forage shrubs, nesting cover, and invasive, exotic vegetation), fragmentation, and loss; human disturbance during sensitive periods; and incompatible land use practices (land conversion, industrial activities, and intensive recreational activities).

Migratory Birds

In addition to the sensitive species already mentioned, many species of migratory birds occur throughout the planning area and breed along the riparian corridors and forested landscapes. The planning area provides important stopover habitat for others, including many special status species migrating through the area in the spring and fall on their way to and from breeding habitats.

Current management actions focus on avoiding destruction and disturbance of breeding habitats and nesting locations, primarily from surface-disturbing activities. Other management actions such as the implementation of standards and guidelines (BLM 1997a) have benefited a variety of migratory birds, particularly those species associated with grasslands and shrublands (see a further discussion in the Sensitive Species section below).

Management challenges for migratory birds include habitat degradation, fragmentation, and loss from exotic and invasive plants; lack of riparian structure and diversity; and incompatible land use practices (e.g., land conversion, snag removal, industrial activities, and intensive recreational activities). Other challenges include impacts from human disturbance during sensitive periods, collision with powerlines and tower guy lines, and avoidance of and collision with wind turbines.

Raptors

The open grassland, sagebrush, and shrubland vegetative types are home to many raptor species. Raptors are attracted to the abundant prey, including upland game birds, small game, and numerous rodent species. Sixteen diurnal raptor species and fourteen owl species are known to occur, eight of which are BLM sensitive species (see the Special Status Species section below).

Seasonal and spatial protective stipulations are currently applied around identified nest sites and communal roost areas to afford raptors a level of protection from human disturbance and industrial activities.

Habitat management challenges for raptors include habitat degradation, fragmentation, and loss; lack of cottonwood regeneration; collision with and/or electrocution from powerlines; collision with wind turbines; and incompatible land use practices (land conversion, snag removal, industrial activities, intensive recreational activities, removal of burrowing mammals). Other challenges include impacts from contaminants such as lead poisoning and rodent control chemicals, and human disturbance during sensitive periods.

Waterfowl

Most species of North American waterfowl have been found in the planning area and many of these species are common migrants. Common nesting species are the Canada goose (*Branta canadensis*), mallard (*Anas platyrhynchos*), Northern pintail (*Anus acuta*), gadwall (*Anas strepera*), American wigeon (*Anas americana*), Northern shoveler (*Anas clypeata*), blue-winged teal (*Anas discors*), cinnamon teal (*Anas cyanoptera*), green-winged teal (*Anas crecca*), redheads (*Aythya americana*) and lesser scaup (*Aythya affinis*).

Natural potholes and reservoirs are crucial for nesting waterfowl with reservoirs becoming increasingly important during dry years. Waterfowl depend primarily on cover in the upland areas and on islands in the spring for successful nesting. Quality breeding habitat for most waterfowl species includes dense nesting cover for breeding success sufficiently close to water bodies which support emergent vegetation and an abundant food supply of aquatic insects for ducklings. Man-made islands that provide security from predators during nesting have been constructed in many reservoirs and are important to Canada geese, some duck species and many other wetland-associated birds. Diving ducks, such as scaup and redheads, also require open and deep water that supports fish and aquatic insects. Dabbling ducks, such as mallards and teal, require migration and winter habitats with a mix of open water for loafing and emergent vegetation for food and cover.

Canada Goose Photo by Craig Miller

Major rivers such as the Milk and Marias also provide waterfowl habitat. Canada geese, mallards, common mergansers (*Mergus merganser*), American wigeon, wood ducks (*Aix sponsa*), and common goldeneyes (*Bucephala clangula*) are the primary species nesting on the rivers. The largest number and variety of waterfowl occur during fall and spring migrations when the birds utilize harvested grain fields and marshes away from the rivers and return to the rivers for roosting and cover.

Current and past management actions have focused on creating and enhancing reservoirs and nesting islands. Annual waterfowl production has increased due to the construction and enhancement of these reservoirs and nesting islands. Other management actions such as the implementation of standards and guidelines (BLM 1997a) have benefited waterfowl, primarily through the increase in residual cover in nesting areas.

The current emphasis for waterfowl management is centered on wetland restoration. Management challenges for waterfowl include habitat degradation through the loss of upland cover surrounding breeding areas and habitat fragmentation and loss. Many productive waterfowl wetlands are frequently dry, but can produce large numbers of waterfowl when water conditions are favorable. Maintaining the hydrology of these areas is a challenge.

Amphibians and Reptiles

Little is known of most reptiles and amphibians in the planning area, but they constitute a significant portion of the wildlife found therein. Ten species of amphibians and 13 reptile species are currently known to inhabit the planning area (Maxell, et al. 2009).

Western Rattlesnake Photo by Craig Miller

Current management for reptiles and amphibians is limited to habitat protection through broad-scale management actions such as standards and guidelines (BLM 1997a) and riparian and aquatic habitat management.

Habitat management challenges for reptiles and amphibians include maintaining populations; minimizing wetland habitat degradation, loss, and impacts from contaminants; controlling exotic and invasive species such as predatory fish and noxious weeds that degrade wetland habitats; minimizing the impacts of diseases; and maintaining natural hydrologic regimes. Western rattlesnake hibernacula have been identified in the planning area. Amphibian larvae may be sensitive to contaminants and adults may bioaccumulate toxic pollutants from insect prey. Some amphibian populations in Montana have recently undergone, or are currently undergoing, declines and extirpations. Impacts from a variety of human activities may affect the viability of reptile and amphibian populations.

Wildlife Special Status Species

Special status species are animals that require particular management attention due to population or habitat concerns and are:

- federally listed threatened and endangered species and designated critical habitats;
- federally proposed species and proposed critical habitats;
- federal candidate species;
- delisted species within the 5 years following delisting; or
- Montana BLM sensitive species.

The BLM accomplishes its threatened and endangered species management through coordination with USFWS and MFWP. The BLM initiates Section 7 consultation with the USFWS before approving or implementing any action that may affect listed species or designated critical habitat. Streamlined consultation procedures detailed in the July 27, 1999 Memorandum of Agreement (MOA) and subsequent implementation guidance for Section 7 consultations are utilized to provide collaborative opportunities in the consultation process. The BLM has entered into an MOA with the USFWS to improve the efficiency and effectiveness of RMP-level Section 7 consultation processes under the ESA. Through this MOA, the BLM agrees to promote the conservation of candidate, proposed, and listed species, and to informally and formally consult on listed and proposed species and designated and proposed critical habitat during planning to protect and improve the condition of species and their habitats to a point where their special status is no longer necessary.

Federally listed species can have critical habitat identified as crucial to species viability. For those species that are listed and have not had critical habitat designations identified for them, the BLM cooperates with the USFWS to determine and manage habitats of importance. Protective measures for migratory birds are provided in accordance with the Migratory Bird Treaty Act of 1918 and Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d), enacted in 1940, with amendments. Other fish and wildlife resources are considered under the Fish and Wildlife Coordination Act (1934).

Special status species indicators reflect population levels, distribution, and quantity and quality of preferred and suitable habitat and the prey needed to support them. This includes critical breeding, wintering grounds, and corridors needed to support migrations and a healthy genetic pool needed for adaptability to future circumstances and conditions. Indicators are detected through allotment evaluations, stream and vegetation monitoring, population surveys, the Natural Heritage Program database, field observations, and USFWS data.

Montana BLM Sensitive Species

Montana BLM sensitive species are those species designated by the BLM State Director, usually in cooperation with the state agency responsible for managing the species and State Natural Heritage programs. BLM sensitive species are those species that:

- could become endangered in or extirpated from a state, or within a significant portion of its distribution;
- are under status review by the USFWS and/or National Marine Fisheries Service;
- are undergoing significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution;
- are undergoing significant current or predicted downward trends in population or density such that federal listed, proposed, candidate, or state listed status may become necessary;
- species that have been delisted within the last five years;
- typically have small and widely dispersed populations;
- inhabit ecological refugia or other specialized or unique habitats; or
- are state-listed, but which may be better conserved through application of BLM sensitive species status.

Over half of the vertebrate animal species considered sensitive by the Montana BLM occur within the planning area and include 6 mammal species, 34 bird species, 4 amphibian species, and 4 reptile species. Table 3.58 shows the species occurring on BLM land and their general habitat association. The planning area contains a large proportion of the global breeding range for many of these species. The Montana BLM will review and update the Bureau sensitive species list once every five years in coordination with state agencies responsible for fisheries, wildlife, and botanical resources (BLM 6840 – Special Status Species Management Manual).

For most special status species, comprehensive data on population numbers and distribution within the planning area are not available. Occurrence data from the Montana Natural Heritage Program identify the presence and location for some special status wildlife species in the planning area; however, these data reflect observations from opportunistic or project-specific surveys rather than a complete inventory of the planning area.

Species added to the sensitive species list will have management actions developed to conserve, enhance and protect the species in accordance with applicable BLM guidance.

The special status species in the planning area are primarily associated with grasslands and sagebrush habitats. Many of the sensitive species are fairly common because of the relatively intact large areas of habitat still remaining compared to other parts of their range. See the Wildlife Habitat section above for a more detailed discussion of changes throughout the Great Plains which have led to designating many of the species discussed below as special status species.

Most management actions will be directed at maintaining habitat and the processes that provide habitat diversity in the planning area. Where species-specific management can improve individual special status species habitats or populations, those actions will be considered as long as they are also compatible with long-term persistence of other habitats and species.

If species which occur on BLM lands in the planning area are added to the T&E list in the future, management actions will be developed to conserve, enhance and protect the species in accordance with the Endangered Species Act.

Sensitive Species – Mammals

Six species of mammals in the planning area are designated as Montana BLM sensitive species (see Table 3.58).

Bats

Three of the species are bats and there is limited knowledge of their distribution and habitat needs in the planning area. Two species, Townsend's big-eared bat and long-legged myotis, have been found in and around Azure Cave in the Little Rocky Mountains. Azure Cave has been designated an ACEC because of their presence as well as the large number of other bat species that hibernate in the cave. The status of populations for these species is unknown.

While no specific management actions exist for bats, management actions associated with standards and guidelines (BLM 1997a) are thought to maintain or improve habitats for most bat species. Water tanks located on BLM lands have been fitted with escape ramps to minimize drowning by bats and other species. Future management actions specifically for bats will require more information on bat distribution and habitat use in the planning area.

Table 3.58
Montana BLM Sensitive Species
In the HiLine Planning Area

Common Name	*Scientific Name*	*State of MT Species of Concern*	*MFWP Tier Level**	*General Habitat*
Mammals				
Fringed Myotis	*Myotis thysanodes*	SOC	2	Shrubland/Forest
Townsend's Big-eared Bat	*Corynorhinus townsendii*	SOC	1	Shrubland
Black-tailed Prairie Dog	*Cynomys ludovicianus*	SOC	1	Grassland
Swift Fox	*Vulpes velox*	SOC	2	Grassland
Long-legged Myotis	*Myotis volans*		2	Forest
Gray Wolf	*Canis lupus*		1	Forest
Birds				
American Three-toed Woodpecker	*Picoides dorsalis*	PSOC	2	Forest
Baird's Sparrow	*Ammodramus bairdii*	SOC	2	Grassland
Bald Eagle	*Haliaeetus leucocephalus*	SOC	1	Forest
Black-crowned Night-heron	*Nycticorax nycticorax*	SOC	3	Wetland
Black Tern	*Chlidonias niger*	SOC	1	Wetland
Black-backed Woodpecker	*Picoides arcticus*	SOC	1	Forest
Bobolink	*Dolichonyx oryzivorus*	SOC	3	Moist Grassland
Brewer's Sparrow	*Spizella breweri*	SOC	2	Shrubland
Burrowing Owl	*Athene cunicularia*	SOC	1	Grassland
Chestnut-collared Longspur	*Calcarius ornatus*	SOC	3	Grassland
Common Loon	*Gavia immer*	SOC	1	Lake
Dickcissel	*Spiza americana*	SOC	2	Grassland
Ferruginous Hawk	*Buteo regalis*	SOC	2	Grassland
Franklin's Gull	*Larus pipixcan*	SOC	2	Grassland/Wetland
Golden Eagle	*Aquila chrysaetos*		2	Shrubland
Great Gray Owl	*Strix nebulosa*	SOC	2	Forest
Greater Sage-Grouse	*Centrocercus urophasianus*	SOC	1	Shrubland
Harlequin Duck	*Histrionicus histrionicus*	SOC	1	Forest/Stream
Le Conte's Sparrow	*Ammodramus leconteii*	SOC	2	Grassland/Wetland
Loggerhead Shrike	*Lanius ludovicianus*	SOC	2	Shrubland
Long-billed Curlew	*Numenius americanus*	SOC	1	Grassland
Marbled Godwit	*Limosa fedoa*		2	Grassland/Wetland
McCown's Longspur	*Calcarius mccownii*	SOC	2	Grassland
Mountain Plover	*Charadrius montanus*	SOC	1	Grassland
Nelson's Sharp-tailed Sparrow	*Ammodramus nelsoni*	SOC	1	Grassland/Wetland
Northern Goshawk	*Accipiter gentilis*	SOC	2	Forest
Peregrine Falcon	*Falco peregrinus*	SOC	2	Forest

Table 3.58
Montana BLM Sensitive Species
In the HiLine Planning Area

Common Name	*Scientific Name*	*State of MT Species of Concern*	*MFWP Tier Level**	*General Habitat*
Red-headed Woodpecker	*Melanerpes erythrocephalus*	SOC	2	Forest
Sage Thrasher	*Oreoscoptes montanus*	SOC	3	Shrubland
Sprague's Pipit	*Anthus spragueii*	SOC	2	Grassland
Swainson's Hawk	*Buteo swainsoni*	SOC	2	Grassland
Trumpeter Swan	*Cygnus buccinator*	SOC	1	Wetland
Veery	*Catharus fuscescens*		2	Forest
White-faced Ibis	*Plegadis chihi*	SOC	2	Wetland
Willet	*Catoptrophorus semipalmatus*		3	Grassland/Wetland
Wilson's Phalarope	*Phalaropus tricolor*		3	Grassland/Wetland
Amphibians and Reptiles				
Great Plains Toad	*Bufo cognatus*	SOC	2	Grassland/Wetland
Greater Short-Horned Lizard	*Phrynosoma hernandesi*	SOC	2	Grassland
Milksnake	*Lampropeltis triangulum*	SOC	1	Shrubland
Northern Leopard Frog	*Rana pipiens*	SOC	1	Wetland
Plains Spadefoot	*Spea bombifrons*	SOC	2	Grassland/Wetland
Snapping Turtle	*Chelydra serpentina*	SOC	3	River/Stream
Spiny Softshell Turtle	*Apalone spinifera*	SOC	1	River/Stream
Western Hog-nosed Snake	*Heterodon nasicus*	SOC	1	Grassland
Western Toad	*Bufo boreas*	SOC	1	Forest/Wetland

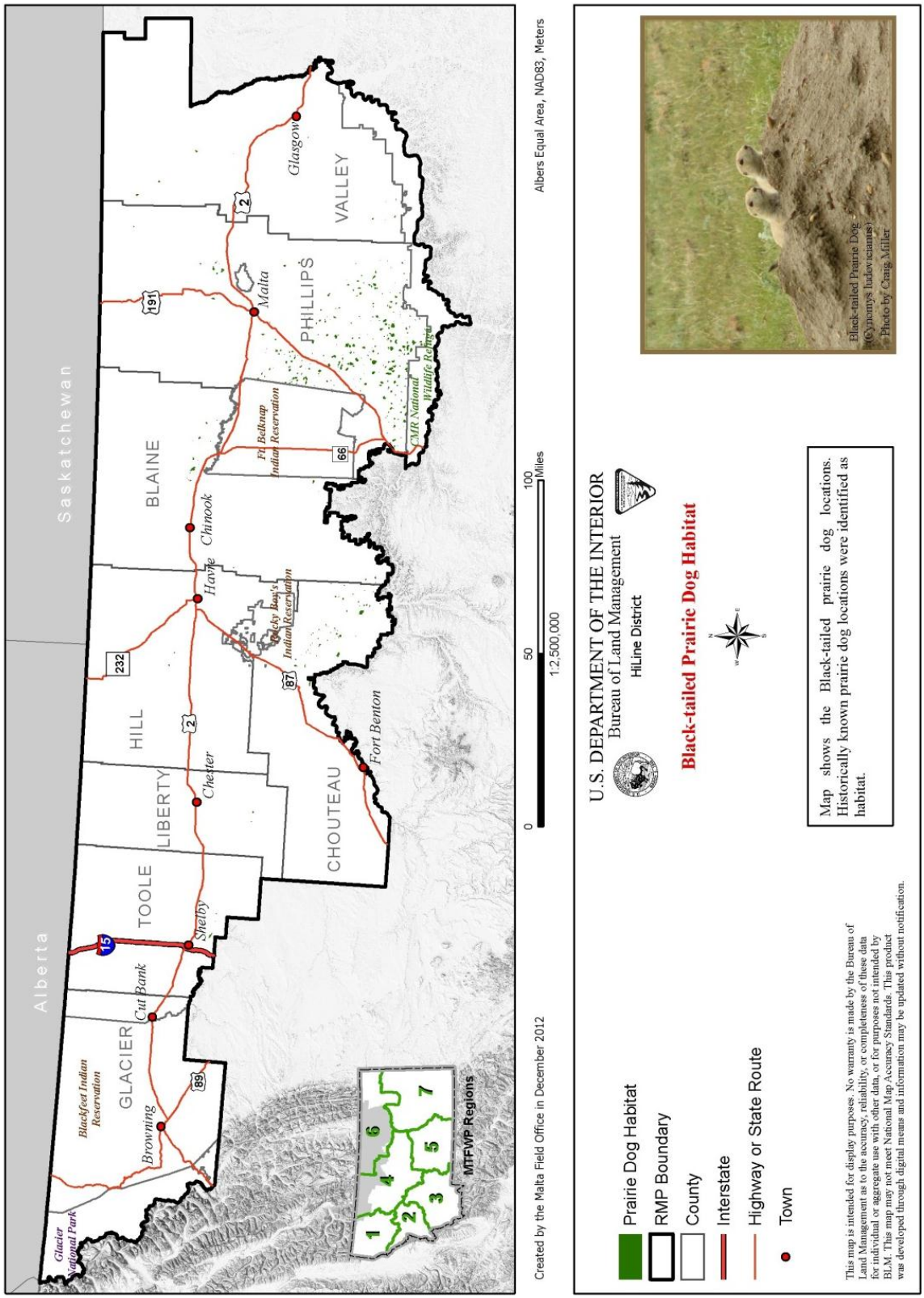
*Tier 1: Greatest conservation need. MFWP has a clear obligation to use its resources to implement conservation actions that provide direct benefit to these species, communities, and focus areas.
Tier 2: Moderate conservation need. MFWP could use its resources to implement conservation actions that provide direct benefit to these species, communities, and focus areas.
Tier 3: Lower conservation need. Although important to Montana's wildlife diversity, these species, communities, and focus areas are either abundant and widespread, or are believed to have adequate conservation already in place.
See MFWP State Comprehensive Wildlife Plan (2005).

Black-tailed Prairie Dogs

Black-tailed prairie dogs exist throughout the planning area, with large concentrations in southern Phillips County (Figure 3.21). Prairie dog towns provide habitat for numerous vertebrate species, including other sensitive species such as the burrowing owl, swift fox, mountain plover, and black-footed ferret (Kotliar, et al. 1999). In 1988, approximately 253 black-tailed prairie dog towns covered over 22,789 acres. The Fort Belknap Indian Reservation and Charles M. Russell National Wildlife Refuge contain about 26,500 acres of black-tailed prairie dog towns. Acreage figures have fluctuated greatly since 1992, when sylvatic plague was discovered in the black-tailed prairie dog population of southern Phillips County. Plague continues to be the primary factor in determining prairie dog populations in the planning area.

A statewide conservation plan for black-tailed and white-tailed prairie dogs was approved in 2002, and the Final MFWP Region 6 Prairie Dog Abundance and Distribution Objectives Plan (which encompasses all the prairie dogs in the planning area) was finalized in April 2006. MFWP is currently mapping prairie dog distribution in the planning area to determine how the current status matches with the plan, and management actions will be proposed to help meet the objectives outlined in the plan, including one complex of at least 5,000 acres of active prairie dog towns within 1.5 km of each other (MFWP 2005).

Figure 3.21
Black-tailed Prairie Dog Habitat



Gray Wolves

Gray wolves were formerly abundant throughout the planning area, but were exterminated from the eastern plains by 1900 and from the rest of Montana by the 1930s. Wolves from Canada began to re-colonize the Glacier National Park area in 1979, and the first wolf den in the western U.S. in over 50 years was documented there in 1986. The wolf population in northwest Montana grew as a result of natural reproduction and dispersal and in May, 2009, gray wolves were removed from the endangered species list.

Montana's first fair chase wolf hunting season occurred in 2009 with a statewide quota of 75 wolves. A total of 72 wolves were taken and the season was closed November 16 when quota numbers were nearly met in Wolf Management Units (WMUs) 1 and 2, and exceeded in WMU 3. The Planning Area is entirely within Wolf Management Unit 1. The wolf quota in WMU 1 was 41. Thirty-eight wolves were harvest prior the November 16 season closure.

A U.S. District Court decision formally reinstated federal Endangered Species Act protections for wolves in the Northern Rockies on August 5, 2010. In May 2011, the USFWS once again removed gray wolves in Montana from the Federal List of Endangered and Threatened Wildlife. Wolves will be managed under Montana's federally approved Gray Wolf Conservation and Management Plan. To avoid relisting, Montana will comply with federal regulations to manage wolves in a manner that will guarantee that the state maintains at least a minimum of 150 wolves and 15 breeding pairs. The line separating Montana in the northern Endanger Area and southern Experimental Area no longer exists and the wolf is reclassified under Montana law as a "species in need of management" statewide.

Swift Fox

The swift fox was extirpated in Montana and the northern Great Plains by the late 1930s. Reintroduction efforts initiated in 1983 in southern Canada have been successful and swift fox populations have established within the planning area. Populations of this fox are increasing and recent surveys estimate the northern Great Plains population to be over 1,000, with about 500 occurring in the planning area on open shortgrass and mixed-grass prairie (Moehrenschlager and Moehrenschlager 2006). The swift fox was removed from the USFWS candidate species list in 2001.

Current management is limited to the application of standards and guidelines (BLM 1997a) for maintaining and improving habitat. Habitat management opportunities could include options for reducing fragmentation to maintain currently intact priority grasslands, limiting the spread of invasive and exotic plants, reducing direct mortalities, and reducing disturbances at den sites.

Sensitive Species – Birds

A majority of the 34 BLM sensitive bird species (see Table 3.58) are associated with the extensive grassland and sage habitats of the planning area. This area is highly important to these species because of large and relatively intact tracts of land allowing for robust bird populations in contrast to the rest of their breeding range, which is much more fragmented and where populations appear to be declining. See the Wildlife Habitat section above for a broader discussion on grassland and sagebrush habitats in the planning area.

The following discussion represents a few key species and species groups in the planning area.

Grassland Birds

The planning area provides habitat for a suite of sensitive bird species associated with grassland habitats. These species include willet, long-billed curlew, marbled godwit, Wilson's phalarope, Sprague's pipit, dickcissel, Brewer's sparrow, Baird's sparrow, Le Conte's sparrow, Nelson's sharp-tailed sparrow, McCown's longspur, and chestnut-collared longspur. This suite of species has exhibited a steep decline in numbers throughout their range (Knopf 1994) related to the changes in the Great Plains as noted in the Wildlife Habitat section above.

In addition to being special status species, Sprague's pipits have been petitioned for listing as threatened under the Endangered Species Act in the United States. The USFWS determined that the petition presented substantial information indicating that listing Sprague's pipit may be warranted and initiated a status review in December 2009 (USFWS 2009). Baird's sparrow is a former USFWS Category 2 candidate for review for possible addition to the

threatened and endangered species list (USFWS 1991) until Category 2 list was discontinued (USFWS 1996). Both species are associated with relatively dense grass patches in large, intact grassland areas.

Large blocks of remaining native grasslands provide some of the best remaining habitat in the world for this group of birds. The number of grassland and shrub grassland bird species currently breeding in the planning area is probably quite similar to that of prehistoric times, but their relative and overall abundance may be quite different. This suite of species occupies a range of environmental conditions in grassland habitats, primarily related to grass height and density, and the relative abundance of these species is determined by the frequency and extent of disturbance factors in grassland systems such as grazing, fire, and weather events. Grazing intensity and fire frequency were probably greater and the abundance of species that respond to shorter vegetation structure may have been greater in prehistoric times. See the Wildlife Habitat section above for a greater discussion on grassland habitats.

Recent studies have demonstrated that these declining species are some of the most common birds across the northern part of the planning area, and the planning area supports healthy populations of the entire suite of grassland associated species, ranging from short grass associated species such as the McCown's longspur to species associated with taller, denser grass such as Sprague's pipit and Baird's sparrow (Hendricks, et al. 2007, 2008). Grasslands in northern Valley County have been identified as a Globally Important Bird Area (Audubon 2007) because of the density and number of grassland bird sensitive species, and the remaining grasslands in the planning area are highly important for these species (Hendricks, et al. 2007, 2008).

Impacts to grassland birds on BLM lands include habitat loss and fragmentation from disturbances related to energy exploration, development and production (primarily oil, gas, and wind), and roads.

Current grazing management on many allotments, which have stocking rates and pasture sizes that promote a range of vegetative structures across the landscape, appear to support large populations of a wide range of grassland bird species. Future management should preserve a variation in vegetative structure in large blocks of native grasslands, minimize fragmentation of the remaining large blocks of habitat, and control the spread of noxious weeds. The management challenge associated with grassland birds is to maintain a dynamic grassland that provides specific habitats for a wide range of grassland species and to avoid management actions for one species which might be detrimental to other special status species.

Grassland Bird/Greater Sage-Grouse Priority Habitat Management Areas

Areas containing substantial and high quality grasslands that support large populations of a suite of special status grassland bird species. This suite of species includes the following species of concern: Sprague's pipit, chestnut-collared longspur, McCown's longspur, Baird's sparrow, and long-billed curlew. Management actions would emphasize the conservation and enhancement of sustainable grassland bird habitats. Areas are delineated by using survey results, predictive models of species distributions, and land ownership patterns.

These areas also include core area for Greater Sage-Grouse identified by MFWP. Sage-grouse core areas are habitats associated with 1) Montana's highest densities of sage-grouse, based on male counts and/or 2) sage-grouse lek complexes and associated habitat important to sage-grouse distribution.

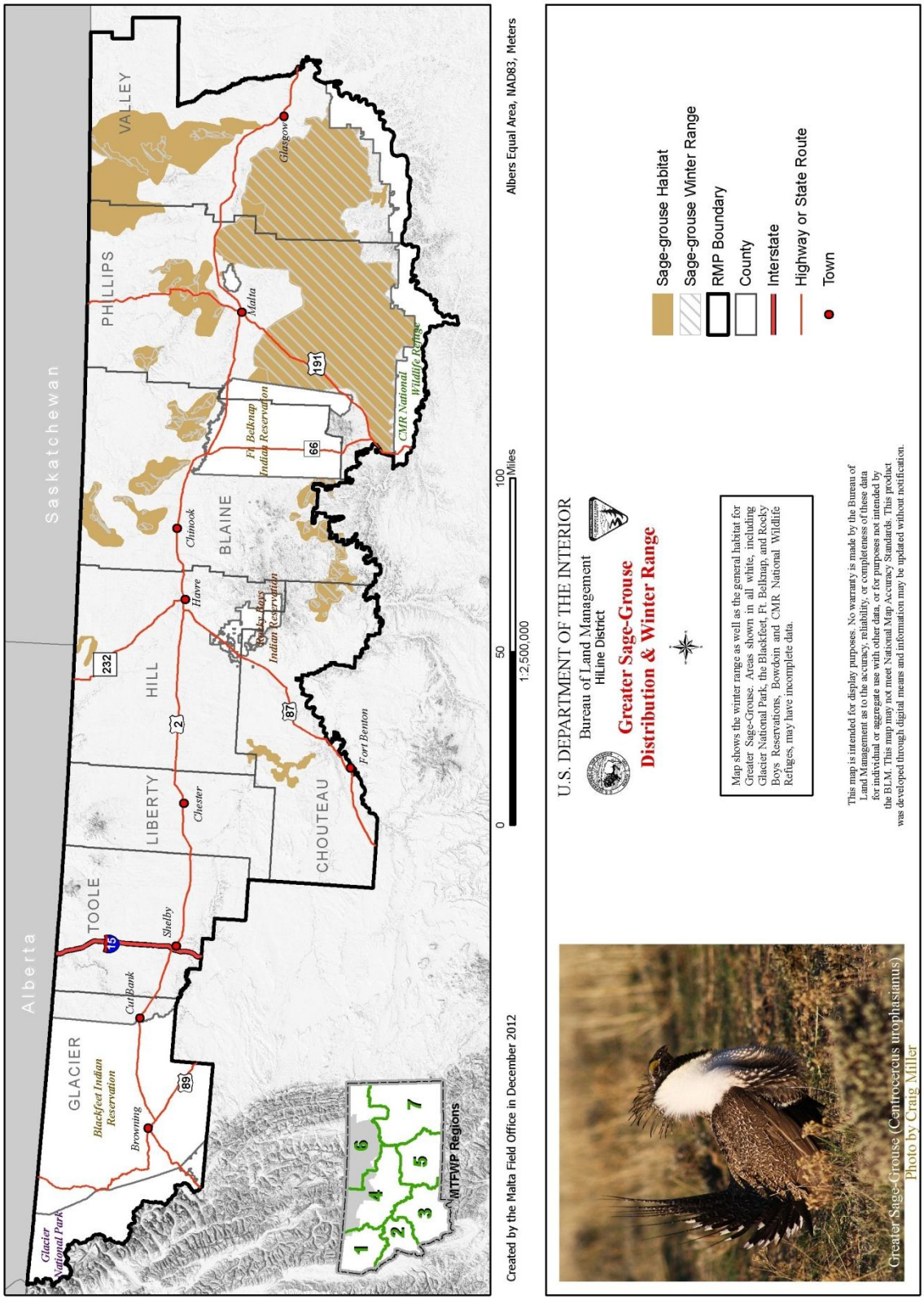
Greater Sage-Grouse

The Greater Sage-Grouse is an important game bird in Montana. They are primarily associated with the big and silver sagebrush communities in grassland-shrub and shrub vegetation types (Figure 3.22). Greater Sage-Grouse prefer sagebrush for nesting cover throughout their range, probably because of the concealment sagebrush provides, and nest success has been positively correlated with cover. Leks are key activity areas for populations and are most often located in open areas surrounded by sagebrush cover.

Most populations of Greater Sage-Grouse have declined during the past 50 years (Connelly, et al. 2004). Population declines throughout their range are largely attributed to the loss and degradation of sagebrush habitats. Changes in land use and land development are the primary causes of habitat loss. Habitat degradation is a complicated interaction among many factors, including drought, grazing management, changes in natural fire regimes, and the invasion of invasive exotic plant species (Connelly, et al. 2004).

The Northern Montana Population is predominantly in northeast Montana but extends north into southern Saskatchewan and Alberta, making up these provinces' entire sage-grouse populations.

Figure 3.22
Greater Sage-Grouse Distribution and Winter Range



Garton, et al. (2011) reported a minimum male count for this population at over 2,700 males and projected a very low probability (i.e., two percent) of the population dipping below 200 males in the next 100 years. The last six years showed a continuous decline to reach abundances as low as those in the 1970s and early 1980s of approximately 1,600 males. Current estimates are about 40% lower than the average counts shown from 1984-2007, which showed a slight increase in abundance males over the preceding 10 years. Model weighted probabilities of declining below effective population sizes of 50 (5.6%) in 30 and 100 years (7.2%) are all still quite low (Garton, et al. 2015). The southern portion of this area, south of the Milk River, has a high abundance of sage-grouse, has been designated as a Priority Area for Conservation (PAC), and is predominately comprised of public land. Land use in this area is livestock grazing with limited dryland farming and irrigated hay production adjacent to creeks and rivers. In general, habitat in this PAC is expansive and intact and faces few if any significant threats, particularly on public lands. Grouse in this PAC make up the majority of birds in this population. North of the Milk River, habitats comprise a relatively low density of silver sagebrush and a correspondingly low density of sage-grouse. The sage-grouse habitats in this area include more private lands and, in some portions of this area, have a long history of grain farming and low to moderate densities of natural gas production. A PAC was designated in northern Valley County where relatively intact habitats provide for resident grouse as well as a conduit for spring and fall migrating sage-grouse between Saskatchewan and southern Valley County. This PAC is adjacent to considerable farming to the east but is itself relatively stable and lacks significant threats. One or more large conservation easements are in place to protect habitat values on key private lands in northern Valley County. Given the extent and limited threats associated with this population, it is considered to be at low risk (USFWS 2013).

Greater Sage-Grouse are distributed throughout the eastern portion of the planning area. There are 286 known leks in the planning area, 147 of which are located on BLM lands. Valley and Phillips Counties have the highest densities of leks occurring in larger tracts of sagebrush shrublands. Within the planning area are 3,015,125 acres of Greater Sage-Grouse. Of this, 1,579,437 acres are on BLM surface and 1,865,792 acres are on BLM oil and gas estate.

The BLM and MFWP have surveyed and monitored Greater Sage-Grouse leks annually since the 1950s. Male attendance on leks is utilized by MFWP to provide an index of relative change in population abundance. Increased survey efforts have located additional leks in the planning area. The number of males observed per lek has remained relatively steady with a peak in the mid-1960s, although this may be an artifact of the number of leks surveyed and actual changes may be less pronounced. Survey efforts varied by year and numbers prior to 1998 are based on less than 20 leks.

The 2012 MFWP counts for the eastern Montana Sage-Grouse Management Zone are only 64.9% of the long-term average. Across Montana, sage-grouse numbers have declined by more than half since 1980 (MFWP 2012b). Hunter harvest estimates have declined even further, dropping from 40,000 birds in 1984 to less than 5,000 in 2011 (MFWP 2012b). This represents an 87.5% decline in hunter harvest across the state.

Habitats in the western and northern portions of the planning area are fragmented by changes in habitat type and land use practices. Large, contiguous blocks of sagebrush and grassland in the western portion of the planning area have for the most part been eliminated. Occupied habitat is fairly contiguous throughout much of southern Valley, Phillips, and Blaine Counties. Sage-grouse populations in the planning area are thought to be non-migratory; however, recent studies have confirmed some movement from populations in the northern part of the planning area and Canada into areas south of the Milk River (Tack 2009). Sage-grouse occurring north of the Milk River in predominantly silver sagebrush habitats remain at lower densities than sage-grouse south of the Milk River. Many areas north of the Milk River have also experienced a reduction of sage-grouse from historic distributions, including areas south of the Alberta and Saskatchewan boundaries. Some of these areas may still facilitate dispersal into or exchanges with Canadian populations, although it is likely that such movements have been greatly reduced (Bush, et al. 2010). Small subpopulations in this region may be dependent on connectivity with larger core populations.

Greater Sage-Grouse have been known to travel 120 km one-way from northcentral Montana, USA, and Saskatchewan, Canada, to wintering grounds north of the Missouri River (Tack, et al. 2011). Five years of tracking this population confirms that their migration is an obligate event that occurs annually regardless of winter severity (Smith 2013).

Sage-grouse habitat south of the Milk River is dominated by Wyoming big sagebrush with silver sagebrush in riparian areas. Sage-grouse habitat in the South Valley/Phillips area is in generally good condition primarily due to maintaining large tracts of big sagebrush habitat. Livestock ranching is the predominant land use in this area, which has conserved

large blocks of native sagebrush grassland habitat on private and public lands. The 20-year trend for male lek attendance is slightly increasing in the South Valley/Phillips area.

The BLM HiLine District is conducting habitat inventories and evaluation studies of sagebrush habitat near Greater Sage-Grouse leks to evaluate habitat as well as determine localized standards for Greater Sage-Grouse habitat condition assessments. The BLM has also co-sponsored a number of research projects related to Greater Sage-Grouse in southern Phillips and northern Valley Counties. Specific wintering concentration areas of Greater Sage-Grouse within the planning area are not well documented to date.

Several petitions to list Greater Sage-Grouse as threatened were submitted to USFWS in 2002. In January 2005, the USFWS determined that listing under the ESA was not warranted, but recent court actions have instructed the USFWS to reconsider that decision. Sage-grouse conservation is a priority for the BLM, and emphasis has been placed on planning efforts throughout their range in North America and in Montana. On March 5, 2010, the USFWS announced that the Greater Sage-Grouse was warranted for listing under the ESA but precluded by other higher priority species. The USFWS will evaluate this decision on a yearly basis to determine if conditions leading to this decision have changed enough to adjust the priority for listing.

Greater Sage-Grouse Priority Habitat Management Areas

Areas with limited impacts containing substantial and high quality greater sage-grouse habitat that supports high density greater sage-grouse populations. Management actions would emphasize the conservation and enhancement of sustainable greater sage-grouse habitat. The area is delineated by using "key," "core" and connectivity data/maps, land ownership patterns, and other resource information.

In 2000, the Montana Sage-Grouse Working Group was formed to develop a statewide, multi-agency strategy for the conservation of the Greater Sage-Grouse. This group prepared the Management Plan and Conservation Strategies for Sage-Grouse in Montana – Final (MSGWG 2005) to provide for coordinated management and direction across the state. In 2004, local Greater Sage-Grouse working groups were formed to develop and implement local conservation plans. The only working group in the planning area is located in Glasgow and the BLM participates with this group. The area covered by this group includes much of the BLM land in Phillips and Valley Counties.

In February 2013, Montana Governor Bullock established the Greater Sage-grouse Habitat Conservation Advisory Council with the stated purpose "to gather information, furnish advice, and provide to the Governor recommendations on policies and actions for a state-wide strategy to preclude the need to list the Greater Sage-grouse under the ESA, by no later than January 31, 2014." The Council is co-chaired by the MFWP Director and the Governor's Natural Resources Policy Advisor. Council members include representatives from agriculture and ranching, conservation and sportsmen, energy, mining and power transmission, tribal government, local government, and the legislature.

Impacts to Greater Sage-Grouse include sage habitat fragmentation, disturbances related to energy (oil and gas, and wind) exploration, development and production, overhead powerlines, and pathogens (West Nile virus). The West Nile virus was confirmed in sage-grouse mortalities in south Phillips County in August 2003. In February 2013 the Conservation Objectives Team (COT) comprised of State and U.S. Fish and Wildlife Service representatives produced a report that includes an overview of the threats to sage-grouse and sagebrush habitats across their range. Appendix M.3 provides a summary of the threats identified in the COT report that are present in the planning area. Current management of Greater Sage-Grouse focuses primarily on protection of Greater Sage-Grouse leks and habitats surrounding leks through seasonal and spatial stipulations for surface-disturbing activities. Management opportunities include protecting large blocks of existing habitat from further loss and fragmentation, reducing the disturbance from surface-disturbing activities, and controlling invasive and exotic plants.

Greater Sage-Grouse Management Zone 1

The range of the Greater Sage-Grouse in North America has been divided into seven sage-grouse management zones based on populations within floristic provinces (Stiver, et. al. 2006). The floristic provinces are areas within which similar environmental factors influence vegetation communities (Knick and Connelly 2011). Management Zone 1 (MZ1) includes southwestern Saskatchewan, southeastern Alberta, central and eastern Montana, northeastern Wyoming, southwestern North Dakota, and northwestern South Dakota. Greater Sage-Grouse habitats in MZ1 were historically a function of the interaction of physical factors (e.g., climate, soils, geology, and elevation), and natural disturbance factors (e.g., fire, grazing, drought) that allowed sagebrush to persist on the landscape. These physical and natural factors

combined to produce an interspersion and juxtaposition of different habitats that included large expanses of sagebrush patches favorable for Greater Sage-Grouse occupation.

The sagebrush species associated with Greater Sage-Grouse habitat in MZ1 is primarily Wyoming big sagebrush. Other shrubs present may include silver sagebrush, greasewood, saltbush, rubber rabbitbrush, green rabbitbrush, and overall shrub cover is less than 10% (Montana Field Guide 2011).

Perennial herbaceous components typically contribute greater than 25% vegetative cover and consist mostly of rhizomatous and bunch-form grasses, with a diversity of perennial forbs (Montana Field Guide 2011). The dominant grass in this system is western wheatgrass and sites may include other species such as Indian ricegrass, blue grama, Sandberg's bluegrass, or bluebunch wheatgrass (Montana Field Guide 2011). Dryland sedges such as threadleaf sedge and needleleaf sedge are very common and important in the eastern distribution of this system in Montana and Wyoming (Montana Field Guide 2011). Common forbs include Hood's phlox, sandwort, prickly pear, scarlet globemallow, purple prairie clover, dotted gayfeather, and milkvetch (Montana Field Guide 2011).

Big sagebrush is easily killed by fire at all intensities, and when exposed to fire, plants do not resprout (Wright et al. 1979). In southwestern Montana, Wambolt and others (2001) found that fire in big sagebrush is stand replacing, killing or removing most of the aboveground vegetation, and that recovery to pre-burn cover (of sagebrush) takes 50 to 120 or more years (Baker 2006). In Montana, Wyoming big sagebrush may require a century or longer to recover from fire (Lesica, et al. 2005). Big sagebrush occurs on level to gently rolling plains, plateaus, sideslopes and toeslopes, and as small and large patches in dissected landscapes such as breaks (Montana Field Guide 2011).

Silver sagebrush is fairly resistant to fire and will resprout vigorously following a fire event (Aldridge and Brigham 2002). White and Currie (1983) stated that burning of silver sagebrush under favorable spring moisture conditions resulted in low plants kill rates and vigorous sprouting with brush cover returning to original, preburn conditions quickly.

Land ownership throughout MZ1 is predominantly private (70%). However, ownership of the remaining range of the Greater Sage-Grouse in MZ1 is 61% private and 13% state or other federal ownership (not including the Fort Peck and Fort Belknap Indian Reservations), with 26% on BLM-managed lands.

Greater Sage-Grouse Photo by Craig Miller

Greater Sage-Grouse populations have declined in portions of MZ1 through wholesale loss of habitat as well as through impacts to birds on the remaining habitat through disturbance and direct mortality. Management Zone 1 contains four sage-grouse populations (Garton, et al. 2011), including the Dakotas, Northern Montana, Powder River Basin, and Yellowstone Watershed populations. Sage-grouse populations within MZ1 declined by two-thirds in the last six years with the entire management zone most likely declining below effective population sizes of both 50 and 500 within 30 years and with 90% certainty within 100 years (Garton, et al. 2015). Individual populations all declined more than 50% in the last six years with both the Dakotas and Powder River Basin declining more than 70% raising a concern that they may be dropping into an extinction vortex. Even the largest population within the Yellowstone watershed fell by two-thirds with parametric bootstraps implying that every population except Northern Montana is virtually certain to go extinct (96% to 100% probabilities) unless recent patterns of decline change (Garton, et al. 2015).

The most pervasive and extensive change to the sagebrush ecosystems in MZ1 is the conversion of nearly 60% of native habitats to agriculture (Samson, et al. 2004). The conversion was facilitated by the Homestead Act of 1862 in the United States and the Canada Dominion Act of 1872 (Knick 2011). Under the Homestead Act, nearly 1.5 million people acquired and plowed over 309,000 sq. mi. (800,000 km^2) of land, primarily in the Great Plains (Samson, et al. 2004). The impacts of land conversion in the late 1800s and early 1900s were probably greatest for sagebrush habitats nearest perennial water sources in MZ1.

Currently, native vegetation covers about 59% of the management zone, with approximately 25% of the remaining native vegetation managed by the BLM. Much of the direct habitat loss from conversion to agriculture has occurred primarily in the far northwestern and northeastern portions of the management zone (Knick, et al. 2011). Cropland currently cover nearly 19% of the MZ and 91% of the MZ is within 6.9 km of cropland (Knick, et al. 2011).

Recent interest in biofuel production and high prices for small grains has resulted in an increase in the conversion of native grasslands or lands formerly enrolled in the Conservation Reserve Program (CRP) to cropland, further emphasizing the importance of BLM lands and associated private lands managed for grazing to maintain large blocks of native grassland and shrubland habitats.

Greater Sage-Grouse are a landscape-scale species, requiring large expanses of sagebrush to meet all seasonal habitat requirements. The loss of habitat from fragmentation and conversion decreases the connectivity between seasonal habitats potentially resulting in the loss of the population (Doherty, et al. 2008). Converting native grasslands to agricultural lands not only resulted in a direct loss of habitats for native wildlife, it began a process of habitat fragmentation. Habitat loss is exacerbated when fragmentation reduces the size and/or isolates remaining habitat patches below the size thresholds necessary to support components of biological diversity or blocks the movement of animals between habitat patches. As large contiguous blocks of habitat are dissected into smaller blocks, they became more isolated from one another by dissimilar habitats and land uses.

Changes in vegetation can also result in the loss and fragmentation of native habitats. The conversion of large acreages of sagebrush to predominately grassland communities results in the direct loss of sagebrush habitat and can also fragment remaining habitat for sagebrush-dependent species, such as the Greater Sage-Grouse. Roads and OHV use can promote the spread of noxious weeds through vehicular traffic and noxious weed infestations can further exacerbate the fragmentation effects of roadways. Irrigation water has also supported the conversion of native plant communities to hayfields, pasture, and cropland, thereby fragmenting sagebrush habitats. Excessive grazing can result in the demise of the most common perennial grasses in this system and lead to an abundance cheatgrass or Japanese brome (Montana Field Guide 2011).

The remaining sagebrush habitats in MZ1 are mostly managed as grazing lands for domestic livestock. Domestic livestock function similarly to the native keystone species bison in the MZ through grazing and management actions related to grazing by serving as the predominant large herbivore in the ecosystem. These actions do not preclude wildlife and vegetation, but they do influence ecological pathways and species persistence (Bock, et al. 1993). The effects of grazing on sagebrush habitats in this management zone are much different than effects noted in the Great Basin since the landscape throughout MZ1 is adapted to withstand grazing disturbance (Knick, et al. 2011).

Historically large numbers of bison (Bos bison) moved nomadically through the MZ in response to changes in vegetation associated with drought, past grazing, and fire. Grazing by bison occurred in large areas as huge herds moved through, and the impacts of these herds on the vegetation, soils, and riparian areas were probably extensive. The interval between

grazing episodes may have ranged from one to eight years (Malainey and Sherriff 1996). Bison were replaced with domestic livestock in the late 1800s.

The intensity and duration of grazing in the MZ increased as domestic livestock numbers and annual grazing pressure increased. Grazing on public lands was unregulated until the passage of the Taylor Grazing Act in 1934. Since the passage of the Taylor Grazing Act, range conditions have improved due to improved grazing management practices and livestock operations related to decreased livestock numbers and the annual duration of grazing. In addition, the BLM has applied Standards for Rangeland Health since 1997 to enhance sustainable livestock grazing and wildlife habitat while protecting watersheds and riparian ecosystems. However, developments to facilitate grazing management often include elements detrimental to sage-grouse. Perhaps the most pervasive change associated with grazing management in sage-grouse habitats throughout the MZ is the construction of fencing and water developments (Knick, et al. 2011). Barbed wire fences contribute to direct mortality of sage-grouse through fence collisions (Stevens 2011) and water developments may contribute to increased occurrence of West Nile Virus in Greater Sage-Grouse (Walker and Naugle 2011). Water developments are particularly prevalent in the northcentral portion of the MZ. Additional habitat modifications associated with grazing management include mechanical and chemical treatments to increase grass production, often by removing sagebrush (Knick, et al. 2011).

Other major land uses in the MZ include energy development (primarily oil and gas development) and infrastructure. Oil and gas development in the MZ has occurred throughout the MZ but is concentrated in the southern portions (Powder River Basin) the north (Bowdoin Field) and the south and east (Williston Basin). Oil and gas development includes direct loss of habitat from well pad and road construction as well as indirect disturbance effects from increased noise and vehicle traffic. Oil and gas developments directly impact Greater Sage-Grouse through avoidance of infrastructure, or when development affects survival or reproductive success. Indirect effects include changes to habitat quality, predator communities, or disease dynamics (Naugle, et al. 2011a). Predation is one of five specific ESA listing criteria; however, the USFWS did not identify predation as a significant threat to sage-grouse populations in their 2010 decision to list the species as warranted for protection under the Endangered Species Act. Despite the USFWS stating that predation is not a significant threat to sage-grouse populations in Montana, the public remains concerned about the influence of predators on sage-grouse conservation.

Currently nearly 16% of the MZ is within 3km of oil and gas wells, a distance where ecological effect is likely to occur (Knick, et al. 2011).

Infrastructure development in MZ1 has also impacted Greater Sage-Grouse habitat. Roads, fences, and utility corridors have also contributed to habitat loss and fragmentation in portions of the MZ. Infrastructure development effects to Greater Sage-Grouse habitats in MZ1 are primarily related to highways, roads, powerlines and communication towers, with nearly 92% of the MZ within 6.9km of a road, 32% within 6.9km of a powerline and 4% within 6.9km of a communication tower (Knick, et al. 2011).

The cumulative and interactive impact of multiple disturbances and habitat loss has influence the current distribution of Greater Sage-Grouse in MZ1. The cumulative extent of human caused changes, the human footprint, on sage-grouse habitat in MZ one is highest at the northern edge of the MZ but occurs throughout the MZ (Leu and Hanser 2011). Population centers for Greater Sage-Grouse in MZ1 (Doherty, et al. 2011) generally correspond to areas lacking a high human footprint and some of these areas have been designated as core areas by Montana Fish, Wildlife, and Parks (MFWP 2010). Map 2.18 shows the relationship of the MFWP core areas to general habitat and the Greater Sage-Grouse and grassland bird priority areas as proposed in Alternative E (Preferred Alternative). Greater Sage-Grouse range in MZ1 is overall very similar to portions of the range where sage-grouse have been extirpated, i.e. areas with high human footprints, mostly because of the abundance and distribution of sagebrush in the MZ (Wisdom, et al. 2011) suggesting that sage-grouse in MZ1 are more vulnerable to declines than other portions of the sage-grouse range.

Mountain Plover

The mountain plover is a migratory species of the shortgrass prairie and shrub-grassland ecoregions of the arid West. The planning area provides a high proportion of their breeding habitat in Montana, and is of global importance for the continued existence of this species. The number of mountain plovers is thought to be about 1,028 individuals in southern Phillips and Valley Counties (Childers and Dinsmore 2008). More individuals may be found in the rest of the planning area but the number is not known. Breeding habitat for the mountain plover is characterized by short vegetation, bare

ground, and flat topography common to prairie dog towns, open plains, and bentonite flats. Unlike other plovers, mountain plovers are rarely associated with water.

Mountain plovers migrate into the planning area in late April to breed and typically leave by early September. Mountain plovers on BLM land in Phillips and Blaine Counties are often associated with black-tailed prairie dog towns (see Wildlife Habitat section above); while in Valley County they are found in hardpan locations around Little Beaver Creek. The Little Beaver Creek area is considered a Globally Important Bird Area because of the numbers of mountain plovers breeding there (Audubon 2007). The mountain plover was proposed for listing as threatened, but was removed from consideration for listing in 2003. However, concern for this species remains high.

Mountain Plover Photo by John Carlson

Current mountain plover management is closely related to black-tailed prairie dog management in much of the planning area because of the close association of plovers and the low structure habitat created by prairie dogs. The Mountain Plover ACEC was established in 2003 in south Valley County to protect habitat associated with bentonitic soils in the area. Management opportunities for mountain plovers include habitat enhancement in areas away from prairie dog towns, other types of vegetative treatments, seasonal limitations on road maintenance in mountain plover habitat, minimizing disturbances during critical time periods, control of noxious and invasive plants, and maintenance of large blocks of habitat where plovers occur.

Raptors

Six raptor sensitive species breed in the planning area on BLM lands. Four raptor species, Swainson's hawk, ferruginous hawk, golden eagle, and burrowing owl, breed in grassland and sagebrush-grassland habitats, while the Northern goshawk and bald eagle require forested areas.

The bald eagle occurs year-round in Montana and has made significant gains in breeding numbers throughout its range. Historical and active nest sites occur across the planning area along the Missouri and Milk rivers. A number of pairs also nest in the forested western portion of the planning area, but not on BLM lands. Bald eagle nests are increasing in the planning area as the population in Montana continues to expand eastward. The planning area is also heavily used during spring and fall migration by eagles that winter to the south and breed in the boreal forests of Canada. They are often present near open water during winters.

Bald eagles were recently removed from the threatened and endangered list. However, bald eagles remain protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d), enacted in 1940, with amendments. This act protects bald eagles and similar looking Golden Eagles from take without a permit. Current management focuses on seasonal and spatial limits on surface-disturbing activities around raptor nests which vary somewhat, depending on which species is addressed. Important roost areas and other seasonal use areas may also be protected with similar management actions.

Sensitive Species – Amphibians and Reptiles

Four amphibian species and five reptile species are listed as Montana BLM sensitive species in the planning area (see Table 3.58). A few key species in the planning area are described below.

Northern leopard frog populations have been extirpated in all known sites west of the Continental Divide in Montana, prompting their listing as a BLM sensitive species. Populations in the planning area still appear to be healthy, but there

is concern that the unknown factors that caused the extinction of the species west of the divide may begin to affect populations in the planning area.

Spiny softshell turtles inhabit large rivers with adequate areas of slack water and sand bars. These turtles lay their eggs in sandy soil or sand and gravel bars near water and impacts to the nesting habitat include invasive and exotic vegetation, livestock concentrations, and changes in water flow patterns due to dams and water diversions. Recent interest has been shown in the spiny softshell turtle on the Upper Missouri and Marias Rivers because this population is a disjunctive population, separate from spiny softshell turtles on the Yellowstone and Lower Missouri rivers.

The Western hognose snake inhabits well-drained, sandy soils in the planning area and specializes in feeding on salamanders, frogs, and especially toads. This species is seldom seen or can be easily overlooked and there are few recent records showing where they probably occur in the planning area in greater numbers than have been recorded in the past. They appear to be declining in other portions of their range.

No current management actions are directed at specific reptile or amphibian species in the planning area, but management actions directed at improving broad-scale habitat conditions through standards and guidelines (BLM 1997a) are expected to maintain and improve habitat.

Management opportunities include increased surveys to determine presence and habitat associations for sensitive species reptiles and amphibians in the planning area, and minimizing impacts to known habitats caused by invasive and exotic species, decreased water quality, and disease. Improvements to specific habitats important to some species may also be considered.

Threatened and Endangered Species

Threatened and Endangered Species – Mammals

Three mammal species, listed as threatened or endangered under the Endangered Species Act, are presently known to occur in the planning area (see Table 3.59):

- black-footed ferret – (Endangered and Experimental)
- Canada lynx – (Threatened)
- grizzly bear – (Threatened)

The black-footed ferret was listed as endangered on March 11, 1967, and is now considered the rarest mammal in North America. The historic range of the ferret in Montana corresponds to the range of the black-tailed prairie dog (*Cynomys ludovicianus*), and the presence of black-footed ferrets is highly dependent on the size and extent of areas occupied by prairie dogs. Historical records exist of black-footed ferrets in the planning area.

The black-footed ferret was thought extinct by 1980, but was rediscovered at Meeteetsee, Wyoming, in September 1981. A successful black-footed ferret captive breeding program has provided animals for reintroductions throughout their former range, including prairie dog towns in south Phillips County. Black-footed ferrets were reintroduced into south Phillips County in 1994, on the Charles M. Russell National Wildlife Refuge as an experimental population. Reintroductions began on BLM land in 2001 and continued through 2005. However, viable self-sustaining populations of black-footed ferrets have not become established, likely due to the presence of plague affecting the overall size of the prairie dog prey base and the ferrets themselves. BLM participation in reintroduction efforts has declined in recent years as reintroduction efforts have not succeeded. No reintroduction efforts have taken place in the area since 2005.

BLM management opportunities will focus on maintenance and enhancement of the prairie dog habitat in the planning area, primarily through the MFWP Region 6 Prairie Dog Abundance and Distribution Objectives Plan (MFWP 2006a). As alternative or improved reintroduction techniques are developed, maintenance of habitat in the planning area may enable those efforts to proceed.

No potential Canada lynx habitat has been identified on BLM land in the planning area. Some parcels of BLM land are adjacent to Canada lynx habitat on U.S. Forest Service land, but the primary forest cover on these BLM parcels (ponderosa pine and dry Douglas-fir) is not considered lynx habitat.

Grizzly bears occur only on the western periphery of the planning area and entirely within Glacier National Park and the Blackfeet Reservation. They were formerly abundant throughout the planning area, but were exterminated from the eastern plains by 1900. Current populations appear healthy in the portions of the planning area adjacent to Glacier National Park and the Blackfeet Indian Reservation.

The Canada lynx and grizzly bear may occur on a very limited or sporadic basis within the planning area, but are not known to occur on BLM lands.

Table 3.59
Threatened, Endangered, and Candidate Species in the HiLine Planning Area

Common Name	*Scientific Name*	*Global Rank*	*State Rank*	*Species Status*
Mammals				
Black-footed Ferret	*Mustela nigripes*	G1	S1	Listed Endangered and Experimental non-essential (portions of Phillips County)
Canada Lynx	*Lynx canadensis*	G5	S3	Listed Threatened
Grizzly Bear	*Ursus arctos horribilis*	G4	S3	Listed Threatened
Birds				
Greater Sage-Grouse	*Centrocercus urophasianus*	G3/G4	S2	Candidate Listing Priority Number 8
Interior Least Tern	*Sterna antillarum*	G4T2Q	S1B	Listed Endangered
Piping Plover	*Charadrius melodus*	G3	S2B	Listed Threatened
Red Knot	*Calidris canutus*	G4	SNA	Listed Threatened
Sprague's Pipit	*Anthus spragueii*	G4	S3B	Candidate Listing Priority Number 8
Whooping Crane	*Grus americana*	G1	S1M	Listed Endangered

If any of these species are added to the T&E list in the future, or are found to occur more regularly on BLM lands in the planning area, management actions will be developed to conserve, enhance and protect the species and their habitat in accordance with the Endangered Species Act.

Threatened and Endangered Species – Birds

Four bird species listed as threatened or endangered under the Endangered Species Act (Table 3.59) are known to occur in the planning area:

- interior least tern (endangered)
- piping plover (threatened)
- red knot (threatened)
- whooping crane (endangered)

The interior least tern occurs on a very limited or sporadic basis, and the potential for breeding on BLM lands in the planning area is low, although breeding is known to occur on Fort Peck Reservoir. The interior least tern has been observed at Whitewater Lake and Nelson Reservoir, but is not known to breed or occur there on a regular basis. They nest primarily on barren to sparsely vegetated riverine sandbars, dike field sandbar islands, sand and gravel pits, and lake and reservoir shorelines from late April to August. Threats to the survival of the species include the actual and functional loss of riverine sandbar habitat. Recovery actions to protect and restore interior least tern populations are outlined in the 1990 Recovery Plan (USFWS 1990), and the 2006 Montana Interior Least Tern Management Plan (MFWP 2006b).

The piping plover was listed as threatened in 1986. Piping plovers breed on barren sand and gravel beaches in the planning area, and low water levels expose appropriate shoreline breeding and nesting habitat. Nesting success is often dependent on subsequent water level fluctuations and flooding is often a major source of nest mortality. Piping plovers are known to occur on Fort Peck Lake, Dry Lake and Lakeside units of the Bowdoin National Wildlife Refuge, Whitewater Lake, and Nelson Reservoir. Water levels at Fort Peck Reservoir are regulated for navigation and recreation, and those at Nelson Reservoir for irrigation purposes. In 2002, portions of the Bowdoin National Wildlife Refuge and Fort Peck Lake were designated as critical habitat for the piping plover. A portion of Nelson Reservoir was also proposed as critical habitat, but not designated due to current conservation agreements with the Bureau of Reclamation.

Recovery actions to protect and restore piping plover populations are outlined in the 1988 Recovery Plan (USFWS 1988b) and the 2006 Montana Piping Plover Management Plan (MFWP 2006b). Nelson Reservoir is the only breeding habitat managed by the BLM (which manages the subsurface) in the planning area, and current management for piping plovers is focused on minimizing disturbances to breeding birds from surface-disturbing activities tied to mineral leasing through timing and spatial stipulations. Management opportunities include habitat creation in areas where disturbances may be less or modifying disturbances to minimize impacts to breeding birds.

Piping Plover Shading a Nest Photo by Fritz Prellwitz

The red knot was listed as a Candidate Species in 2006. The USFWS determined on December 11, 2013, that the red knot warranted a Threatened listing. The red knot has been observed rarely during migration in Phillips County at Bowdoin National Wildlife Refuge, Whitewater Lake, Nelson Reservoir; Valley County at Newton Pond; and in Liberty County at Lake Elwell. The most recent observation was in 2005 at Whitewater Lake. No nesting or breeding occurs in the HiLine planning area.

The whooping crane was listed as endangered in 1970. No known whooping crane stopover, roosting, or nesting habitat occurs within the planning area, nor is the area within the whooping crane's principal migration corridor. However, migration of the Canadian population occasionally results in sightings in northeastern Montana, as noted with three sightings since 1990 in a small area southwest of the town of Whitewater in Phillips County. This wetland area habitat can be utilized by migrating whooping cranes, and management opportunities include maintaining or enhancing the wetland habitat for migratory stopovers.

Threatened and Endangered Species – Amphibians and Reptiles

No amphibian or reptile species in the planning area are currently listed as threatened, endangered, or candidate species.