3.0 AFFECTED ENVIRONMENT

This chapter describes the physical, biological, and human aspects of the environment that could be affected by the proposed action and no action alternative presented in Chapter 2.0. Each resource is described in terms of its current condition and the desired condition outlined for it in the Forest Plan. The Bridger-Teton National Forest (BTNF) has been evaluating Forest conditions and trends at the landscape level, and has compiled the following landscape assessments (LSAs) for areas that surround and include the Project Area: Greys River LSA (USFS 2004a), Hoback Basin LSA (USFS 2004b), and Teton Division LSA (USFS 2003b). These analyses, particularly the Hoback Basin LSA, have been used extensively in evaluating the affected environment of the Project Area.

3.1 INTRODUCTION

Chapter 3.0 is organized by resource areas that are key components of the affected environment or that must be analyzed in accordance with law, regulation, or policy. Resources include those associated with the issues identified in Chapter 1.0. Resources are grouped by physical, biological, or human elements of the environment. Each resource section is further organized into the subsections described below.

3.1.1 Resource

Section heading for the resource, for example: *Air Quality* or *Wildlife*.

Resource Description

The resource is described in terms of concerns, potential issues or impacts, and objectives related to that resource.

Indicators

The indicators for each resource are identified. Indicators are the quantitative or qualitative units of measure used to estimate effects and compare the alternatives.

Forest Plan Direction

The Land and Resource Management Plan (Forest Plan) for the BTNF, completed in 1990, provides strategic, Forest-wide direction. The Forest Plan provides a framework that guides all day-to-day resource management operations on the BTNF, but does not make project-level decisions. This section describes Forest Plan direction for the resource addressed in the section, including goals, objectives, Forest-wide standards and guidelines, Management Area (MA) standards and guidelines, and Desired Future Conditions (DFCs).

Temporal Scope

The temporal scope is the time period in which a resource may be impacted by the proposed project. The temporal scope varies among resources depending on the type of effects that may occur. For example, increased erosion and sedimentation caused by surface disturbing activities would continue until disturbed areas are successfully revegetated. Recovery of soil and water resources following disturbance would likely occur over an estimated 5-year period.

Geographical Scope

The geographical scope is the area in which a specific resource may be impacted by the proposed project. Affected areas vary in size by resource and the type of effect that may occur. For example, the affected area for soils would be the pipeline corridor where soils would be disturbed. However, the affected area for water quality would be the drainages receiving water affected by increased erosion and sedimentation.

Affected Environment

This section provides a brief overview of the current condition of the resources that may be affected by the proposed project within the Project Area. In some cases, a more detailed description may be found in the *Project File* at the Big Piney Ranger District office in Big Piney, Wyoming. The *Project File* contains supporting data and analysis of existing conditions developed during the preparation of this Environmental Impact Statement (EIS), which are hereby incorporated by reference.

3.2 THE PHYSICAL ENVIRONMENT

Air, water, and soil combine to create the physical environment, which is the foundation of all ecosystems. The physical environment is addressed in three sections: air, streams and watershed, and geology and soils.

3.2.1 Air Resources, Including Air Quality, Noise, and Odor

Resource Description

The primary air quality issues associated with the proposed project are fugitive (airborne) dust from construction activities, vehicle exhaust from project vehicles or tanker trucks hauling liquefied natural gas (LNG) to Jackson, and emissions from the proposed gas processing facility. Noise from construction activity would also be associated with the proposed project. Oil and gas exploration and production activity within the Pinedale Anticline and the Jonah fields and other areas near the Project Area also have the potential to increase ambient levels of air pollutants in the Project Area. Noise and odor sources associated with other developments include drilling activities, compressor engines, and vehicle traffic.

The Clean Air Act (as amended) provides a legal mandate to protect public health and welfare from pollution. National Ambient Air Quality Standards (NAAQS) protect human health and welfare with an adequate margin of safety. Pollutants for which standards have been set by EPA include sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), ozone (O_3), and particulate matter less than 10 or 2.5 microns in aerodynamic diameter (PM_{10} and $PM_{2.5}$).

Air Quality Related Values (AQRVs) include terrestrial and aquatic deposition and visibility impairment. Atmospheric deposition refers to the processes by which air pollutants are removed from the atmosphere and deposited on terrestrial and aquatic ecosystems. In general, an AQRV is a resource with protection standards as identified by a Federal Land Manager (FLM) for one or more federal areas of special concern that may be adversely affected by a change in air quality.

Particulate matter is an air quality concern because of its potential to adversely impact human respiratory systems. It can also reduce visibility, an air quality attribute in scenic areas. If not managed, project emissions could have the potential to impact sensitive areas such as downwind Class I areas.

Emissions of air pollutants from fugitive dust, vehicle exhaust, or treatment of natural gas associated with the proposed action could include nitrogen oxides (NO_x), carbon monoxide (CO), particulate matter with

a diameter less than 10 micrometers (PM_{10}), particulate matter with a diameter less than 2.5 micrometers ($PM_{2.5}$), sulfur dioxide (SO_2), ozone (O_3) and non-ethane-methane volatile organic compounds (VOCs). Most of the ambient O_3 and its precursor, nitrogen dioxide (NO_2), is not directly emitted from emission sources, but is formed in the atmosphere from reactions involving NO, NO_2, VOCs, and ultraviolet light.

Indicators

- Emissions related to truck transport of LNG to Jackson (emission factors for heavy duty vehicles – nitrogen oxides [NO_x], carbon monoxide [CO], and volatile organic compounds [VOCs] in tons per year)
- Emissions related to treatment of natural gas by glycol dehydration and injection of air before gas enters pipeline (NO_x, CO, and VOCs in tons per year)
- Effects related to noise and odor
- Effects from fugitive dust and exhaust from construction vehicles or equipment during pipeline construction
- Effects related to operation and maintenance of pipeline
- Effects on air-quality-related values and regional haze at Class I and sensitive Class II areas
- Compliance with State of Wyoming and National Ambient Air Quality Standards

Forest Plan Direction

Activities are planned to protect the quality of the basic watershed resources of soil, water, and air (Forest Plan, page 136). The Land and Resource Management Objectives substantially supporting the BTNF Forest-wide standards and guidelines for soil, water, and air include 1.3 (a, b), 4.2 (d), and 4.3 (c).

Desired Condition

National Forest System (NFS) lands are managed so that air quality complies with federal and state requirements. AQRVs in sensitive areas, such as Class I and Class II wilderness areas, are protected from air quality impacts by protection standards set by FLMs, in accordance with the Clean Air Act (as amended) and the Wilderness Act. Public health and welfare are protected from pollution in accordance with the Clean Air Act (as amended).

Temporal Scope

The short-term impact on air quality is anticipated to occur for the duration of pipeline construction activities, over a period of 6 months. Long-term project impacts to air quality from treatment of natural gas at the proposed gas treatment facility could occur for the foreseeable future.

Geographical Scope

Areas that may be directly, indirectly, or cumulatively affected, including the Project Area and downwind sites, are within the scope of the analysis. The project location is shown in **Figure 1-1** and **Figure 2-3**.

Affected Environment

Climate and Meteorology

The climate of the Project Area is defined by two ecoregions or ecosystem provinces, which are large areas of similar climate where ecosystems recur in predictable patterns (Curtis 2005):

- Ecosystem Province M331: Southern Rocky Mountain Steppe (Open Woodland - Coniferous Forest - Alpine Meadow Province), Middle and Southern Rocky Mountains.
- Ecosystem Province 342: Intermountain Semi-desert Province, Columbia-Snake River Plateaus, Wyoming Basin.

Most of the Project Area is included in the Southern Rocky Mountain Steppe. The climate of the Southern Rocky Mountain Steppe is a temperate, semi-arid steppe regime with average annual temperatures ranging from 35 to 45 °F (2 to 7 °C) in most of the region, but reaching 50 °F (10 °C) in the lower valleys. Climate is influenced by the prevailing west winds and the general north-south orientation of the mountain ranges. East slopes are much drier than west slopes; individual mountain ranges have similar east-west slope differences region-wide. Winter precipitation varies considerably with altitude. Total precipitation in mountainous areas is moderate. Less precipitation occurs on the plains to the east and west. In the highest mountains, a considerable part of annual precipitation is snow, although permanent snowfields and glaciers cover only relatively small areas. Bases of these mountains receive precipitation equivalent to only 10 to 20 inches of rainfall per year. At higher elevations, annual precipitation increases to 40 inches, and average temperatures are lower (Bailey 1995).

The Wyoming Basin, including the Green River Basin, (Intermountain Semi-desert Province) is characterized by slightly lower average temperatures and precipitation than on the plateaus. Green River Basin watersheds that include portions of the Project Area are shown in **Figure 3-1** on page 3-11. Winters are cold, and summers are short and hot. Average annual temperatures range from 40 to 52 °F (4 to 11 °C), and the average growing season has fewer than 100 days in the south and 140 days in the north and east. Average annual precipitation ranges from 5 to 14 inches, and is fairly evenly distributed throughout the year (Bailey 1995).

The Hoback Basin is characterized as having cool temperatures with moderate humidity and precipitation. High temperatures in summer average between 68 and 78 °F, and summer lows average between 25 and 34 °F. High temperatures in winter range between 23 and 36 °F, while winter lows range from –5 to 8 °F. The lowest temperature ever recorded at Bondurant was –52 °F in February 1982. During most of the year, the higher elevations are generally 5 to 15 °F cooler than in the valley. However, in the winter, inversions can trap cooler air in the valleys, causing the valley temperatures to be colder (USFS 1985).

A monthly summary for the Bondurant weather station at Hoback Guard Station is shown in **Table 3-1**. These data are available from the Western Regional Climate Center (WRCC) for the period of record from August 1, 1948 to March 31, 2003 (USFS 2004b).

TABLE 3-1 MONTHLY SUMMARY – HOBACK GUARD STATION (BONDURANT WEATHER STATION)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (°F)	23.1	28.6	37.0	47.8	61.6	70.5	78.7	77.3	68.1	55.9	36.7	23.6	50.8
Average Min. Temperature (°F)	-4.9	-3.1	5.0	18.2	27.7	32.0	34.7	32.8	25.8	17.4	8.1	-4.0	15.8
Average Total Precipitation (in.)	2.70	2.00	2.03	1.26	1.68	1.55	1.24	1.28	1.45	1.32	2.12	2.63	21.26

Average Total Snowfall (in.)	33.3	22.4	17.7	5.3	1.4	0.2	0.0	0.0	0.4	3.3	20.3	33.5	137.8
Average Snow Depth (in.)	25	30	29	12	0	0	0	0	0	0	5	16	10

Historical temperature and precipitation data for the Project Area can also be inferred from measurements taken in Pinedale and Jackson. These data represent measurements taken from 1948 to 2004. **Tables 3-2** and **3-3** show that a wide range of temperatures can be expected in the Project Area (WRCC 2005a). Temperature inversions, generally caused by radiative cooling, are common. Summer inversions usually break up by mid-morning. Winter inversions are typically stronger and persistent, and can last for more than a day under severe conditions. Nocturnal inversions can trap pollutants until daybreak when stagnant air is replaced by trans-valley winds. The Pinedale area typically receives less precipitation than Jackson. **Tables 3-4** and **3-5** present historical precipitation data for these two areas (WRCC 2005a).

TABLE 3-2 TEMPERATURE - PINEDALE, WYOMING

Temperature[1] (°F)					
				Daily Extremes	
Period	Maximum	Minimum	Mean	High	Low
Annual	51.7	19.9	35.8	94	-49
Winter	28.2	0.4	14.3	55	-49
Spring	49.3	19.5	34.4	85	-32
Summer	75.3	38.5	56.9	94	18
Fall	54	21.2	37.6	89	-28

[1] Station:(487260) Pinedale (period of 1948 to 2004)

TABLE 3-3 TEMPERATURE - JACKSON, WYOMING

Temperature[1] (°F)					
				Daily Extremes	
Period	Maximum	Minimum	Mean	High	Low
Annual	54	23.1	38.6	98	-50
Winter	29.3	6.5	17.9	58	-50
Spring	52.1	23.8	38	90	-32
Summer	78.3	38.7	58.5	98	18
Fall	56.4	23.6	40	93	-27

[1] Station:(484910) Jackson (period of 1948 to 2004)

TABLE 3-4 PRECIPITATION - PINEDALE, WYOMING

Precipitation[1] (inches)						
					Snowfall	
Period	Mean	High	Low	1-Day Maximum	Mean	High
Annual	10.8	19.38	5.21	1.78	61.1	124
Winter	1.83	3.81	0.41	0.64	31.9	111
Spring	3.11	6.72	0.87	1.78	16.9	52.2
Summer	3.28	7.3	0.51	1.44	0.3	7.5
Fall	2.58	5.01	0.93	1.2	12.1	38.2

[1] Station:(487260) Pinedale (period from 1948 to 2004)

TABLE 3-5 PRECIPITATION - JACKSON, WYOMING

Precipitation[1] (inches)						
Period	Mean	High	Low	1-Day Maximum	Snowfall	
					Mean	High
Annual	15.9	25.29	8.26	1.8	74.7	154.9
Winter	4.03	9.28	1.14	1.4	50.4	113.7
Spring	4.15	9.9	1.14	1.8	13.8	46.5
Summer	3.85	8.49	0.8	1.26	0.1	5
Fall	3.87	9.47	1.11	1.77	10.4	40.2

[1] Station:(484910) Jackson (period from 1948 to 2004)

The elevation of the Project Area ranges from 5,911 to 8,850 feet above sea level. Mean annual precipitation at Bondurant is 21 inches. Average annual snowfall varies greatly by elevation. The Hoback Guard Station, at an elevation of 6,620 feet, has an average snowfall of 30 inches in February. At higher elevations, the snowfall in February is nearly 120 inches. Precipitation data derived from the DaymetUS database indicate that the mean annual precipitation along the pipeline corridor in Hoback Basin and Hoback Canyon is 17 to 24 inches per year. Daymet is a model developed by the University of Montana, Numerical Terradynamic Simulation Group (NTSG), to fulfill the need for fine resolution, daily meteorological and climatological data necessary for plant growth model inputs.

Tables 3-6 and **3-7** present wind data for Big Piney Airport and Jackson Hole Airport. Prevailing wind direction is based on the hourly data from 1992 through 2002 and is defined as the direction with the highest percent of frequency. Monthly average wind speeds are based on hourly observations from the reporting airport during the period 1996 through 2006. These data are based on at least 2 years of hourly data (WRCC 2007b,c). **Table 3-6** shows that, for the Big Piney area, the prevailing winds are predominantly from the northwest. The Jackson Hole Airport data show prevailing winds from the north-northeast.

TABLE 3-6 WIND DIRECTION

Station	Average Wind Direction												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Big Piney Airport	ENE	ENE	NW	NW	NW	NW	W	W	NW	NW	NW	NW	NW
Jackson Hole Airport	NNE	NNE	NNE	NNE	N	SW	N	NNE	NNE	NNE	SSW	NNE	NNE

TABLE 3-7 WIND SPEED

Station	Average Wind Speed (miles per hour)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Big Piney Airport	5.3	5.0	6.8	8.6	9.0	8.9	7.9	7.4	6.9	6.8	5.5	5.2	6.9
Jackson Hole Airport	7.7	7.8	8.6	8.1	7.8	7.2	6.5	6.4	6.3	6.8	6.4	6.6	7.2

Air Quality

Areas sensitive to potential degradation of air quality include Class I and sensitive Class II areas. **Table 3-8** shows the sensitive areas in the vicinity of the Project Area. Because the Project Area encompasses a linear distance of more than 50 miles, the distance of each Class I or sensitive Class II area from the community of Bondurant was used as a representative distance from the proposed project in **Table 3-8**.

TABLE 3-8 CLASS I AND SENSITIVE CLASS II AREAS NEAR THE PROJECT AREA

Sensitive Area	Federal Agency[1]	Total Acreage	Distance From Project (miles)	PSD Class[2]
Bridger Wilderness	FS	426,758	20	I
Fitzpatrick Wilderness	FS	198,885	35	I
Teton Wilderness	FS	560,801	50	I
Washakie Wilderness	FS	694,306	50	I
Grand Teton National Park	NPS	308,082	40	I
Yellowstone National Park	NPS	2,201,803	70	I
Gros Ventre Wilderness	FS	284,166	10	II
Popo Agie Wilderness	FS	102,551	50	II
Shoal Creek Wilderness Study Area	FS	32,531	5	II
Palisades Wilderness Study Area	FS	80,560	25	II
Scab Creek Proposed Wilderness	BLM	7,719	40	II
Lake Mountain Wilderness Study Area	BLM	13,580	50	II
Beaver Creek Area of Critical Environmental Concern	BLM	3,591	40	II
Rock Creek Area of Critical Environmental Concern	BLM	5,266	50	II
Jedediah Smith Wilderness	FS	123,442	45	II

[1] FS = U.S. Forest Service, NPS = National Park Service, FWS = U.S. Fish and Wildlife Service
[2] Clean Air Act Prevention of Significant Deterioration

Pollutant Concentrations

Pollutant concentration refers to the mass of pollutants present in a specific volume of air. The Project Area is located within a designated attainment area with acceptable existing air quality based on EPA standards for the protection of human health. Concentrations of criteria pollutants in the ambient air are less than the NAAQS, and air quality in the Project Area is considered to meet federal and state air quality standards.

Table 3-9 presents NAAQS and Wyoming Ambient Air Quality Standards (WAAQS) for criteria air pollutants, with the exception of lead, which is not a pollutant of concern for the proposed project. Criteria air pollutants include nitrogen dioxide (NO_2), carbon monoxide (CO), particulate matter (PM_{10}), fine particulate matter ($PM_{2.5}$), sulfur dioxide (SO_2), and ozone (O_3). **Table 3-9** also presents measured air quality data that are inferred to be representative of the Project Area.

TABLE 3-9 CONCENTRATIONS OF CRITERIA AIR POLLUTANTS

Pollutant	Averaging Time	NAAQS (µg/m^3)	WAAQS (µg/m^3)	Monitored Concentration (µg/m^3)[a]	Percent NAAQS (%)	Percent WAAQS (%)
NO_2[b]	Annual	100	100	4.7	4.7	4.7
CO[c]	8 hour	10,000	10,000	2,394	23.9	23.9
	1 hour	40,000	40,000	9,804	24.5	24.5
PM_{10}[d]	Annual	--	50	21.9	43.8	43.8
	24 hour	150	150	67	44.7	44.7

TABLE 3-9 CONCENTRATIONS OF CRITERIA AIR POLLUTANTS

Pollutant	Averaging Time	NAAQS ($\mu g/m^3$)	WAAQS ($\mu g/m^3$)	Monitored Concentration ($\mu g/m^3$)[a]	Percent NAAQS (%)	Percent WAAQS (%)
$PM_{2.5}$[d]	Annual	15	15	7.0	46.7	46.7
	24 hour	35	35	23.7	67.7	67.7
SO_2[e]	Annual	78	60	3.4	4.4	5.7
	24 hour	365	260	7.8	2.1	3.0
	3 hour	1,305	1,300	31.3	2.4	2.4
O_3[f]	8 hour	157	157	139	88.5	88.5
	1 hour	235	235	151	64.3	64.3

a micrograms per cubic meter (EPA 2005, 2006, 2007)
b Monitor 56-035-0100 Approximately 4 miles south of Daniel, WY off of HWY 189
c Monitor 300310013 - Yellowstone Nat'l Park West Entrance Station, MT
d Monitor 560390006 - 200 S. Willow Jackson, WY
e Monitor 56-013-6001 90 Gas Hill Road, Riverton, WY (EPA 2005 data)
f Monitor 560391011 - Yellowstone National Park, WY

Atmospheric Deposition

Atmospheric deposition refers to the processes by which air pollutants are removed from the atmosphere and deposited on terrestrial and aquatic ecosystems, and is reported as the annual mass of material deposited on an area. Air pollutants are deposited by wet deposition (precipitation) and dry deposition (gravitational settling of particles and adherence of gaseous pollutants to soil, water, and vegetation). The estimation of atmospheric deposition is complicated by the contributions of several components, including rain, snow, cloud water, particle settling, and gaseous pollutants, to deposition. Deposition varies with precipitation, which, in turn, varies with elevation and time.

The Clean Air Status and Trends Network (CASTNet) provides estimated total annual deposition of total nitrogen (N) and total sulfur (S) in Yellowstone National Park and Pinedale from site measurements of ambient air chemical compounds that contain N and S. These compounds include SO_2, sulfate (SO_4), nitrate (NO_3), and ammonium (NH_4) that have potential to affect the acidity of ecosystems. The National Atmospheric Deposition Program (NADP) measures wet deposition rates of NO_3 and SO_4. NADP wet deposition data are collected at all CASTNet sites.

In 1989 the Forest Service determined that tolerable deposition rates for the Bridger Wilderness would be less than 3 to 5 kg/ha-yr for N and less than 5 kg/ha-yr for S (USFS 1989). Although a more recent prediction is not available, the agency no longer believes the levels predicted as protective in 1989 are still valid. Studies in Rocky Mountain National Park in Colorado have shown ecosystem impacts at much lower rates of deposition (i.e., 1.5 kg/ha/yr of N has caused changes in lake community structures).

The National Park Service Data Analysis Threshold (DAT) of 0.005 kg/ha-yr is used in this analysis as a screen for the proposed source to determine whether additional analysis is warranted. The DAT is used to measure the level of concern from new sources of N and S emissions.

Table 3-10 presents CASTNet total annual deposition estimates for Pinedale and Yellowstone from 2000 through 2004 (EPA 2006). **Table 3-10** also presents a summary of NADP wet deposition rates for NO_3 and SO_4 for 2000 through 2004 (NADP 2006).

TABLE 3-10 ATMOSPHERIC DEPOSITION NEAR THE PROJECT AREA WITH POTENTIAL TO AFFECT THE ACIDITY OF ECOSYSTEMS

Site	Deposition Rate (kg/ha/yr)			
	Minimum	Maximum	Minimum	Maximum
	Total Deposition[1]			
	Nitrogen (N)		Sulfur (S)	
Pinedale	1.35	1.85	0.74	0.91
Yellowstone	1.14	1.48	0.61	0.71
	Wet Deposition[2]			
	Nitrates (as N)		Sulfates (as S)	
Gypsum Creek	0.388	0.675	0.343	0.663
Pinedale	0.415	0.614	0.363	0.593
Sinks Canyon	0.420	0.745	0.430	0.853
South Pass City	0.603	0.770	0.533	0.750
Yellowstone	0.377	0.495	0.303	0.430

[1] Wet and dry deposition (EPA 2006)
[2] NADP 2006

Visibility

The 1977 Clean Air Act amendments established visibility as an AQRV that FLMs must consider. EPA's regional haze rule seeks restoration of natural visibility conditions through steady improvements over the next six decades. Regional haze occurs when pollutants become well mixed in the atmosphere, causing a general alteration in the appearance of landscape features by changing the color or contrast between landscape features or causing features of a view to disappear. Regional haze is caused by light scattering and light absorption by fine particles and gases.

Visibility impairment is measured in terms of change in light extinction or change in deciview (dv). Potential changes to regional haze are calculated in terms of a perceptible "just noticeable change in visibility" when compared to background conditions. A dv change of 1.0 or 2.0 (equivalent to a 10 percent and 20 percent change in extinction) represents a small but perceptible change in visibility. This analysis uses a 0.5 dv change as a screening threshold for significance. There are no applicable local, state, tribal, or federal regulatory visibility standards.

Visibility is expressed as a Standard Visual Range (SVR), the greatest distance at which an observer can just see a black object viewed against the horizon sky, the larger the SVR, the cleaner the air. The Inter-Agency Monitoring of Protected Visual Environments (IMPROVE) program has determined SVR for national parks and wilderness areas since the 1980s. SVR is calculated from measured ambient parameters and haze forming pollutants at monitoring stations in Yellowstone National Park and the Bridger Wilderness.

From measurements taken at Yellowstone National Park from 2000 to 2004, SRVs on the 10 percent cleanest days vary from 272 to 298 km, average SRVs vary from 194 to 210 km, and SRVs for the 10 percent worst days vary from 113 to 130 km (VIEWS 2006a). Trend analysis shows that in Yellowstone National Park the best visibility days improved while the middle and worst visibility days showed a slight decrease in SVR during 1997 through 2004 (VIEWS 2006b). Trends in visibility, updated by the NPS for 2005, showed stable or improving visibility in all monitored National Parks, including Yellowstone National Park, on both clear and hazy days (NPS 2006).

From measurements taken at the Bridger Wilderness from 2000 to 2004, SRVs on the 10 percent cleanest days vary from 282 to 307 km, average SRVs vary from 203 to 218 km, and SRVs for the 10 percent worst days vary from 116 to 139 km (VIEWS 2006a). Trend analysis shows that general visibility in Bridger Wilderness improved during the period 1989 through 2004 (VIEWS 2006b). Ongoing oil and gas development is affecting general visibility in the vicinity of the Bridger Wilderness. Cumulative visibility impacts from the Jonah Infill and regional sources were predicted to be above the 1.0-dv threshold at the Bridger Wilderness (BLM 2006a).

3.2.2 Streams and Watershed

Resource Description

The Project Area lies in the Green River and Upper Snake River Basins. The watersheds in these basins are critical to the State of Wyoming, providing water for wildlife, fisheries, agriculture, light industry, and residential uses as well as a variety of recreation activities, which contribute substantially to the tourism industry. Stream health and watershed condition can be affected by ground-disturbing activities such as removal of vegetation, soil disturbance, water diversions, and stream crossings, which are inherent to any pipeline project. Soil erosion and increased runoff from disturbance may cause increased sedimentation to streams and loss of streambank stability. Removal of riparian vegetation and disruption of stream beds can affect riparian and aquatic habitat.

Indicators

- Effects on stream channel conditions and stability
- Effects on natural flow characteristics, water quality, and quantity
- Effects on streambank stability
- Potential sedimentation

Forest Plan Direction

Activities are planned to protect the quality of the basic watershed resources of soil, water, and air (Forest Plan, page 136). The Land and Resource Management Objectives substantially supporting the BTNF Forest-wide standards and guidelines for soil, water, and air include 1.3 (a, b), 4.2 (d), and 4.3 (c).

The land and resource management challenges on the BTNF for watersheds and streams include ensuring needed quantities of clean water, with the goal that water quantity and quality are retained or improved for local users (Forest Plan, page 114). The objectives are to protect municipal, agricultural, and other potable water supplies and ensure that management activities do not deteriorate water flow-timing, quantity, or quality; and meet or exceed current state water quality standards or Forest Service water quality goals (Forest Plan, page 114).

Applicable Forest-wide standards and guidelines (Forest Plan, page 133) are listed below.

Standards

- Streambank Vegetation - Grass and shrub vegetation will be maintained within 25 feet plus 2 to 4 feet for each one percent side slope adjacent to live streams. Vegetation that gives greater stability because of rooting structure will be planted during the revegetation of channel banks following construction.
- Natural Drainage - Natural drainage channels of any stream will be protected during building activities. Following activities, the stream will be returned to its original width, depth, gradient, and curvature.

- Clear-Water-Diversion- Clear-water-diversion methods will be employed whenever building activities such as pipeline trenching must pass through a stream channel.
- River Qualities- The Hoback River, in MAs 47, 22, and 21, in DFC Areas 2B and 12 (Forest Plan, pages 275-307), will be managed to protect values that make it eligible for designation as a Scenic or Recreation River.
- Wild and Scenic Rivers System Standard – River segments and a corridor of at least ¼ mile on either side, that have been determined eligible for inclusion in the Wild and Scenic Rivers system will be managed to protect or enhance their outstanding values (added to page 142 of the Forest Plan by an Attachment to the Record of Decision).

Guidelines

- Restoring Stream Channel Conditions- Areas where human activities have resulted in adverse impacts such as channel widening, channel aggradation, or lowering of the water table should be restored.
- Crossings- Stream structural crossings should be avoided in reaches that are rated 4 or 5 in channel stability.
- Construction Staging Area- Construction staging and equipment service areas will be located outside of the riparian area.
- Streambanks- At least 90 percent of natural bank stability should be maintained, and vegetation should be maintained to 80 percent of its potential natural condition.

The Wyoming Department of Environmental Quality (WDEQ) regulates water quality. Management guidance in the Forest Plan ensures compliance with federal and state water quality laws and regulations.

Desired Condition

The desired conditions for watersheds and streams describe the land management direction that is intended to accomplish the goals and objectives of the Forest Plan. In general these are: manage watersheds to maintain soils, minimize erosion, prevent excessive alterations of stream flow, and retain water quality and quantity for local users.

Management will minimize erosion and sedimentation to geologic background levels (USFS 2004b). Ground-disturbing activities will establish measures to stabilize and mitigate sedimentation sources to address Forest Plan watershed and riparian area standards and guidelines. Any stream in a precarious condition will warrant extra care to protect and improve its condition (USFS 2004b).

Temporal Scope

The temporal scope includes the period during and immediately following construction of the proposed pipeline. The first year following construction activities is anticipated to be the period of greatest alteration of the factors influencing soil erosion, runoff, and sediment transport. Pipeline construction activities would potentially affect stream channel conditions, water quality, streambanks, riparian vegetation, and sediment load. These effects would decline in following years because of the implementation of Best Management Practices (BMPs) and design criteria. Reclamation procedures would include recontouring of disturbed areas, replacement of topsoil, re-establishment of surface drainage and vegetation, and installation of short- and long-term erosion and sediment controls. As time passes following reclamation of the areas disturbed during construction, the magnitude and intensity of soil erosion, runoff, and sediment transport would decline.

Geographical Scope

The Project Area includes most of the Fisherman Creek and Hoback River drainages, and a small portion of the Snake River drainage just south of Jackson. The corridor follows the Hoback River for 26.4 miles, and the Snake River for 4.4 miles. In addition to the Project Area, the extent of these drainages downstream from the proposed project that could be affected by project activities are included in the scope of this analysis.

Affected Environment

Watersheds

Portions of 18 sixth-level watersheds are included in the Project Area. These watersheds are within the Green River and Upper Snake River Basins, and span Teton, Lincoln, and Sublette Counties. Half of the pipeline route (25.4 miles) is located on lands administered by the BTNF. The watersheds within the BTNF are resources of the highest value when viewed in terms of the amount of water supplied for local, regional, and national needs.

Watershed boundaries were developed by the U.S. Geologic Survey (USGS) based on Hydrologic Unit Code (HUC) sixth-level watersheds. These watersheds range in size from 5,039 acres to 25,093 acres **(Table 3-11).** The extent of each watershed within the Project Area is shown in **Figure 3-1**.

TABLE 3-11 SIXTH-LEVEL WATERSHEDS

Watershed Identification	Total Acres	Project Area Acres
140401011801	5,039	1,161
140401011804	5,603	339
140401011805	16,745	1,885
140401011806	23,274	8,346
170401030201 (Middle Flat Creek)	13,363	3,720
170401030203 (South Twin Creek)	13,847	520
170401030204 (Cache Creek)	19,035	4,729
170401030205 (Lower Flat Creek)	23,745	3,285
170401030401 (Hoback River-Poison Creek)	11,778	5,001
170401030402 (Cliff Creek)	25,093	9,429
170401030501 (Greys River-Spring Creek)	13,897	833
170401030601	19,267	6,891
170401030606	13,406	5,355
170401030701	24,436	4,557
170401030702	12,852	5,966
170401030801	9,471	736
170401030901	17,185	828
170401031001	24,716	178
Total (All Watersheds)	**292,761**	**63,767**[a]

[a] Project Area contains 63,767 acres (all ownerships), including 40,184 acres of NFS lands.

Figure 3-1 Sixth-level Watersheds and Soil Sensitivity

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Watershed condition describes the health of a watershed as measured against management objectives and factors that affect favorable conditions of flow and soil capability (USFS 2004b). Three condition classes are used to characterize a watershed relative to its potential and tolerance. Tolerance is defined as the capacity or ability to endure unfavorable environmental factors without exhibiting unfavorable effects (USFS 2004b).

- Watershed Condition Class I – Watershed condition is at or above potential.
- Watershed Condition Class II – Watershed condition is below potential but can be improved by applied management of improvement measures.
- Watershed Condition Class III – Watershed condition is at or below tolerance.

The watershed condition classes are comparable to those in the Inland West Watershed Initiative (IWWI), discussed in the following paragraphs. The IWWI is a coarse filter assessment describing the watershed conditions of the sixth-level HUCs, named "sub-watersheds," which range in size from 5,000 to 50,000 acres. The IWWI is a dynamic process that provides an assessment of watershed and stream channel conditions. The ratings are based on existing information and first-hand knowledge (USFS 2004b).

Watershed vulnerability, geomorphic integrity, and water quality integrity were evaluated for each watershed. Watershed vulnerability includes natural geologic/landform characteristics, such as erodible soils and landslide potential. Watershed geomorphic integrity includes the amount of ground disturbance from roads, timber management, range management, recreation use, and mining activities. Water quality integrity is based on the amount of damaged stream segments, which is another layer. The impact criteria for damaged stream segments are bank damage, sediment loads, channel modification, flow disruption, thermal changes, chemical contamination, and biological stress. Generally, the impacts to streams within the Project Area are from streambank damage and high sediment loads associated with existing roads and grazing. Watershed vulnerability describes a watershed's inherent vulnerability to disturbance. The watershed rating is based on the percentage of sensitive lands.

Geomorphic integrity reflects current conditions by assessing the watershed's various attributes and the disturbance regimes imposed on them. Each watershed is rated (e.g. high, moderate, and low) based on three criteria: soil-hydrologic function, properly functioning condition, and dynamic equilibrium. The criteria are defined as:

1) Soil-hydrologic function is the land's ability to absorb and store water based on organic ground cover (plants, litter, humus), soil porosity, and soil structure relative to its natural potential condition.
2) Properly functioning condition is the presence of adequate vegetation, landform, or large woody debris to dissipate stream energy associated with high water flows, such as the 25-year flood (modified from the BLM).
3) Dynamic equilibrium is the continual adjustment within a historic range of variability (HRV) of upland, valley, and stream channel morphology by dynamic physical processes, interrupted only by extreme disturbance (reset) events.

Using the above criteria, each sub-watershed is rated based on the following definitions.

1) High – The watershed has high soil and water integrity relative to its natural potential condition. Disturbance does not compromise soil-hydrologic function or soil-stream resilience.
    a. Soil-hydrologic function is estimated to be excellent or good throughout the watershed, and
    b. All streams are estimated to be in dynamic equilibrium relative to their own potential, and
    c. All riparian areas are estimated to be in properly functioning condition.

2) Moderate – the watershed has moderate soil and water integrity relative to its natural potential condition. Disturbance partly compromises soil-hydrologic function or soil-stream resilience. Recovery can occur naturally or through revised management with minimal investment.
    a. Soil-hydrologic function is estimated to be damaged in isolated areas (e.g. less than 20 percent) of the watershed, or
    b. A minor part (less than 20 percent) of stream miles are estimated not to be in dynamic equilibrium relative to their own potential, or
    c. A minor part (less than 20 percent) of riparian miles are estimated to be functioning at risk or non-functioning.

3) Low – The watershed has low soil and water integrity relative to its natural potential condition. Disturbance widely compromises soil-hydrologic function or soil-stream resilience. Recovery requires capital investments and revised management. Management must complement recovery. Criteria are:
    a. Soil-hydrologic function is estimated to be degraded over much (e.g. more than 20 percent) of the watershed, or
    b. A major part (e.g. more than 20 percent) of stream miles are estimated not to be in dynamic equilibrium relative to their own potential, or
    c. A major part (e.g. more than 20 percent) of riparian miles are estimated to be functioning at risk or non-functioning.

A high integrity rating is inferred to mean the sub-watersheds are operating within their historic range of variability (HRV). This means that the watersheds are healthy, functioning, and resilient to adverse impacts, and implies that their recovery rates are relatively fast, which allows moderate disturbances to occur without serious damage to any sub-watershed.

Geomorphic integrity reflects the stream's ability to absorb and store water and its physical soil-stream resilience. Ratings are based on preliminary professional judgments (USFS 2004b). The ratings were updated in 2003, and are comparable to the watershed condition classes in the Forest Plan. A moderate rating characterizes a stream with moderate soil and water integrity relative to its natural potential condition. Disturbance partly compromises soil-hydrologic function or soil-stream resilience, and recovery can occur naturally or through revised management with minimal investment (USFS 2004b).

The South Fork of the Hoback River has a moderate geomorphic integrity rating. This rating is based on historic grazing impacts, natural hillslope instability, Hoback Canyon highway, flooding on Lamb and Kilgore Creeks, and erosion from salvage sales (USFS 2004b). The primary concerns for this area are sediment delivery to stream channels from existing roads, burned areas, gullies, and past flood damage (USFS 2004b).

Fisherman Creek, which runs parallel to the pipeline corridor, also has a moderate geomorphic integrity rating. This rating is based on trail stream crossings and increased use of these crossings (USFS 2004b).

Dell Creek was also given a moderate rating. Recreation and lack of riparian vegetation from poor streamside grazing practices were given as reasons for the rating (USFS 2004b). The primary concerns for this stream are its crossings in the Shoal Creek Wilderness Study Area and portions of the Gros Ventre Wilderness.

A low geomorphic integrity rating characterizes a stream with low soil and water integrity relative to its natural potential condition. Disturbance widely compromises soil-hydrologic function or soil-stream resilience. Management must complement recovery (USFS 2004b). Two streams in the Project Area, Muddy Creek and Cliff Creek, were given a low rating (USFS 2004b). The rating for Muddy Creek is

based on the poor location of existing roads. Approximately 25 percent of the riparian areas are at risk or not functioning properly (USFS 2004b). Natural hillslope instability and historic upland grazing were given as the reason for the rating on Cliff Creek. The unstable hillslopes are contributing large amounts of sediment to the stream, and grazing has resulted in soil loss and weed invasions (USFS 2004b).

Streams

There are 136 miles of streams in the Project Area. Most streams drain into the Hoback or Snake Rivers. The Hoback River accounts for 23 percent of the perennial stream length in the Project Area. The total length of streams within the Project Area, according to stream type and watershed, is provided in **Table 3-12**. Within the Project Area, watershed 140401011806 contains the greatest length of perennial and intermittent streams.

TABLE 3-12 PERENNIAL AND INTERMITTENT STREAMS

Watershed	Stream Type (miles)		Total (miles)
	Perennial	Intermittent	
140401011801	0	2	2
140401011804	1	0	1
140401011805	4	0	4
140401011806	18	5	23
170401030201 (Middle Flat Creek)	5	1	6
170401030203 (South Twin Creek)	1	0	1
170401030204 (Cache Creek)	6	3	9
170401030205 (Lower Flat Creek)	5	0	5
170401030401 (Hoback River-Poison Creek)	6	2	8
170401030402 (Cliff Creek)	16	0	16
170401030501 (Greys River-Spring Creek)	1	0	1
170401030601	11	2	13
170401030606	11	4	15
170401030701	12	0	12
170401030702	13	1	14
170401030801	2	0	2
170401030901	1	0	1
170401031001	1	0	1
Total	**114**	**20**	**134**

Water Quantity

Runoff in the Project Area is dominated by snowmelt. The peak streamflows occur between April and the middle of May or June. By the end of July or August, the streamflows recede to a summer base level. As the temperature cools and ice forms in November and December, the streamflows drop to a winter base level and remain at this level until March. A moderate runoff year in the Project Area will generate bankfull flows. Bankfull flows occur when a stream's banks are over-topped and water moves into the floodplain. Bankfull flows generally occur every 1.5 to 2.5 years (USFS 2004b).

Mean annual streamflow in 2002 on the Snake River below Flat Creek was 2,824 cubic feet per second (cfs) (USGS 2004). The mean monthly streamflow at that location is highest in June at 10,930 cfs, and lowest in January at 1,308 cfs (USGS 2004). Streamflow data for the Hoback River were only available between 1945 and 1957. The mean annual streamflow on the Hoback River in 1955 was 500 cfs (USGS 2004). The mean monthly streamflow for that time shows the peak flows in July at 2,326 cfs and low flows in March at 189 cfs (USGS 2004).

Water Quality

Existing water quality in the Project Area has been affected by streambank damage and high sediment loads associated with roads and grazing. MacDonald and Stednick (2004) characterize the potential threat of total suspended sediments (TSS) to water quality in Colorado forests, but the characterization is also applicable to the Project Area. TSS, which represent the concentration of solids in the water column, are likely the greatest threat to water quality in the Project Area, and can affect water quality both physically and chemically. The high surface area of fine particles has the potential to absorb phosphorus and other nutrients and chemicals, leading to further water quality degradation. An unnatural sediment load can also remove a stream from its state of equilibrium and cause it to become unstable.

Roads are a large and chronic sediment source and can have adverse effects on watershed function. The road system intercepts surface and subsurface flows and routes them more quickly to stream channels. In addition, roads have lower infiltration rates, generate greater runoff, and cause increased soil erosion from road surfaces, cuts, and fills. These factors can increase sediment delivery to surface drainages, cause higher peak flows, and accelerate timing of peak flows. This process is most prevalent where roads encroach on streams. The sediment produced from roads depends on a number of factors, including traffic, ground cover, precipitation, and slope.

The State of Wyoming has designated streams in the Project Area as Class 2AB, with beneficial uses for drinking water, game and fish, fish consumption, other aquatic life, wildlife, agriculture, industry, and scenic value. There is one Class 1 stream in the Project Area, Granite Creek, which is a tributary to the Hoback River. Class 1 waters are specially designated waters on which the existing water quality is protected regardless of the uses supported by the water.

The Clean Water Act requires states to compile a list of water bodies, known as the 303(d) list, that do not fully or partially support their designated beneficial uses. One stream segment in the Project Area is on the WDEQ 303(d) list of impaired streams for 2002. The listed segment is Flat Creek between Cache Creek and the Snake River. The segment parallels the pipeline corridor south from the existing Lower Valley Energy (LVE) facility for approximately 3 miles. This segment is listed for physical degradation. There are two listed segments outside the Project Area near Big Piney: Piney Creek North and Reardon Draw. The Piney Creek North segment is listed for ammonia, fecal coliform bacteria, and total residual chlorine. Reardon Draw is listed for physical degradation. No Total Maximum Daily Loads (TMDLs) have been established for any stream segments in the Project Area.

Streambanks

Stream conditions are determined based on a stream's ability to transport the sediment and flows of the watershed. Most streambanks in the Project Area are in moderate condition (USFS 2004b).

Water Influence Zone

The Water Influence Zone (WIZ) is a riparian buffer that includes the floodplain and riparian vegetation areas. The width of the WIZ on each side of a stream is considered to be 100 feet for the purpose of this analysis. Approximately 5 percent of the Project Area (all ownerships) falls within the WIZ (**Table 3-13)**.

TABLE 3-13 WATER INFLUENCE ZONE BY WATERSHED

Watershed	Water Influence Zone - Acres		
	Perennial	Intermittent	Total
140401011801	0	45	45
140401011804	29	0	29
140401011805	96	0	96
140401011806	440	128	568
170401030201 (Middle Flat Creek)	128	17	145
170401030203 (South Twin Creek)	32	0	32
170401030204 (Cache Creek)	156	78	234
170401030205 (Lower Flat Creek)	119	0	119
170401030401 (Hoback River-Poison Creek)	146	53	199
170401030402 (Cliff Creek)	385	0	385
170401030501 (Greys River-Spring Creek)	26	0	26
170401030601	266	59	325
170401030606	275	101	376
170401030701	285	0	285
170401030702	316	14	330
170401030801	40	0	40
170401030901	32	0	32
170401031001	21	0	21
Total	**2,792**	**495**	**3,287**[a]

[a] 3,289 acres of 63,767 total Project Area acres (all ownerships) are in the WIZ

3.2.3 Soils and Geology

Resource Description

Soils are derived from volcanic materials, sedimentary and glacial debris, and igneous or metamorphic rock. The potential effects on soils are the loss of soil productivity related to the following factors:

- Accelerated wind and water erosion;
- Compaction;
- Mixing of topsoil with subsoil or spoil;
- Modification of surface drainage patterns;
- Disruption of vegetation, surface litter, and soil organic matter;
- Infestation by undesirable weedy species;
- Nutrient loss; or
- Chemical contamination.

Changes to earth materials caused by surface-disturbing activities affect the characteristics of soils and slopes, and influence soil productivity, soil movement, compaction, and slope stability in different ways. Disturbance can trigger new landslides or reactivate existing ones. Project activities have the potential to reduce the stability of slopes and cause slope failure, which could increase soil erosion and sedimentation

to streams and rivers. In addition, increased soil erosion and rerouting of surface and groundwater have the potential to initiate debris flows or flooding that could damage Forest resources, private property, and transportation corridors.

Most of the Project Area is located within the Overthrust Belt, a zone of complexly deformed rocks traversing the western part of the continent in a north-south direction. In western Wyoming, thin rock layers have been complexly folded, faulted, and thrust eastward for tens of miles into their present position against the Teton-Gros Ventre foreland uplift, an older zone of faulting and uplift. The Hoback Basin formed after the Overthrust Belt was in place. The basin contains young stream and lake sediments.

Indicators

- Soil disturbance (acres)
- Disturbance in sensitive soils susceptible to erosion, compaction, or revegetation failure (acres)
- On-site erosion (tons per acre – first year following pipeline installation)
- On-site erosion (tons per acre – fifth year following pipeline installation)
- Disturbance in areas with steep slopes or slope stability concerns (acres)
- Disturbance in active or potentially active landslides or debris flows (acres)
- Compliance with Soil Management Standard for special geotechnical/slope stability design to control risk of mass wasting and sedimentation (Forest Plan, page 136)

Forest Plan Direction

Activities are planned to protect the quality of the basic watershed resources of soil, water, and air (Forest Plan, page 136). The Land and Resource Management Objectives substantially supporting BTNF Forest-wide standards and guidelines for soil, water, and air include 1.3 (a, b), 4.2 (d), and 4.3 (c). The applicable Forest-wide standards and guidelines for geology and soils (Forest Plan, page 136) are listed below.

Standards

- Sediment Control - Sediment control will take into account drainage density, slope position and configuration, and subsurface flow conditions.
- Soil Management - A geotechnical evaluation will be conducted prior to earthmoving activities on marginally stable, unstable, and landslide areas. Special design considerations will be incorporated as needed to control the risk of mass wasting and sedimentation. A slope-stability assessment or evaluation will be conducted on marginally stable, unstable, or landslide areas prior to vegetation manipulation.

Guidelines

- On-site Erosion - Project-caused on-site erosion should be reduced by 50 percent 1 year after disturbance, and by 95 percent 5 years after disturbance.
- Rehabilitation - Rehabilitation plans will identify quantities of topsoil (A- and B-horizons) to be reserved for stockpiling prior to project initiation. Rehabilitation seed mixes or other plantings will be designed for each vegetation community type that meets the desired future condition.
- Soil Capability - Leave a minimum of 80 percent of the total operating area in a condition of acceptable soil productivity potential for trees and other managed vegetation following land management activities (Forest Plan, page Appendix B-43).

Desired Condition

The desired conditions for geology and slope stability are to avoid the intensification of slope stability hazards. The desired conditions for soils are to maintain soil resources, minimize erosion, prevent excessive sedimentation of streams, and retain or restore vegetation communities for soil protection.

Temporal Scope

This analysis considers existing conditions and projected conditions during and immediately following installation of the proposed pipeline. The greatest alteration of factors influencing slope stability would occur immediately following the installation and reclamation of the proposed pipeline. As time passes, the magnitude and intensity of these effects would decline as vegetation re-establishes on disturbed areas.

The temporal scope for soil resources is 1 and 5 years following the implementation of the proposed action. The greatest effects are expected to occur within the first year following the disturbance. Pipeline construction activities would potentially affect soil surface cover, soil productivity, sedimentation, runoff, and erosion. These effects should decline in the following years because of the implementation of Best Management Practices (BMPs) and design criteria, including specifications for the removal, storage and replacement of topsoil (A-horizon) and subsoil (B-horizon), revegetation procedures, and installation of short- and long-term erosion and sediment controls. As time passes following reclamation of the areas disturbed during construction, the magnitude and intensity of soil erosion would decline.

Geographical Scope

The scope of this analysis is the Project Area along the proposed pipeline route. The corridor originates approximately 3 miles south of Jackson and terminates west of Daniel Junction, Wyoming.

Affected Environment

Soils

The soils in the Project Area have been mapped in a soil survey of the Teton National Forest (USFS 1985). Fifty soil map units (SMUs) were delineated in the Project Area. The descriptions presented below provide information about the sensitivity of soils to erosion and compaction, their revegetation limits, and the suitability of the soils for management. Soil ratings used to assess the potential soil effects of the proposed pipeline are briefly described below.

- **Sensitivity to Compaction** – The sensitivity of a soil to compaction is based on soil texture, coarse fragment content, and permeability of subsoils. Soils with a high compaction rating are at risk for increased surface runoff and erosion, and restricted plant growth because of the destruction of soil structure and reduced water infiltration by heavy equipment traffic.
- **Sensitivity to Erosion** – Erosion sensitivity ratings are based on the assumption that vegetation and litter have been removed and the natural soil horizons remain intact. The sensitivity of a soil to erosion is based on a complex interaction of factors but is primarily related to soil texture, soil structure, organic matter content, and permeability. Soils with a high sensitivity to erosion may have an excessive loss of soil material and a substantial reduction in productivity.
- **Revegetation Limitation** – Limitation is based on soil texture, depth, coarse fragments content, infiltration rate, available water capacity, and slope. This rating assumes a barren soil surface where compaction has been minimized or the soil has been ripped prior to planting. A rating of severe indicates that a slow response or recovery of vegetation cover can be expected, and erosion control practices may be needed. A rating of very severe indicates that erosion control practices will be needed and the site may not return to the pre-disturbance vegetation cover.

- **Stability-** Stability ratings are based on land characteristics that indicate potential for mass failures along with frequency of actual landslides. A marginally unstable rating indicates that evidence of past mass movement exists but no current movement is discernible. An unstable rating indicates that the site is actively moving and probabilities of increased or additional movement are high, even without human-caused disturbances (Forest Plan, page Appendix B-40).
- **Sensitive Ground**- Soils with high erosion and compaction hazards and severe revegetation limitations are classified as sensitive ground (USFS 2004b). Soils within this classification are potentially slow to recover from ground disturbing activities and may require special measures to revegetate and stabilize.

Based on these ratings, 40 of the SMUs have a low or moderate compaction rating, meaning that they would suffer a substantial reduction in long-term natural productivity capability (USFS 2004b). However, they can be managed for sustained natural productivity by controlling the timing and intensity of use, and their natural productivity can be restored through the application of relatively simple soil compaction mitigation treatments (USFS 2004b). Twenty-seven SMUs have low or moderate erosion ratings. A low erosion hazard rating refers to soils where erosion is unlikely under ordinary climatic conditions. A moderate rating refers to soils where some erosion is likely and control measures may be needed. Eighteen of the SMUs have slight or moderate revegetation ratings. A slight rating is given to soils that have properties favorable for revegetation. The limitations to revegetation are minor and can be easily overcome. A moderate revegetation limitation can be overcome or modified by special planning, design, or maintenance. Thirty-seven SMUs have a stable or marginally stable rating. A stable rating indicates that evidence of past landslide activity has not been identified and the observable characteristics of the land are evidence that the probability of landslides in the future is low. A marginally stable rating indicates that evidence of past landslide activity has not been identified, but some land characteristics suggest that landslide potential may exist (USFS 2004b).

Six SMUs in the Project Area are considered sensitive (**Figure 3-1**). All of these soils have high erosion and compaction ratings and severe to very severe revegetation limits. These soils have stability ratings of marginally unstable or unstable. Sensitive SMUs are described in **Table 3-14**.

TABLE 3-14 SOIL PROPERTIES FOR SENSITIVE SOILS

SMU Number	SMU Description	Drainage Class[1]	Permeability[2]	K-Factors[3]
457	Argic cryoborolls, fine, montmorillonitic- typic cryoboralfs, fine, montmorillonitic, silty clay loam- argic pachic cryoborolls, fine, montmorillonitic complex	Well	Slow to Moderately Slow	0.43
611	Argic-cryoborolls, fine, montmorillonitic- typic cryoboralfs, fine, montmorillonitic, silty clay loam- argic pachic cryoborolls, fine montmorillonitic association	Well	Moderately Slow to Moderate	0.32 to 0.43
616	Argic vertic cryoborolls, fine, montmorillonitic- argiaquic cryoborolls, fine, montmorillonitic comples	Somewhat Poor to Moderately Well	Moderately Slow	0.37 to 0.43
651	Mollic cryoboralfs, fine, montmorillonitic- mollic cryoboralfs, fine-loamy, mixed- typic cryoboralfs, fine, montmorillonitic, silty clay loam complex	Moderately Well to Well	Moderately Slow to Moderate	0.37 to 0.49
351	Mollic cryoboralfs, fine-loamy, mixed- typic cryoboralfs, fine, montomorillonitic complex	Well	Moderate to Moderately Slow	0.37

657	Typic cryoboralfs, fine, montmorillonitic-typic cryoboralfs, fine-loamy, mixed-typic cryoboralfs, clayey-skeletal, montmorillonitic complex	Well	Moderate to Slow	0.24 to 0.43

[1] Drainage class refers to the frequency and duration of periods of saturation or partial saturation (USFS 1985).
[2] Permeability is measured as the number of inches per hour that water moves downward through saturated soil (USFS 1985).
[3] K-factors indicate the susceptibility of a soil to erosion by water. The value of K is a function of the particle-size distribution, organic-matter content, structure, and permeability of the soil or surface material. The higher the value, the more susceptible the soil is to erosion.

Geology

The geology resource description concentrates on factors that influence landslide and debris flow hazards in the Project Area. Geologic hazards and geotechnical concerns, including landslides, faults, sink holes, and manmade fill, have been evaluated (Plumley 2005). The known and documented landslides within the Project Area that continue to affect or have the potential to affect U.S. Highway 189/191 (Munger Mountain, Shoal Creek, and Bondurant Landslides) have been mapped and described by the Wyoming Department of Transportation (WYDOT). Relevant information from WYDOT pertaining to these landslides is provided in Plumley (2005). The types of slope movements are characterized in **Table 3-15**.

TABLE 3-15 TYPES OF SLOPE MOVEMENTS

Name of Feature	Type of Slope Movement[1]	Typical Rate of Movement when Active
Bedrock Slump Blocks	Rotational movement that occurs by shear displacement along concave upward surfaces.	Extremely slow to moderate (1ft/5 years to 5 ft/day)
Translational Landslides/ Debris Slides	Movement along a more or less planar surface typically controlled by weak, adversely dipping planes (e.g. weak beds, bedding planes, faults) within bedrock; or debris slides, movement of weathered bedrock and soil, at the contact between soils and bedrock.	Very slow to rapid (ft/year to ft/minute)
Earth Flows	Failure in predominantly fine-grained, cohesive soils with shear plane along the basal surface and flanks.	Slow (ft/year to ft/month)
Debris Flows	Predominantly coarse sediment-water mixtures that originate in steep ravines and are deposited as fan-like accumulations near that mouth of the ravines (includes debris avalanche deposits).	Very rapid (ft/sec)

[1] Modified from Varnes (1978)

Landslide activity level or age categories in the Project Area have been generally classified as active, potentially active, older/inactive or ancient (Plumley 2005). These categories are relative in the sense of more or less susceptibility to movement. **Table 3-16** characterizes the relative stability of the Project Area by providing the acreage for each landslide deposit type and activity level category. The acreage of rockfall areas was not identified as a separate category.

TABLE 3-16 LANDSLIDE AND DEBRIS FLOW DEPOSITS IN THE PROJECT AREA

Type of Feature	Active or Potentially Active[1]		Older/Inactive or Ancient[1]	
	Landslide Deposit (Qls)	Debris Flow Deposit (Qdf)	Landslide Deposit (Qlso)	Debris Flow Deposit (Qdfo)
Acres	952	147	2,745	22

[1] Activity Level:
Active = Historic or physical record of movement during the past 25 years
Potentially Active = No historic or physical record of movement during the past 25 years
Older/Inactive = No evidence of historic activity. Significant vegetation cover exists. Large, deep-seated inferred landslide blocks that are deeply eroded suggesting movement
Ancient = Occurred several thousand years ago

Specific geologic hazards and potentially unstable areas are described in **Table 3-17**. Landslide and debris flow deposits, geologic contacts, faults, boreholes, test pits, and proposed river crossings are shown in **Figure 3-2** following page 3-28.

TABLE 3-17 POTENTIAL GEOLOGIC HAZARDS AND GEOTECHNICAL CONCERNS IN THE PROJECT AREA

Map Feature	Map Symbol and ID[1]	Feature Description	Estimate Potential Movement
Debris Flow	Qdf #1	Older debris flow fan	Large debris flow could potentially cover ground features and structures and cause localized erosion.
Debris Flow	Qdf #2	Debris flow run-out path	Debris flow potentially initiated by abnormally high rainfall or snowmelt, which could cause localized erosion.
Landfill	F#1	Existing municipal landfill	Settlement of landfill material and cover.
Active or Potentially Active Landslide	Qls #1-3	--	--
Active Landslide	Qls #4	Large, deep-seated bedrock slide. Movement has impacted the elevation and grade of the old highway. Above highway: well-defined arcuate scarp. Below highway to Snake River: hummocky topography and rotational toe features.	Recent movement apparent because of geomorphic features and patching of highway. Potential for several feet of slow movement or accelerated movement particularly from seismic shaking.
Active Landslide	Qls #5	Munger Mountain Landslide: Active translational bedrock slide of fractured sandstone within a larger ancient landslide complex. WYDOT data indicate movement in 1969 and 1970 along and adversely dipping clay zone within sandstone. Movement triggered by removal of toe section during road construction. WYDOT maps from	Potential for movements of several to tens of feet particularly from abnormally high rainfall or snowmelt or strong seismic shaking.

TABLE 3-17 POTENTIAL GEOLOGIC HAZARDS AND GEOTECHNICAL CONCERNS IN THE PROJECT AREA

Map Feature	Map Symbol and ID[1]	Feature Description	Estimate Potential Movement
		1969 indicate upslope right-of-way (ROW) fence shifted approximately 20 feet downslope, and the base of the slide was up to 40 feet below the ground surface.	
Potentially Active Landslide	Qls #6	No evidence of recent movement.	--
Potentially Active Landslide	Qls #7	Large slump-earth flow complex. Multiple slump block features and geomorphology suggests an ancient deep-seated landslide reactivated during historic times.	Historic rate of movement is unknown. Potential for reactivation from abnormally high rainfall or snowmelt or strong seismic shaking.
Active or Potentially Active Landslide	Qls #8	--	--
Active Landslide	Qls #9	Camp Creek Saddle Earth Flow Complex: Series of coalescing earth flows. Landslide deposits composed of silty clay and plastic clay derived from weathering of underlying Camp Davis Formation (siltstone and claystone). Landslide debris up to 60 feet (See Chapter 4.0 - Environmental Consequences for a detailed description of the Camp Creek Saddle Complex).	Geomorphic evidence suggests earth flow movements of several inches to several feet due to abnormally high rainfall or snowmelt.
Active or Potentially Active Landslide	Qls #10	--	--
Potentially Active Fault	Hoback Fault	Hoback Fault: No geomorphic evidence of movement during the last 10,000 years where fault crosses the river.	Unlikely to experience significant movement.
Active or Potentially Active Landslide	Qls #11	--	--
Old/Inactive Debris Flow	Qdf #3	--	--
Sink Hole	SH #1	Sink hole located southeast of Stinking Springs and north of the highway. Diameter of sink hole is 2 to 3 feet. Likely connected to a cave. Origin unknown, but may be related to erosion or piping along the Hoback Fault.	Low potential for additional sink holes to develop.
Old/Inactive Debris Flow	Qdf #4	--	--

TABLE 3-17 POTENTIAL GEOLOGIC HAZARDS AND GEOTECHNICAL CONCERNS IN THE PROJECT AREA

Map Feature	Map Symbol and ID[1]	Feature Description	Estimate Potential Movement
Active Landslide	Qls #12	Translational and earth flow features. Upper portion of the slide composed of scarps and slump blocks with up to 5 feet of displacement that has damaged the old highway (up slope of existing highway).	Potential for reactivation of landslide. Possible movements of up to a few feet particularly from abnormally high rainfall or snowmelt or strong seismic shaking.
Potentially Active Landslide	Qls #13	Small, slow-moving earth flow with evidence of movement in the past several decades.	Potential for reactivation of landslide due to abnormally high rainfall or snowmelt. Slow movements of several inches to a couple of feet possible.
Active Landslide	Qls #14	Very active translational debris slide.	--
Active Landslide	Qls #15	Shoal Creek Landslide: Very large slump-earth flow complex with headscarps and slope blocks extending 2,000 feet upslope of the highway. Head area of the landslide is deep-seated slump blocks. Toe area is earth flows. WYDOT reports indicate activity for the last 20 years with accelerated movement following heavy runoff in 1996 and 1997. Gabion walls were installed on the west side of the slide to prevent undercutting of the toe of the landslide by the Hoback River. In addition, WYDOT has installed ditches and a 5-foot-deep subdrain immediately south of the highway.	May be experiencing slow creep type movement in the toe area. Portions of the slide complex could reactivate and experience movement of up to several feet due to abnormally high rainfall or snowmelt.
Active Landslide	Qls #16	Bondurant Landslide: Slide composed of several landslides. Based on WYDOT information, slide reactivated during wet periods prior to October 1986. This resulted in slide deposition on the highway and a shift of the highway to the south. Slide appears to be translational and occurs in Tertiary Wasatch Formation (siltstone and claystone). WYDOT installed a subdrain system in the late 1980s. Since that time, no additional maintenance has been required on the effected portion of the highway.	Recent movement in subsidiary landslides since subdrains were installed. Moderate potential for one or more of these slides to move several feet or more during wet periods. Excavation in the area may reduce stability.
Active or Potentially Active Landslide	Qls #17-19	--	--

TABLE 3-17 POTENTIAL GEOLOGIC HAZARDS AND GEOTECHNICAL CONCERNS IN THE PROJECT AREA

Map Feature	Map Symbol and ID[1]	Feature Description	Estimate Potential Movement
Fill Slope	F#2	Accelerated creep of old highway grade upslope of existing highway.	Appears to be potentially unstable and experiencing accelerated creep.

[1] Location of geologic hazards and geotechnical concerns in the Project Area are shown on **Figure 3-2** following page 3-28.
-- Information not available.

The activity levels of landslides and debris flows and the location and description of the geologic hazards and areas of geotechnical concerns were based on the following:

- Interpretation of stereo photographic pairs;
- WYDOT information;
- Topographic/geologic maps that identified landslides, potentially unstable slopes, or active faults;
- Aerial and on-the-ground site reconnaissance;
- Drill hole and trench data; and,
- Correlation of existing landslide features (active or ancient), and factors that could be readily observed or measured in the field.

Rotational and translational slides and debris flows have occurred in the Project Area. Both features are initiated in saturated soil or colluvium on a steep slope. Slides begin and continue movement on a distinct shear surface that usually forms a relatively impervious layer to the downward percolation of water. This surface may be a bedding plane in solid rock or layers within a soil mantle such as a clay lens. Slides may break up- or downslope into multiple blocks with independent movement, or even eventually break down to spread laterally, resembling a flow. When the dip of the bedding plane is generally in the same direction as a hill slope, the slope is further destabilized over whatever effect gravity and gradient imposes. Landslides and debris flows constitute a potential threat to life and property because of their rate of movement and location adjacent to property development and the existing highway.

The majority of the large and ancient landslides are slump-earth flow type complexes. These complexes are composed of rotational slump blocks in the head and main body of the slide mass with earth flows in the toe of the complex.

The locations of epicenters of known earthquakes and their magnitudes are described in Plumley (2005). Earthquake activity in the last 10,000 years has resulted in ground rupture from faulting, ground shaking, seismically-induced slope failure, and liquefaction. Ground rupture has been associated regionally with large (magnitude 7.0 or larger) earthquakes such as the 1959 Hebgen Lake event in southwestern Montana, but events of this magnitude have not occurred historically in the Project Area. Seismically induced landslides, such as Hebgen Lake slide located in southwestern Montana and the Gros Ventre slide located north of the Project Area, have occurred in response to historic earthquakes of varying magnitudes.

A potentially active fault, the Hoback Fault does occur in the Project Area (**Figure 3-2**). Although this fault is unlikely to experience significant movement, the Project Area could experience strong earthquake-induced ground shaking in the future should movement occur along this fault.

Liquefaction maps are not available for the Project Area. In general, young alluvial deposits and soils consisting of loose, fine-and medium-grained sand having a uniform particle-size range are most susceptible to liquefaction.

Mass movement of soil and geologic material occurs when the stresses acting on hill or valley sideslopes exceed the strength of the material involved. This is typically expressed as a factor of safety (Fs) where:

$$Fs = \frac{\text{Strength or shear resistance of material}}{\text{Magnitude of stress}}$$

When the Fs is less than 1, the slope will fail and movement of soil and geologic material will occur. The Fs of the surface geologic formation and the soil mantle may decline due to increases in weight - loading (surcharge) and porewater pressure, and the removal of lateral support of the slope (i.e. undercutting and steepening of slopes). This may occur due to the following:

- Increased runoff, concentration of precipitation, erosion, and weight-loading caused by fill placement, and reduced permeability from activities in the temporary work areas; and,
- Reduced lateral slope support from trench excavation and removal of trees and shrubs.

These factors may increase the potential for accelerated movement of existing landslides and initiation of new landslides.

Figure 3-2 Geologic Hazards and Geotechnical Concerns

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3.3 THE BIOLOGICAL ENVIRONMENT

The biological environment is made up of vegetation and animals. When combined with the physical environment, they interact to form an ecosystem. Both plants and animals rely on the air, soil, and water to thrive. Plants and animals are also interdependent. Animals rely on plants for forage and habitat. Plants rely on animals and natural processes for succession and distribution. Natural processes, such as fire, succession, and disease alter habitats over time. The biological environment is discussed in two subsections: vegetation (including wetlands, rangeland resources, special status plant species, and noxious weeds) and wildlife and fisheries (including special status species).

3.3.1 Vegetation, Including Wetlands, Rangeland Resources, Wildland Fire Hazards, Special Status Species, and Noxious Weeds

Resource Description

Vegetation resources include vegetation (including wetland and riparian areas), rangeland resources, fire and fuels, special status species, and noxious weeds and invasive species. Vegetation could be affected by changes in overall vegetation types and introduction of invasive species. Wetland and riparian areas could be lost or affected by erosion, soil compaction, and conversion to non-wetland vegetation types. Rangeland resources could be affected by changes in vegetation, increased erosion, introduction of invasive species, or soil compaction. Fire and fuels could be affected by changes in fuel loads and dominant vegetation. Special status species could be affected by the destruction of habitat or harm to individual plants. Noxious weeds and invasive species could increase in areas where they already exist or could be introduced into new areas from surface disturbing activities or project traffic.

Indicators

- Effects on vegetation, by vegetation type
- Wetland and riparian disturbance (acres), including compliance with Construction and Staging-Area Guideline for location of construction staging and equipment service areas outside riparian areas (Forest Plan, page 133)
- Effects on streambank vegetation, including compliance with Streambank Vegetation Standard for maintenance of grass and shrub vegetation adjacent to streams (Forest Plan, page 133)
- Effects on livestock grazing
- Effects on wildland fire hazards
- Effects on Special Status Plant Species - Proposed, Threatened and Endangered Species, Forest Service Sensitive Species, and Management Indicator Species (MIS)
- New disturbed areas susceptible to noxious weed infestation (acres)

Forest Plan Direction

The land and resource management goals and objectives for vegetation include:

- 3.3 – Sensitive species are prevented from becoming a federally listed Threatened species in Wyoming.
- 3.3(a) – Protect Forest Service Intermountain Region Sensitive plant species and provide suitable and adequate amounts of habitat to ensure that activities do not cause (1) long-term or further decline in population numbers or habitats supporting these populations, and (2) trends towards federal listing.

- 4.3 – Overall diversity of and riparian habitats within the BTNF are enhanced as timber is removed.
- 4.3(a) – Provide for vegetative species and age diversity, genetic quality, and forest appearance.
- 4.3(b) – Provide for diverse habitats to ensure viable populations of MIS.
- 4.3(c) – Protect and rehabilitate riparian areas to retain and improve their value for fisheries, aquatic habitat, wildlife, and water quality.
- 4.8 – Livestock operations are not disrupted needlessly.
- 4.8(a) – Help prevent human interference with livestock operation along driveways and in other areas.
- 4.8(b) – Help control the spread of noxious weeds.

The Forest-wide standards and guidelines for vegetation (Forest Plan, page 122-133) applicable to this project are described below.

Standards

Sensitive Species Management Standard - Quantifiable objectives will be developed to identify and improve the status of sensitive species and eliminate the need for listing critical habitat of Priority I, II, and III species, as listed by the Wyoming Game and Fish Department (WGFD) and Intermountain Region Sensitive Species Lists, will be protected and maintained. The Forest Service will cooperate with WGFD on management programs, when needed, to maintain population objectives of these species, especially with species identified as needing immediate attention and active management to ensure that a significant decline in populations does not occur. Information collection and interpretive programs will promote the conservation of these species and their habitats. Forest managers will participate in species and habitat surveys and monitoring programs needed to gain necessary data to determine population status.

Streambank Vegetation Standard - Grass and shrub vegetation will be maintained within about 25 feet plus 2 to 4 feet for each 1 percent side slope adjacent to live streams. Vegetation with greater stability provided by rooting structure will be planted during the revegetation of channel banks following construction.

Guidelines

Construction Staging-Area Guideline - Construction staging and equipment service areas will be located outside of riparian areas

Desired Condition

The desired condition for vegetation resources includes a number of components. Protecting special status species and maintaining, improving, or increasing suitable habitat for these species is emphasized. Additionally, habitat is managed for use by wildlife, including small game, big game, and non-game species. Protecting or improving forest health through management activities and mitigation measures applied to the design of other projects should increase the amount of forest and rangelands restored to a healthy condition. Protecting, maintaining, and improving the health of wetlands and riparian areas is required for future stream health. Design of projects should emphasize eradicating populations of noxious weeds and preventing future colonization of these species.

Vegetative characteristics that provide habitat for wildlife are the primary focus of MAs 21, 22, 23, 41, and 49. Habitat is managed to achieve the game and fish populations, harvest levels, success, and recreation day objectives identified by the WGFD and agreed upon by the Forest Service. Groups of

species are emphasized, such as early- or late-succession-dependant species, in order to increase species richness or diversity. Sufficient habitat should be provided to maintain desired populations and distribution of big-game species. Aspen should be managed for its value as wildlife habitat and for its scenic value and fall colors.

Additionally, in MAs 21 and 41, vegetative management plans should be prepared for each developed site to define a program for maintaining the desired vegetative mix and character and to provide for public safety.

Temporal Scope

This analysis considers short-term effects on vegetation over a period of 1 to 3 years during and immediately following construction of the proposed pipeline, and long-term effects occurring within 5 to 20 years. The first year following construction activities is anticipated to be the period of greatest alteration of vegetation. Effects on vegetation would decline in following years because of the implementation of Best Management Practices (BMPs) and design criteria for reclamation, including revegetation. As time passes following reclamation of the areas disturbed during construction, the magnitude and intensity of effects on vegetation would decline.

Geographical Scope

The geographic scope of this analysis is limited to the Project Area. The Project Area is a corridor along the LVE natural gas pipeline. The corridor is 49.7 miles long and 2 miles wide, and originates at the existing Lower Valley Energy liquefied natural gas (LNG) facility approximately 3 miles south of Jackson. The pipeline will terminate west of Daniel Junction, Wyoming near the confluence of Crooked and Middle Beaver Creeks, where it ties into an existing pipeline. Vegetation resources within the Project Area and along access routes that will be used for project activities may be directly affected.

Affected Environment

The affected environment for vegetation is presented in five sections: vegetation (including wetlands and riparian areas), rangeland resources, fire and fuels, special status species (plants), and noxious weeds and invasive species.

Vegetation

The Project Area contains 40,184 acres of National Forest System (NFS) lands. Elevations in the Project Area range from approximately 5,911 feet to 8,850 feet. The vegetation types occurring in the Project Area include lodgepole pine and spruce/fir timber stands along with aspen stands scattered throughout the area. In the higher elevations, non-forested habitats include sagebrush/grass and riparian types scattered throughout the corridor. The vegetation types are typically influenced by soils, precipitation patterns, varying topography and, in some cases, fire occurrence. Specific species occurring in the forested settings include: lodgepole pine, mixed stands of subalpine fir, Engelmann spruce, and aspen. Minor amounts of Douglas-fir and Whitebark pine also are found scattered throughout the higher elevations of the Project Area. This variety of forested patterns and openings with species and age class diversity provides cover and forage habitats for numerous wildlife species inhabiting the area.

The most common cover types include non-forested (50 percent), lodgepole pine (16 percent), and Douglas-fir (15 percent). **Figure 3-3** shows the distribution of vegetation types in the Project Area. **Table 3-18** summarizes the cover types found on NFS lands in the Project Area.

TABLE 3-18 VEGETATION TYPES ON NATIONAL FOREST LANDS IN PROJECT AREA

Vegetation Type	Acres	Percentage
Aspen	2,957	7
Douglas-fir	6,000	15
Lodgepole pine	6,486	16
Engelmann spruce/Subalpine fir	2,654	7
Riparian	2,050	5
Non-forested	19,980	50
Clearcuts/burns	57	Much less than 1
Total Acreage	40,184[a]	100

[a] Project Area contains 63,767 acres (all ownerships), including 40,184 acres of NFS lands.

Many biological communities exist within the Project Area, and support a variety of plant and animal species. These species rely on each other for optimal growth and success. Healthy plant communities reflect healthy animal communities and vice versa. Fire suppression has altered the natural state of some of these communities. Species pairings (associations and interactions) indicative of ecosystem health include a variety of vegetative types and communities.

Alpine Communities

The desired condition is to maintain existing condition and extent where these communities exist. Alpine communities are typically characterized by herbs and dwarf shrubs. Most of these areas have fragile, highly erodible soils, and may have dense vegetation or be almost entirely barren rock. Plant species and community diversity are controlled by heavy winds, cold temperatures during summer and winter, and intense ultraviolet radiation. Vegetation structure rarely exceeds 4 inches in height with occasional low-growing shrubs reaching heights of 2 to 3 feet. Large woody debris is scarce.

The hydrologic functioning of these communities seems to be intact. The overall risk for this community type is moderate. This assessment is based on the assumption that recreation use will continue and current livestock grazing practices will continue.

Mountain Shrub Associations

The desired condition is to maintain the existing extent and diversity of these communities. These areas are slightly moister than pure sagebrush types and slightly drier than quaking aspen communities. These communities typically occur adjacent to riparian areas under conifer stands and on relatively rocky sites. A wide variety of shrubs, grasses, and forbs are associated with this community type. The mountain shrub community type is a complex of several different species that share some common characteristics.

Browse intensity is high wherever mountain shrub communities are located in wildlife winter range. Forest-wide, more than 70 percent of the total acreage in this community type is in a downward trend in extent and condition. This can be expected to continue so long as elk populations remain higher than historic levels.

These communities are at a high risk for reduction in size and productivity. Loss of berry production, reduced grass cover, and an increase in disease will adversely affect the potential value of this community type to wildlife and livestock. Its frequency and patch size is decreasing as a result of fire suppression and subsequent sage encroachment.

Figure 3-3 Vegetation Types and Sensitive Plant Species

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Big Sagebrush

Big sagebrush communities occur throughout the area, primarily in dry bottomlands, benches, and on south- and west-facing slopes. These communities are interspersed with open meadows, willowed valley bottoms, conifer stands, and occasional aspen patches. Mountain sagebrush and Vasey big sagebrush are the most abundant varieties in the area. Some subalpine big sagebrush and basin big sagebrush also occur.

Distribution of mountain, Vasey and subalpine big sagebrush is related to temperature, precipitation, and soil water-holding capacity. Mountain big sagebrush occupies relatively warm, dry sites; it is associated with bluebunch wheatgrass, antelope bitterbrush, arrowleaf balsamroot, and mountain snowberry. Subalpine big sagebrush occupies cool, moist sites in association with slender wheatgrass, northwest cinquefoil, sticky geranium, spike trisetum, purple oniongrass, and Raynold's sedge. Vasey big sagebrush and Idaho fescue are associated with both groups of species.

The fire regime of the big sagebrush communities has been altered by fire suppression and livestock grazing. Because of direct and indirect fire suppression, the current mix of structure and age classes is outside the historic range of variation. About 90 percent of the big sagebrush communities have more than 15 percent shrub canopy cover. The increase in big sagebrush canopy cover has replaced the historic mosaic of structure and age classes with very large patches of uniformly dense sagebrush.

The increase in big sagebrush density and cover has been accompanied by a decrease in herbaceous cover. This is due to increased competition from sagebrush and heavy grazing by livestock and wildlife. Total ground cover is within the historic range of variation over most of the analysis area; however, continued decline of herbaceous vegetation could be accompanied by an increase in bare soil, which would cause more erosion and produce more sediment.

Fire suppression and heavy grazing have greatly altered the fire regime by lengthening fire intervals. This has caused a shift toward older age classes and denser sagebrush canopies throughout the area. The pre-settlement mosaic of age and structure classes has been replaced by large areas of dense, old sagebrush. This change has been accompanied by reduced herbaceous production and increased bare soil.

Tall Forb Association

The desired condition for this association is to maintain stands and upward trends in vigor, diversity, and ground cover. Erosion rates are acceptable, not accelerated, because of bare ground and gullies. Tall forb communities are characterized by a large array of luxuriant, tall (16 to 48 inches) mesic forbs. These communities occur on all aspects and slope gradient, near springs, along streams in small forest openings, and in large, open, high-elevation parklands where soils are deep and soil moisture is adequate for growth to occur nearly all season long. Historically, these community types were common at elevations above 7,000 feet and in precipitation zones where annual precipitation is more than 35 inches. These sites are characterized by deep, well-drained, productive soils.

Common forb species include: monkshood, nettleleaf, columbine, aster, larkspur, fleabane, geranium, stickseed, cow parsnip, ligusticum, bluebell, osmorhiza, lousewort, cinquefoil, coneflower, meadowrue, valerian, groundsel and goldenrod. Many species are present in climax condition, with no species showing dominance.

Grass and grass-like species in these communities include: Raynolds sedge, slender wheatgrass, and oniongrass. Shrubs and trees are mostly absent in these communities, with an occasional quaking aspen patch encroaching.

Grassland, Meadows, Dry Park Associations

The desired condition is to achieve greater diversity and vigor over existing conditions where trampling and overuse has occurred, and to reduce undesirable non-native plants or increasers that indicate overuse. Generally, the goal is to maintain the existing extent of these communities and keep conifers from encroaching on them.

Three distinct grassland meadow community types occur in different environments throughout the area. These environments are high-elevation grassy ridge tops and forb lands, wet and dry open meadows and parkways, and open grassy hillsides. Typical vegetation in this community type includes Idaho fescue, bluebunch wheatgrass, bluegrass, needlegrass, wheatgrass, tufted hairgrass, timothy, some dryland sedges, bistort, cinquefoil, clover, geranium, and lupine.

Intensive grazing by livestock and elk has been the single largest influence on change. Continued livestock grazing and elevated elk populations are causing these communities to become concentrated in smaller areas. Impacts include soil compaction, loss of ground cover and loss of the “A” soil horizon.

Grazing by livestock and wild ungulates, combined with fire suppression, has allowed an increase in conifer encroachment into many grassland communities. These communities are considered to have a high risk of change due to fire suppression, recreation, wild ungulate and livestock grazing, and the spread of noxious weeds.

Riparian and Wetland Associations, Including Wet Meadows

The desired condition is to maintain and restore the extent, diversity, and functionality of this association, avoiding disturbance and overuse, and recognizing that this basic resource is a key to the future productivity of the BTNF. On a site-specific basis of 5 to 20 acres, cover and structure of the community type is sufficient to slow overland flow and filter sediments. Stream gradient, stream meanders, and flow regimes result in channel morphologies within properly functioning condition.

Riparian community types include all areas where free or unbound water is present, at least seasonally, in the upper soil profile. These communities can be found in association with seeps, springs, bogs, lakes, or streams. They support all vegetative growth forms, including trees, shrubs, grasses, grasslikes, and non-vascular types of ground cover.

The risk to each riparian site depends, in simplified terms, on the vegetation present (kind), the amount (how well it protects the site), the soils (erodibility and productivity), and the topography (rockiness and slope of the land). It is clear that the condition of riparian areas has changed in the previous 100 years. Many areas may not be capable of returning to their former condition because of soil losses and hydrologic changes. There will always be a potential risk for overuse because of the high demand for human activity and the limited resources at each site.

Wetland areas are also at risk because of their desirability for forage production. This will be especially important in dry years when large animals can gain access to previously unused plants and cause soil compaction.

There are 2,050 acres of riparian habitat on NFS lands within the Project Area (USFS 2004b) and Wyoming Natural Diversity Database (**Figure 3-3**). Although these water-influenced habitats only occupy 5.1 percent of the Project Area, they are used by a disproportionate number of wildlife and plant species. Riparian and wetland habitats in the Project Area provide habitat for nesting and migratory birds, amphibians, and a variety of mammal species. These habitats provide suitable cover, water, and forage for elk, deer, and moose in the Project Area. They are also areas of greater plant diversity.

After review of aerial photography and National Wetland Inventory (NWI) data, wetlands along the entire proposed pipeline disturbance corridor were delineated by onsite inspection in accordance with the U.S. Army Corps of Engineers (COE) Wetland Delineation Manual (COE 1987). Wetlands were classified using the U.S. Fish and Wildlife Service (FWS) Wetland Classification System (Cowardin et al. 1979). Only those wetlands within the proposed corridor were delineated. The *Project File* contains detailed information on all wetlands delineated.

Three wetland types have been identified within the Project Area. Each wetland type, representing palustrine and riverine ecological systems, is briefly described below according to Cowardin et al. (1979). Most of the wetlands are associated with the Hoback River system.

> Palustrine Emergent (PE). These are natural moist swales and seeps that are hydrologically associated with riverine wetlands and irrigation canals. Vegetation is generally herbaceous and includes species such as sedges, bulrushes, redtop, field horsetail, reed canarygrass, and panicled aster. Some shrubby species such as sandbar willow and yellow willow, may also be present.
>
> Palustrine Scrub/Shrub (PSS). These are natural moist swales and seeps that are hydrologically associated with riverine wetlands and irrigation canals. These areas are dominated by woody vegetation less than six meters (20 feet) tall. Plants include true shrubs, young trees, and trees or shrubs that are small or stunted because of environmental conditions. Vegetation is dominated by shrubby species such as sandbar willow and yellow willow, but may also contain herbaceous species such as sedges, bulrushes, redtop, field horsetail, reed canarygrass, and panicled aster.
>
> Riverine Rocky Shore (RRS). These are wetland environments characterized by bedrock, stones, or boulders which singly, or in combination, have an areal cover of 75 percent or more and an areal coverage by vegetation of less than 30 percent. Water regimes are restricted to irregularly exposed, regularly flooded, irregularly flooded, seasonally flooded, temporarily flooded, and intermittently flooded. Vegetation is dominated by sandbar willow, reed canarygrass, redtop, panicled aster, and field horsetail.

A total of 53 jurisdictional wetlands covering 30.68 acres were provisionally identified within or immediately adjacent to the proposed pipeline disturbance corridor. The COE, with EPA oversight review and concurrence, exercises jurisdictional responsibilities under Section 404 of the Clean Water Act, including final acceptance of the wetlands inventory. Twenty-one wetlands were identified as PE. Twenty-two wetlands were delineated as PSS. Nine wetlands bordering the Hoback River were classified as RRS. Portions of one wetland were classified as PE and other portions of the same wetland were classified as PSS. The acres of each wetland type delineated within the proposed pipeline disturbance corridor are shown in **Table 3-19.**

TABLE 3-19 WETLANDS DELINEATION

WetlandType	Length (feet)	Acres within Pipeline Corridor
Riverine Rocky Shore (RRS)	1,212	2.08
Palustrine Emergent (PE)	7,679	13.33
Palustrine Scrub/Shrub (PSS)	8,872	15.27

Five potential wetland sites were provisionally identified as Waters of the U.S. (WUS). These WUS are documented in the *Project File*. WUS are subject to regulation by the COE, with EPA oversight review and concurrence on all decisions made by the COE. A total of 1.84 acres of WUS occur within the proposed pipeline disturbance corridor. These sites were not delineated as wetlands because of the absence of hydric soils, wetland hydrology, or hydrophytic vegetation. Each of these five locations was

identified as a WUS because of the presence of distinct bed and bank channel morphology. WUS are located in the following areas along the proposed pipeline disturbance corridor:

T.36N. R.112W., Sections 1 and 2;
T.36N. R.112W., Section 12;
T.36N. R.112W., Section 25;
T.38N. R.113W., Section 33; and
T.38N. R.114W., Section 5.

Twenty-one potential wetland sites were provisionally determined to be nonwetlands. These locations are documented in the *Project File*. These sites appeared as drainages on the topographic maps or were mapped in the NWI as riverine or palustrine wetlands. Upon investigation, these sites did not meet the COE definition of jurisdictional wetlands based on the lack of at least one of three wetland determination characteristics: hydric soils, wetland hydrology, or hydrophytic vegetation. In addition, drainages at these locations did not show distinct bed and bank morphology and did not, therefore, provisionally qualify as WUS.

Aspen Association

Aspen is an MIS ecological indicator for aspen habitat on the BTNF that provides important wildlife habitat and serves to increase ecological diversity within the Forest. The desired condition for this association is to restore and maintain aspen communities so that they can be managed for their value as wildlife habitat, scenic values, and fall colors. There is limited documentation of the decline of aspen in the west (Knight 2001), although aspen in Colorado have declined by 49 percent according to Bartos (2001). Currently, population status and trend data for aspen on the Forest are not available. However, some baseline information is available through past forest stand mapping data. Future inventory of aspen stands will facilitate determination of trends in aspen status on the Forest. In the Rocky Mountain region, aspen is considered to be a seral species that will eventually be replaced by conifers in the absence of frequent fires, which serve to remove conifers. Fire suppression may have allowed aspen stands in the BTNF to become over-mature, to the point that they may begin to deteriorate.

Aspen is very abundant on the BTNF, with 145,746 acres forest-wide included in cover types that contain more than 30 percent aspen. Aspen in the Project Area (2,957 acres) are at high risk of loss because their structural classes do not fall within a balanced range. Older age classes of trees dominate the area. Existing conditions in the Project Area include no acres in stand initiation stand structure that includes the grass/forb and seedling/sapling category. Because small-scale natural disturbance regimes have been interrupted, the aspen community type is not meeting the historic spatial variation in age classes and structural diversity. Conifer encroachment is also occurring in more than 15 percent of the aspen stands. Aspen encroached upon by conifers are rejuvenated by natural disturbances or management activities. Aspen respond readily to human management actions such as cutting or burning that stimulate sucker growth and serve to reinvigorate stands.

Rangeland Resources

Livestock was brought in the area by early homesteaders and settlers in the 1890s. Cattle numbers increased rapidly in the early 1900s, and overstocking and early spring use developed into general practice. While records are sketchy and incomplete for the early 1900s, it is generally agreed that considerably more livestock were grazed than the land could reasonably support.

Grazing permits were first issued in the Hoback allotments about 1910 and provided the first attempt to regulate and manage livestock numbers and seasons of use. Initially, the objective of the permit process

was to formulate practical salting plans and educate the permittees. The process was met with limited success and as a result, action was undertaken in 1937 to deal with poor management. A reduction of numbers was implemented between 1938 and 1943, and the season of use was shortened to June 1 through October 31. The grazing seasons were again shortened in 1946 to June 11 through October 20 to better meet range readiness standards in the spring. From the 1950s through the 1970s, large investments were made in pasture fencing, larkspur treatment with herbicides, and sagebrush spray projects to improve rangeland and better control the livestock.

From 1970 through 1986, grazing management permits were assessed using the National Environmental Policy Act (NEPA) process. New allotment management plans (AMPs) were prepared, implementing deferred, deferred rotation, and rest rotation grazing systems and establishing vegetative use limits for each allotment. These AMPs, with some minor changes, set the bases and direction for the current livestock grazing programs.

Existing Range Program

There are four livestock allotments within the Project Area. All of the allotments are managed for cattle and horses. Forest personnel and permittees meet annually prior to the grazing season to prepare the annual operating instructions (AOI) for each allotment. These instructions specifically describe the responsibilities, terms and conditions of the grazing permit, and the goals and objectives set forth in the AMPs, which must be met to graze on NFS lands. Effective stock management practices, practices that are not working, and changes needed toward move to the desired condition are discussed during preparation of the AOI.

Range readiness inspections are required prior to livestock entry to NFS lands. Range readiness objectives are 6 to 8 inches of leaf growth on wheat and brome grasses and/or seed heads on bluegrass or fescue grasses, and sufficient drying of soils so they are not damaged by the hoof actions of livestock. The average date of range readiness for the cattle allotments is June 11. Pasture seasons and rotations are based on current year climatic condition and allowable vegetative utilization limits of key forage plants. Once the allowable vegetative utilization is reached on an allotment, the livestock must be removed. As a condition of the term grazing permit, the permittees of an allotment are responsible for the day-to-day management of livestock distribution, utilization objectives, and annual maintenance of structural range improvements. The Forest Service conducts periodic compliance inspections to ensure that all permit requirements are met. Long-term condition and trend monitoring is conducted by the Forest Service in cooperation with the permittees on established bench mark areas to ensure that prescribed livestock management practices are meeting the desired conditions described in the Forest Plan. Allotment-specific management systems are as follows:

Fisherman Creek C&H Allotment

Livestock management on the Fisherman Creek allotment is under a four-pasture deferred grazing system. Pastures 1 and 2 are the lower elevation pastures, and are used first, following the management practice of early-season, short-duration grazing to allow for vegetative re-growth and seed development. Pastures 3 and 4 are used after seed ripe. The average date of seed ripe in the area occurs around August 1st. Vegetative utilization limits are set at 50 percent for riparian plant communities in good condition and 40 percent on all upland vegetative plant communities in fair to good condition. A lower vegetative utilization limit may be imposed if a pasture is found through long-term condition and trend monitoring to be in an unsatisfactory condition or has a downward trend.

Graveyard Hill C&H Allotment

Graveyard Hill allotment is just one pasture with a split season; 10 days at the first of the season, and then deferred until October 16th for an additional 30 days of livestock grazing use. Vegetative utilization limits

are set at 50 percent for riparian plant communities in good condition and 40 percent on all upland vegetative plant communities in fair to good condition. A lower vegetative utilization limit may be imposed if a pasture is found through long-term condition and trend monitoring to be in an unsatisfactory condition or has a downward trend.

Hoback C&H Allotment

The Hoback allotment includes 12 pastures where three herds of livestock are rotated through selected pastures. Vegetative utilization limits are set at 50 percent for riparian plant communities in good condition and 40 percent on all upland vegetative plant communities in fair to good condition. A lower vegetative utilization limit may be imposed if a pasture is found through long-term condition and trend monitoring to be in an unsatisfactory condition or has a downward trend.

Jack Creek C&H Allotment

The Jack Creek allotment includes 12 pastures where three herds of livestock are rotated through selected pastures. Once livestock have been rotated into the next pasture, no stock will be allowed to return to pastures already used. Vegetative utilization limits are set at 50 percent for riparian plant communities in good condition and 40 percent on all upland vegetative plant communities in fair to good condition. A lower vegetative utilization limit may be imposed if a pasture is found through long-term condition and trend monitoring to be in an unsatisfactory condition or has a downward trend.

Existing Condition of Rangelands

Existing rangeland conditions for each allotment have been evaluated. The objectives being used to assess rangeland condition are: the similarity of the current plant community and ground cover to the desired plant community; and desired ground cover. Information from the 1983 Range Inventory Standardization Committee Report (USFS 2004b), suggests that a value of 75 percent similar or greater may be used to differentiate between meeting and not meeting vegetative management objectives. The ground cover recommendations, which indicate functionality, are shown in **Table 3-20**. These recommendations conform to the Rangeland Ecosystem Analysis and Monitoring Handbook (FSH 2209.21) for Region 4. Riparian monitoring followed the protocol established by Winward (2000). Additional information used in the evaluation of tall forb community health was provided by Winward (1998).

TABLE 3-20 PERCENT GROUND COVER AND FUNCTIONALITY BY VEGETATION COVER TYPE

Vegetation Cover Type	Functioning	Functioning at Risk	Non-Functioning
Alpine	90	89 to 61	60 or less
Aspen	80	79 to 61	60 or less
Tall Forb	80	79 to 61	60 or less
Mountain Big Sagebrush	70	69 to 61	60 or less

Ground cover represents the percentage of litter, basal vegetation, rocks greater than ¾ inch in size, moss, and cryptograms when compared with the total area. A lower percentage of ground cover indicates more bare ground. Proper functioning rangeland (watershed) condition is defined as the minimum quantities or qualities of basic physical attributes required to produce and sustain desired values, such as livestock forage, clean water, and wildlife habitat on a long-term basis.

Vegetation condition by pasture is shown in **Figure 3-4**. **Table 3-21** shows the current conditions and trends for vegetation and ground cover for each of the allotments in the Project Area (USFS 2004b).

Figure 3-4 Vegetation Condition by Pasture

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TABLE 3-21 EXISTING RANGELAND CONDITION AND TREND

Allotment	Pasture #	Capable Acres Functioning Uplands/ Riparian	Capable Acres Functioning at Risk Uplands/ Riparian	Capable Acres Non-Functioning Uplands/ Riparian	Trends** Ground Cover/ DFC-Veg.	Total Capable Acres	Total Allot. Acres
Fisherman Creek C&H	1	5,410 / 597			U/S	6,007	9,011
	2	0 / 350	3,808 / 0		U/S	4,158	7,446
	3	5,401 / 574	0 / 106		None	6,081	21,855
	4	0 / 375	3,345 / 0		None	3,720	9,364
Total		**10,811 / 1,896**	**7,153 / 106**			**19,966**	**47,676**
Graveyard Hill C&H	1	732 / 281			S/D	1,013	1,182
Total		**732 / 281**				**1,013**	**1,182**
Hoback C&H	1	5,089 / 143			D/D	5,232	7,446
	2	2,849 / 185			D/D	3,034	4,519
	3	2,139 / 0	0 / 557		S/S	2,696	12,923
	4	4,454 / 250			D/D	4,704	6,060
	5	416 / 32			D/D	448	260
	6	3,608 / 99			S/D	3,707	3,961
	7	4,819 / 196			S/D	5,015	7,066
	8	6,135 / 0	0 / 900		S/S	7,035	39,416
	9	6,444 / 714			U/S	7,158	21,941
	10	2,195 / 157			S/D	2,352	4,846
	11	85 / 3			S/D	88	97
	12	339 / 7			S/D	346	378
Total		**38,572 / 1,786**	**0 / 1,457**			**41,815**	**108,913**
Jack Creek C&H	1	521 / 17			None	538	1,188
	2	2,331 / 252			None	2,583	4,894
	3	0 / 648	1,575 / 0		None	2,223	3,207
	4		1,353 / 76		None	1,429	1,937
	5		1,056 / 171		None	1,227	2,387
	6	262 / 86			S/S	348	763
	7	749 / 281			None	1,030	1,824
	8	2,217 / 147			U/S	2,364	3,996
	9		78 / 5		None	83	100
	10	2,183 / 302			U/S	2,485	6,273
	11	1,464 / 147			U/S	1,611	5,195
	12	380 / 2			S/S	382	621
Total		**10,107 / 1,882**	**4,062 / 252**			**16,303**	**32,385**
Grand Totals		**60,222/5,845**	**11,215/1,815**			**79,097**	**190,156**

** Trend: U=upward trend, S=stable trend, D=downward trend. None=only one reading on study site and trend could not be determined.

Wildland Fire Hazards

The vegetation communities within the Project Area have been directly and indirectly affected over the past 100 years. Wildland fires and suppression activities have played a major role in determining vegetative composition and current use patterns. The dominant hazardous fuels in the Project Area are the overstocked mixed conifer stands with saplings as ladder fuels. Sagebrush/grass fuels that are present throughout the Project Area can also present hazardous fuel conditions on slopes in late summer and fall (BLM and USFS 2004). The assessed mixed conifer fuel types will exhibit a high resistance to fire control and make initial attack difficult. Existing stand density on some slopes will enhance the possibility of a crown fire. In lodgepole pine stands, lack of active management has generated insect and disease problems primarily with the mountain pine beetle. This situation has, in some cases, generated significant fuel loadings, which have created potential fire hazards that may ultimately compromise natural resource values and developments within the area. The possibility of ignition in both lodgepole/mixed conifer and sagebrush/grass fuel types is high, due to vehicular traffic on roads in the Project Area and lightning strikes associated with summer thunderstorms. Numerous topographic features in the area, such as steep slopes, gullies, and aspect, will increase rates of spread and will allow fires to "roll out" beneath fire fighters or spot over roads (BLM and USFS 2004). Grazing by all large ungulates and fire suppression may have altered the composition and overall coverage of stands capable of producing a grassy understory in which low-intensity fires occasionally occur.

Special Status Species

Species status, habitat, and occurrences of 25 special status plant species are summarized in **Table 3-22**. Only herbaceous species are included in the table. Documentation of whether two federally listed species, 18 Forest Service Sensitive species, six Management Indicator Species (MIS), and three Wyoming State Species of Concern have the potential to occur within the Project Area is provided. Four species are designated as both Sensitive species and MIS.

There are no Endangered plant species known to occur in the BTNF. The FWS lists two Threatened plant species as having the potential to occur in Sublette County. As indicated in **Table 3-22**, neither species, Ute ladies'-tresses orchid or western prairie fringed orchid, is known to occur within the Project Area (WYNDD 2004). The Project Area occurs at a higher elevation than Ute ladies'-tresses is typically found in Wyoming. One questionable historic record of occurrence of western prairie fringed orchid from Wyoming in 1842 is now considered to be from western Nebraska (FWS 1989). These species are not discussed further.

There are 18 Sensitive plant species listed by the Forest Service in the Intermountain Region (Region 4) with potential to occur on the BTNF. Eight of these species occur in specialized habitats that are not found in or near the Project Area. Potential habitat exists within the Project Area for 10 of these species (**Table 3-22**) and **Appendix F**. Three Sensitive species, soft aster, Payson's milkvetch, and Payson's bladderpod, are known to occur within the Project Area. Additional populations of Payson's milkvetch occur within 4 miles of the Project Area (**Figure 3-3**).

Three Wyoming State Species of Concern, creeping campion, fragile rockbrake, and flat-top broomrape, also occur in the Project Area. One additional occurrence of creeping campion is located within 3 miles of the Project Area. An occurrence of flat-top broomrape is located within the proposed disturbance area, about 50 feet southwest of the proposed pipeline, near Cliff Creek. This occurrence was last documented in 1998.

Two Management Indicator Species (MIS), Payson's milkvetch and boreal draba, are known to occur in the Project Area. An additional population of boreal draba occurs within 4 miles of the Project Area (**Figure 3-3**). Habitat exists for all MIS plant species except Weber's saw-wort. Aspen, discussed previously in this section, and not included in **Table 3-22**, is an MIS ecological indicator for aspen habitat on the BTNF that serves to increase ecological diversity within the Forest.

TABLE 3-22 SPECIAL STATUS PLANT SPECIES

Common Name	Scientific Name	Species Included	Species Status	Additional Information
Pink Agoseris	*Agoseris lackschewitzil*	No	BTNF Sensitive	This species is endemic to the Wind River Range and Beartooth Mountains of northwestern Wyoming in Park and Sublette Counties. It occurs in wet montane and subalpine meadows from 9,600 to 10,600 feet (Fertig et al. 1994). The Project Area occurs at a lower elevation limit than the plant is typically found. This species has not been documented within the Project Area (WYNDD 2004).
Sweet-flowered rock jasmine	*Androsace chamaejasme carinata*	Yes	BTNF Sensitive, BTNF MIS	This species occurs in the Absaroka Range, Owl Creek Mountains, and Wind River Range in Wyoming. It occurs in montane rock crevices and rocky soils derived from limestone dolomite and may occur in clearings or beneath shrub cover in leaf litter from 8,500 to 10,800 feet (Fertig et al. 1994). This species has not been documented within the Project Area (WYNDD 2004), though potential habitat exists.
Soft aster	*Aster mollis*	Yes	BTNF Sensitive	This species is endemic to the Bighorn Mountains and Hoback Canyon in Wyoming. It occurs in sagebrush grasslands and mountain meadows on deep, calcareous soils at the edge of aspen or pine woodlands from 6,400 to 8,500 feet (Fertig et al. 1994). There is one known occurrence of this species in the NE ¼ of Section 22 in T38N R115W within the Project Area (WYNDD 2004).
Meadow milkvetch	*Astragalus diversifolius v. diversifolius*	Yes	BTNF Sensitive	This species is known from one historical report on the Green River Basin in western Wyoming. It occurs in moist meadows that are often alkaline and swales in sagebrush valleys from 4,400 to 6,300 feet (Fertig et al. 1994). This species has not been documented within the Project Area (WYNDD 2004), though potential habitat exists.
Starveling milkvetch	*Astragalus jejunus jejunus*	Yes	BTNF Sensitive	This species is known from multiple occurrences in southwest Wyoming. It occurs on dry, barren ridges and bluffs of shale, sandstone, clay, or cobblestone from 6,000 to 7,100 feet (Fertig et al. 1994). This species has not been documented within the Project Area (WYNDD 2004), though potential habitat exists.
Payson's milkvetch	*Astragalus paysonii*	Yes	BTNF Sensitive, BTNF MIS	This species is known from the Wyoming and Salt River Ranges of western Wyoming in Lincoln and Sublette Counties. It occurs in disturbed areas and recovering burns, clear cuts, and road cuts on sandy soils with low cover of herbs and grasses, from 6,700 to 9,600 feet (Fertig et al. 1994). There is one known occurrence within the Project Area, near in the SW ¼ of Section 32 in T37N R111W, and two additional occurrences are within four miles of the Project Area (WYNDD 2004).

TABLE 3-22 SPECIAL STATUS PLANT SPECIES

Common Name	Scientific Name	Species Included	Species Status	Additional Information
Shultz milkvetch	*Astragalus shultziorum*	Yes	BTNF MIS	This species is endemic to Wyoming in the Teton, Salt River, and Wind River Ranges of Teton, Lincoln, and Sublette Counties. It occurs in subalpine forb communities on shallow, rocky, calcareous soils from 8,800 to 11,500 feet (Heidel and Fertig 2001). This species has not been documented within the Project Area (WYNDD 2004), though potential habitat exists.
Slender moonwort	*Botrichium lineare*	Yes	BTNF Sensitive	This species is known from one occurrence in the Black Hills National Forest in Crook County, Wyoming. It occurs on disturbed sites such as old roadbeds on coarse textured limestone derived soils up to 10,000 feet (Beatty et al. 2003). This species has not been documented within the Project Area (WYNDD 2004), though potential habitat exists.
Seaside sedge	*Carex incurviformis*	No	BTNF Sensitive	This species is known from the Absaroka and Wind River Ranges in Wyoming. It occurs in moist alpine and subalpine tundra and wet rock ledges from 10,000 to 12,200 feet (Fertig et al. 1994). The Project Area occurs at a lower elevation limit than the plant is typically found. This species has not been documented within the Project Area (WYNDD 2004).
Black and purple sedge	*Carex luzulina atropurpurea*	No	BTNF Sensitive	This species is known from the Wind River Range in Wyoming (Fremont and Sublette Counties). It occurs in subalpine wet meadows and streamsides from 10,000 to 10,600 feet (Fertig et al. 1994). The Project Area occurs at a lower elevation limit than the plant is typically found. This species has not been documented within the Project Area (WYNDD 2004).
Fragile Rockbrake	*Cryptogramma stelleri*	Yes	State Species of Concern	This species is known from the Wind River, Teton, and Wyoming Ranges, the Bighorn Mountains, and and the Yellowstone Plateau in Fremont, Park, Sheridan, and Teton Counties. It occurs in moist protected locations on thin, mossy soil in shady limestone cliffs near water, from 6,600 to 8,700 feet (Fertig 2000a). There is one known occurrence within the Project Area, in the SE ¼ of Section 1 in T38N R115W (WYNDD 2004).
Wyoming tansymustard	*Descurainia torulosa*	Yes	BTNF Sensitive, BTNF MIS	This species is endemic to the Absaroka Range and Rock Springs Uplift in Wyoming (Fremont, Park, Sweetwater, and Teton Counties). It occurs in sparsely vegetated sandy slopes at the base of cliffs of volcanic breccia or sandstone, from 8,300 to 10,000 feet (Fertig 2004). This species has not been documented within the Project Area (WYNDD 2004), though potential habitat exists.
Boreal draba	*Draba boealis*	Yes	BTNF MIS	This species is a disjunct in the mountains of western Wyoming. It occurs on moist, north-facing limestone slopes and cliffs and along shady streamsides, from 6,200 to 8,600 feet (Fertig et al. 1994). There is one known occurrence within the Project Area in the SE ¼ of Section 1 in T38N R115W, and one additional occurrence is within four miles of the Project Area (WYNDD 2004).

TABLE 3-22 SPECIAL STATUS PLANT SPECIES

Common Name	Scientific Name	Species Included	Species Status	Additional Information
Rockcress draba	*Draba densifolia v. apiculata*	No	BTNF Sensitive	This species occurs in moist, gravelly, alpine meadows and talus slopes, often on limestone-derived soils, from 10,400 to 12,000 feet (Fertig et al. 1994). The Project Area occurs at a lower elevation limit than the plant is typically found. This species has not been documented within the Project Area (WYNDD 2004).
Wolly fleabane	*Erigeron lanatus*	No	BTNF Sensitive	This species is known from the Wind River Range (Sublette County). It occurs in alpine or subalpine limestone talus slopes above 11,000 feet (Fertig et al. 1994). The Project Area occurs at a lower elevation than the plant is typically found. This species has not been documented within the Project Area (WYNDD 2004).
Narrow-leaf goldenweed	*Haplopappus macronema linearis*	No	BTNF Sensitive	This species is known to occur in northwest Wyoming in Fremont, Park, and Teton Counties and in Yellowstone National Park. It occurs in semi-barren, whitish clay flats and slopes, gravel bars, and sandy lakeshores from 7,700 to 10,300 feet (Fertig et al. 1994). No suitable habitat occurs within the Project Area; this species has not been documented within the Project Area (WYNDD 2004).
Payson bladderpod	*Lesquerella paysonii*	Yes	BTNF Sensitive	This species is endemic to eastern Idaho, western Montana, and western Wyoming (Lincoln, Sublette, and Teton Counties). It occurs on rocky, sparsely vegetated slopes, often on calcareous substrates, from 6,000 to 10,300 feet (Fertig et al. 1994). There are two known occurrences within the Project Area, in the NE ¼ of Section 5 and in the NE ¼ of Section 22, in T38N R115W (WYNDD 2004).
Flat-top broomrape	*Orobanche corymbosa var. corymbosa*	Yes	State Species of Concern	This species is known from the Jackson Hole and Hoback Canyon areas in Sublette and Teton Counties. It occurs in sagebrush and juniper communities on plains and hills, from 6,600 to 6,800 feet (Fertig 2000b). There is one known occurrence within the Project Area, in the SW ¼ of Section 14 in T38N R115W (WYNDD 2004).
Naked-stemmed parrya	*Parrya nudicaulis*	No	BTNF Sensitive	This species is endemic to the Wind River Range and Beartooth Mountains of northwestern Wyoming. It occurs on alpine talus limestone substrates from 10,700 to 11,400 feet (Fertig et al. 1994). The Project Area occurs at a lower elevation limit than the plant is typically found. This species has not been documented within the Project Area (WYNDD 2004).
Creeping twinpod	*Physaria intergrifolis v. monticola*	Yes	BTNF Sensitive	This species is endemic to eastern Idaho and the mountains of western and central Wyoming (Lincoln and Sublette Counties). It occurs on barren, rocky, calcareous hills and slopes, from 6,500 to 8,600 feet (Fertig et al. 1994). It has not been documented within the Project Area (WYNDD 2004), though potential habitat exists.
Western prairie fringed orchid	*Platanthera praeclara*	No	Threatened	This species typically occurs in moist prairie habitats (FWS 1989). One questionable historic record of occurrence in Wyoming from 1842 is now considered to be from western Nebraska (FWS 1989). This species has not been documented within the Project Area (WYNDD 2004).

TABLE 3-22 SPECIAL STATUS PLANT SPECIES

Common Name	Scientific Name	Species Included	Species Status	Additional Information
Greenland primrose	*Primula egaliksensis*	Yes	BTNF Sensitive	This species is disjunct in Colorado and Wyoming (Park and Sublette Counties). It occurs in wet meadows along streams and calcareous montane bogs, from 6,600 to 8,000 feet (Fertig et al. 1994). This species has not been documented within the Project Area (WYNDD 2004), though potential habitat exists.
Weber's saw-wort	*Saussurea webberii*	No	BTNF Sensitive, BTNF MIS	This species is known from the Wind River Range in Wyoming (Fremont and Sublette Counties). It occurs on alpine talus and in gravel fields on limestone, from 10,200 to 11,200 feet (Fertig et al. 1994). The Project Area occurs at a lower elevation limit than the plant is typically found. This species has not been documented within the Project Area (WYNDD 2004).
Creeping campion	*Silene repens* var. *australis*	Yes	State Species of Concern	This species is known from the Hoback Canyon area of Wyoming in Sublette and Teton Counties. It occurs on rocky slopes and ridges from 6,500 to 9,800 feet (Fertig 2001). There is one known occurrence within the Project Area, in the NE ¼ of Section 22 in T38N R115W, and one additional occurrence is within four miles of the Project Area (WYNDD 2004).
Ute ladies'-tresses orchid	*Spiranthes diluvialis*	No	Threatened	This species typically occurs in mesic riparian meadows (FWS 1992). No suitable habitat exists within the Project Area. This species has not been documented within the Project Area (WYNDD 2004). No water depletions will occur as part of this project.

Noxious Weeds and Invasive Species

Weed occurrences are relatively common because the Project Area follows much of the highway corridor. These occurrences are typically recognized and treated before they are allowed to become infestations.

In general, Sublette County is relatively free of noxious weeds, however there are some areas of known infestations along the highway corridor (Peterson 2005). Weed species that are known to occur include spotted knapweed, scentless chamomile, toadflax, Canada thistle, musk thistle, and leafy spurge. Leafy spurge occurs along the Hoback River near the Bondurant post office. Other species occur throughout the Project Area in small patches, and no other large infestations are known. Sublette County Weed and Pest Department controls weeds along the highway by both physical removal and spraying of herbicide (Peterson 2005).

In addition to noxious weeds in the highway corridor, a known infestation of spotted knapweed occurs at the Fisherman Creek aggregate pit site. This infestation has been known since 1991, and Sublette County Weed and Pest has been attempting to control the spotted knapweed in this area since its discovery. In the past, this has included shutting down all or parts of the pit (Peterson 2005).

There are numerous weed occurrences in the portion of the Project Area within Teton County. Predominant weed species include spotted knapweed, oxeye daisy, leafy spurge, bull thistle, musk thistle, houndstongue, black henbane, common tansy, and common mullein. These species occur primarily along the highway corridor. The occurrence at Stinking Springs has one of the largest spotted knapweed patches in the area. There are also areas of concentrated weed infestations in Wilson Canyon, Porcupine Creek, Camp Creek, and Poison Creek. All of the infestations in the highway corridors receive at least one herbicide treatment each summer (Wells 2005).

3.3.2 Wildlife and Fisheries, Including Special Status Species

Resource Description

Wildlife, fisheries, and preferred habitats are influenced by vegetation composition, structure, spatial management, recreational use of roads and trails, and management activities. Project activities have the potential to affect wildlife and fisheries through injury, mortality, disturbance, or alteration of suitable habitat.

This section describes the affected environment of wildlife and fisheries in the Project Area. The mountainous terrain through Hoback Basin and the area along the highway corridor of U.S.189/191 provides habitat for a variety of terrestrial and aquatic species. Relevant scientific and wildlife management literature was used as a basis for describing species ecology, habitat needs, and management guidelines. Wildlife habitat and occurrence information was derived from existing resource data for the BTNF, state resource agencies, and others. No wildlife surveys were conducted specifically for this environmental analysis.

Indicators

- Effects on species and habitat diversity and habitat components
- Effects on big game populations and important habitat components
- Effects on existing elk feedgrounds
- Effects on Federally Listed Species
- Effects on Forest Service Sensitive Species
- Effects on Management Indicator Species (MIS)
- Effects on migratory birds

Forest Plan Direction

Overall management direction includes the goals of protecting ecosystem diversity and productivity by maintaining viable populations of all native and desired non-native wildlife in habitats throughout their geographic range, producing habitat capability levels to meet objectives for MIS, providing opportunities for use of wildlife resources in accordance with local demands, developing and implementing management objectives for Sensitive species, ensuring that species do not become Threatened or Endangered because of Forest Service actions, and managing habitats and activities for federally listed species to achieve recovery objectives.

Applicable management guidance for wildlife and fisheries responds to the following Forest Plan goals and objectives:

- 3.1 Grizzly bear recovery is achieved.
- 3.2 Recovery is achieved for the Endangered species on the BTNF.
- 3.2(d) – Reduce preventable, human-caused mortality of bald eagles on the BTNF to zero per year, with emphasis on public education.
- 3.2(e) – Provide suitable and adequate amounts of habitat for bald eagles.
- 3.2(f) –Provide suitable and adequate amounts of habitat for peregrine falcons.

The goal of the BTNF for fisheries is to ensure the long-term prosperity of native fisheries with an objective of eliminating or reducing threats to aquatic resources. The BTNF cooperates with other state and federal agencies, including the U.S. Fish and Wildlife Service (FWS) and Wyoming Game and Fish Department (WGFD) to manage fisheries and their habitats.

Other guidance for wildlife and fisheries is contained in the Forest-wide fish and wildlife prescription, to provide habitat adequate to meet the needs of dependent fish and wildlife populations, including those of Threatened, Endangered, and Sensitive Species (Forest Plan, page 123). Species addressed include federally listed Threatened or Endangered Species, Forest Service Sensitive Species, and MIS.

Key Forest-wide standards and guidelines that apply to wildlife (Forest Plan, page 123 to 127) include: security area standard, habitat effectiveness standard, road location guideline, big-game winter-range standard, elk calving areas standard, elk wallow standard, notification standard, grizzly bear/human management standard, grizzly bear habitat management standard, bald eagle nesting territory management standard, peregrine falcon reintroduction guideline, peregrine falcon disturbance standard, fencing riparian area guideline, Sensitive Species management standard, fish habitat management guideline, streambank stability guideline, new impoundments standard, fish passage standard, reintroduction areas of bighorn sheep range standard, snag management guideline, and snag habitat guideline (USFS 1990).

The Canada lynx was listed as a Threatened species under the Endangered Species Act in 2000 (FWS 2000). In 2003, in response to a court-order to reconsider the listing, the FWS clarified the final listing decision (FWS 2003a). The single factor threatening the listed population was determined by the FWS to be the inadequacy of existing regulatory mechanisms and the potential of these plans to allow actions that adversely affect lynx, especially considering that the majority of lynx habitat is located on federal lands.

Important to the conservation of the Canada lynx on federally managed lands are documents resulting from several studies on the species: “The Scientific Basis for Lynx Conservation” (Ruediger et al. 2000), “Lynx Conservation Assessment and Strategy (LCAS)” (Ruggerio et al. 2000), and Lynx Conservation Agreements (LCAs) between the Forest Service and FWS (USFS and FWS 2000). These documents are the product of a federal interagency Canada lynx coordination effort initiated in 1998. The LCAS states that Forest Plans should include all procedures necessary to conserve lynx for projects recognized as having lynx habitat. The Forest Service filed a Notice of Intent (NOI) in the Federal Register on August 15, 2002 to prepare an EIS for agency plans to incorporate conservation measures for Canada lynx and its habitat in the northern Rockies through plan amendments, including an amendment to the Forest Plan for the BTNF (Northern Rockies EIS). The LCAS, the Lynx Science Report, and final listing decision document (FWS 2000) were the basis for the EIS process. The Record of Decision (ROD) incorporating goals, objectives, standards, and guidelines for the conservation of Canada lynx and its habitat in the northern Rockies into affected Forest Plans was signed in March 2007 (USFS 2007).

Implementation of management direction in the Northern Rockies EIS across the range of the lynx on the BTNF is expected to contribute to conservation of the species (USFS 2007). Guidelines specific to energy development, which would be applicable to a utility gas pipeline, include: remote monitoring should be encouraged to reduce snow compaction; and winter access should be limited to designated routes. Any monitoring of the pipeline will follow the pipeline corridor, either on land or by air.

Desired Condition

The desired condition for wildlife and fisheries includes the following components:

- provide sufficient amounts of suitable habitat to support native wildlife populations and maintain species diversity;
- conserve, enhance, or maintain key habitat components and wildlife habitats and populations;
- native trout populations occupy their historical range and maintain viable populations; and
- address the issues needed to recover or conserve special status species, including Proposed, Threatened and Endangered Species, Forest Service Sensitive Species, Management Indicator Species, and Wyoming Species of Special Concern.

Temporal Scope

This analysis considers existing conditions and projected conditions immediately following implementation of the proposed action, and includes impacts for the duration of proposed activities. As time passes following implementation of the proposed action, the magnitude and intensity of effects on wildlife would decline as human activities related to project activities end and reclamation of disturbed areas is completed.

Geographical Scope

Wildlife species are managed within unique management units. The Canada lynx is managed within lynx analysis units (LAUs). Eight LAUs contain portions of the Project Area: Big Twin Middle Beaver, Upper Hoback North, Upper Hoback South, Lower Hoback South, Lower Hoback North, Lower Hoback Middle, Fall Creek South, and Flat Creek (**Figure 3-5**). Potential effects on lynx, its habitats, and prey will be assessed within these LAUs. WGFD manages big game populations within herd units. Herd units are determined by an arbitrary boundary based on studies that show limited interchange among population segments of a species. Within the Project Area, there are portions of five elk herd units (103, 104, 105, 106, and 107), one mule deer herd unit (104), one moose herd unit (105), one bighorn sheep herd unit (107), and one pronghorn antelope herd unit (401) (WGFD 2004b).

The Project Area transects three WGFD-managed Wildlife Habitat Management Areas (WHMAs) **(Figure 3-5)**. These WHMAs provide habitat for a variety of wildlife species, including big game and raptors. The WHMAs within the Project Area are South Park, Horse Creek, and Camp Creek **(Figure 3-5)**. The South Park, Horse Creek, and Camp Creek elk feedgrounds are located within these WHMAs.

Affected Environment

This section provides a brief overview of federally listed species under the Endangered Species Act, Forest Service Sensitive Species, and MIS that may occur within the Project Area. More detailed information may be found in the Biological Assessment (federally listed species) and MIS report (MIS species) in the *Project File* at the Big Piney Ranger District office in Big Piney, Wyoming. The Biological Evaluation (Forest Service Sensitive species) is included as **Appendix F**.

Federally Listed Wildlife Species

The bald eagle and grizzly bear have been formally delisted by the FWS since the DEIS was released. These species are considered in Forest Service Sensitive species section in this FEIS analysis.

The FWS provided a listing of species of interest or concern to the Forest Service in a letter response to public scoping for the proposed project (FWS 2004) and in an updated Forest-wide listing (ES-61411) for the BTNF (FWS 2007). The agency also publishes listings of Threatened and Endangered species with potential to occur by county in Wyoming, including species with potential to occur in Sublette and Teton Counties. This information was consulted to determine which species might be present in the Project Area. The Canada lynx (*Lynx canadensis*) is a federally listed threatened species that may be present or have habitat in the Project Area. Additionally, the gray wolf (*Canis lupus*) is federally listed as an experimental nonessential population. This species may be present or have habitat in the Project Area.

The black-footed ferret (*Mustela nigripes*) is a listed species, but is not discussed further for the following reasons. The last known wild population of black-footed ferrets was found near Meeteetse, Wyoming in 1981, and the entire population was live trapped for use in a captive breeding and reintroduction program.

The black-footed ferret is assumed extinct in Wyoming; however, reintroduction programs have begun. Suitable habitat occurs in plains grasslands with large prairie dog complexes (Cerovski et al. 2004). No suitable habitat occurs within the Project Area and none of the sites selected for the reintroduction effort in Wyoming have been near the BTNF. There have been no documented occurrences of black-footed ferret within the Project Area (WYNDD 2004). This species will not be affected by the proposed project.

A portion of the Project Area is situated in the Upper Green River Basin, which drains into the Colorado River downstream. Endangered Colorado River fishes, Humpback chub (*Gila cypha*), Bonytail (*Gila elegans*), Colorado pikeminnow (*Ptychocheilus lucius*), and Razorback sucker (*Xyrauchen texanus*), and their critcal habitat downstream of the Project Area (FWS 1994a) will not be affected because no water depletions from the Upper Green River Basin are anticipated. These species are not discussed further.

One Candidate species, the yellow-billed cuckoo (*Coccyzus americanus*), is identified for riparian areas west of the continental divide. However, riparian habitats containing extensive stands of cottonwoods are limited in the area affected, so the likelihood of yellow-billed cuckoos being present is negligible. No known observations of this species have been made in or near the Project Area (WYNDD 2004). The yellow-billed cuckoo was listed as a Candidate species by the FWS on July 25, 2001 (FWS 2001). This species prefers habitats consisting of moderately dense thickets and deciduous trees near water at lower elevations, and frequently uses low, dense, shrubby vegetation. The yellow-billed cuckoo generally requires relatively large riparian tracts below 7,000 feet for breeding (Fertig 1999). The FWS describes habitat for the yellow-billed cuckoo to include open and riparian woodlands and deciduous riparian habitat up to elevations of 6,600 feet (FWS 2001). The only relatively large riparian tracts within the Project Area consist of willow riparian habitat at an elevation of more than 7,000 feet. Because suitable habitat for the yellow-billed cuckoo is not present, no impacts to this species are projected. This species is not addressed further in this document.

Canada Lynx

The historic range of Canada lynx extended from Alaska across much of Canada, with southern extensions into parts of the western United States, the Great Lakes states, and New England (McKelvey et al. 1999; Ruediger et al. 2000). The FWS listed the Canada lynx in March 2000 as Threatened in the contiguous United States (FWS 2000). The distribution of lynx is associated with the boreal forest, and closely follows that of the snowshoe hare (Ruggiero et al. 1994). Snowshoe hares are the primary prey of lynx, thus lynx foraging habitat coincides with the dense understory shrub and sapling habitat utilized by snowshoe hare (Ruggiero et al. 1994). Lynx denning habitat is found in mature forests with high horizontal cover provided by coarse woody debris (Ruggiero et al. 1994; Ruediger et al. 2000). Suitable travel corridors consist of a closed canopy of coniferous or deciduous vegetation taller than 6 feet. Lynx avoid large openings where they cannot find snowshoe hare, stalk other prey, or stay hidden from larger predators (Ruggiero et al. 1994). The preferred habitat of the lynx in the western U.S. is the Rocky Mountain conifer forest dominated by lodgepole pine, subalpine fir, and Engelmann spruce at an elevation above 6,500 feet (McKelvey et al. 1999; Ruediger et al. 2000). Most lynx records outside of Yellowstone National Park were above an elevation of 2,500 m (8,200 ft) in lodgepole pine or spruce-fir vegetation (USFS 2004b).

In Wyoming, the majority of lynx sightings have been in the northwestern and west-central parts of the state (USFS 2004b). Several historic observations of lynx were made near the Project Area during the 1960s and 1970s. Since that time, the sightings have been sparse in northwestern Wyoming (WYNDD 2004). The WGFD and Forest Service have conducted surveys for lynx in the western mountains of Wyoming since the winter of 1995-1996. Radio collared lynx from the Wyoming Range (Lincoln and Sublette Counties) have been tracked while making long-range northward movements into southern Yellowstone National Park (YNP) and crossing U.S. 189/191 (USFS 2004b).

A study in 2001 nailed barbed carpet-pad rub stations to trees in microhabitats where lynx prefer to move to collect hair samples indicating the presence of lynx in certain habitat such as ridges, saddles, riparian areas, near water sources, and along forest edges (Pyare 2001). There were no lynx hairs identified from hair pads in this study, suggesting that no lynx were present in the area. Squires et al. (2003) detailed in their study, "Distribution of Lynx and Other Forest Carnivores in the Wyoming Range, south-central Wyoming" that one male and one female lynx were captured and equipped with radio transmitter collars. The home ranges of the two lynx were located in the Beaver Creek and Horse Creek watersheds near the Wyoming Range. Visual inspection of locations taken from their GPS collars indicated that the male and female lynx avoided clearcuts and aspen stands, but frequented high elevation conifer stands. Both collared lynx were believed to have died of starvation (Squires and Laurion 2000).

There have been several studies and surveys on the BTNF and adjacent NFS lands during the past few years. The most recent track surveys occurred during the winter of 2006-2007. Endeavor Wildlife Research surveys discovered potential lynx tracks on the BTNF in the Moose/Gypsum Creek area on the Pinedale Ranger District and in the North Cottonwood Creek and Hoback Rim area on the Big Piney Ranger District. In the winter of 2004-2005, Endeavor Wildlife Research conducted snow track surveys in the Sheridan Creek watershed within the Wind River Range on the Shoshone National Forest, and found tracks from potentially two different lynx. DNA amplified from scat collected from one of the lynx in the Sheridan Creek area came from a lynx that also occupied the northern end of the Wyoming Range.

Based on limited local telemetry data and studies of Canada lynx and snowshoe hare relationships in other areas, it appears the lack of an adequate prey base could be the limiting factor for the species in this area (Ruediger et al. 2000). Lynx home ranges in the area are large, and snowshoe hare density is relatively low. Snowshoe hares do not exhibit dramatic population cycles in the Project Area and surrounding areas as they do in northern regions. Canada lynx at the southern end of their range may compensate to some degree by use of alternative prey species. However, documented incidents of starvation and low reproductive success suggest the existing prey base situation for Canada lynx in this area is poor.

Although the habitat surrounding the Project Area is potentially suitable for lynx, with dense forest and wilderness areas in relatively close proximity, the Project Area is at the lower elevation limit for Canada lynx and includes U.S. Highway 189/191, a heavily used travel corridor. Existing habitat conditions preclude anything other than a slight chance for an incidental presence of lynx in the Project Area. Suitable, productive habitat for this species is not found along high-use primary roads, adjacent to residential development, on commercially used private lands, or in relatively small areas receiving heavy recreation use. Transient or dispersing individuals may cross busy roads, especially during nighttime low-traffic periods, but regular occupancy is precluded by displacement effects associated with extensive development on private lands and chronic and unpredictable human presence. There is no documented evidence of occupancy in the Project Area for the Canada lynx.

Lynx analysis units (LAUs) have been delineated across the BTNF, and provide the fundamental scale at which to evaluate and monitor effects of proposed projects on suitable lynx habitat. LAUs encompass both lynx habitat (which may or may not be in suitable condition) and non-lynx habitat (such as lakes or rock talus). Conservation measures generally apply only to suitable lynx habitat on federal lands within the LAUs. The Project Area contains portions of eight LAUs: Big Twin Middle Beaver, Upper Hoback North, Upper Hoback South, Lower Hoback South, Lower Hoback North, Lower Hoback Middle, Fall Creek South, and Flat Creek. (**Figure 3-5**).

Suitable lynx habitat has been identified following the criteria in the LCAS (Ruediger et al. 2000). Based on limited available information, all forested vegetation communities in the Project Area have been identified as suitable lynx habitat. No delineations were made for specific lynx denning and foraging habitats or travel corridors within suitable lynx habitats. This approach is considered appropriate in the absence of specific habitat characterization data for the LAUs included in the Project Area. **Table 3-23** contains provisional estimates of the suitable and currently unsuitable or unsuitable lynx habitat occurring within each LAU that contains a portion of the Project Area. Currently unsuitable habitat is defined in the LCAS as habitat in an early successional stage as a result of recent fires or vegetation management (Ruediger et al. 2000). **Table 3-24** contains an estimate of the suitable lynx habitat on NFS lands within the Project Area by LAU.

TABLE 3-23 SUITABLE LYNX HABITAT IN AFFECTED LAUS (ACRES)

Lynx Analysis Unit (LAU)	Total Acres in LAU	Suitable Habitat	Unsuitable Habitat	Currently Unsuitable Habitat
Big Twin-Middle Beaver	34,868	22,206 (64)	12,639	23
Fall Creek South	86,532	40,290 (47)	43,626	2,616
Flat Creek	72,646	40,975 (56)	31,642	29
Lower Hoback Middle	55,443	26,441 (48)	28,984	18
Lower Hoback North	74,946	34,520 (46)	36,376	4,050
Lower Hoback South	63,003	33,200 (53)	29,176	627
Upper Hoback North	73,797	36,701 (50)	36,464	632
Upper Hoback South	72,586	26,849 (37)	43,956	1,781
Total	**533,821**	**261,182 (49)**	**262,863**	**9,776**
Percent of lynx habitat in each LAU identified as suitable is in parentheses				

TABLE 3-24 LYNX HABITAT ON NFS LANDS WITHIN THE PROJECT AREA BY LAU (ACRES)

Lynx Analysis Unit (LAU)	Project Area Acres in LAU	Suitable Lynx Habitat
Big Twin-Middle Beaver	439	284 (65)
Fall Creek South	4,232	1,529 (36)
Flat Creek	1,937	281 (15)
Lower Hoback Middle	16,449	7,316 (44)
Lower Hoback North	1,431	708 (49)
Lower Hoback South	873	522 (60)
Upper Hoback North	9,546	2,799 (29)
Upper Hoback South	5,277	669 (13)
Total	**40,184**	**14,108 (35)**
Percent of lynx habitat in each LAU identified as suitable is in parentheses		

Gray Wolf

Gray wolves were historically present in the GYA, but were virtually extirpated from the western United States by the 1930s (FWS 1994b). In 1973, the northern Rocky Mountain wolf subspecies was listed as Endangered; in 1978 all gray wolves south of Canada (except those in Minnesota) were listed as Endangered. Gray wolves were reintroduced in the GYA in 1995 and 1996. Following reintroduction, the status of the gray wolf within the GYA was changed from Endangered to nonessential experimental, under Section 10j of the ESA.

Figure 3-5 Lynx Analysis Units (LAUs) and Lynx Habitat

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At the end of 2002, a minimum of 217 wolves in 21 packs existed in Wyoming and at least 263 wolves in 21 packs existed in Idaho (FWS et al. 2004). Wolves use a variety of habitats, including coniferous forest, montane meadow, and shrub steppe. Key components of suitable wolf habitat include a sufficient year-round prey base of ungulates and alternate prey, suitable and semi-secluded denning and rendezvous sites, and a sufficient area with minimal exposure to humans (FWS et al. 2004). Preferred wolf prey species (deer, elk, and moose) are found within the Project Area. Wolves den in late March or early April, and are sensitive to human disturbance near active den sites (FWS et al. 2004). Den sites are typically located in well-drained soils on slopes less than 30 percent and within 1,200 feet of surface water.

Mapping in the Rocky Mountain Wolf Recovery Annual Reports (FWS et al. 2004) indicates that the Teton pack exists north of the Project Area and three small packs, Green River, Daniel, and Pinedale/Cora, occur south, east, and west of the Project Area, respectively. In 2005, there was an increase in depredation of livestock from wolves, and five wolves were removed from the Daniel pack (USFS 2006a).

Wolves have been observed regularly within the Fisherman Creek drainage. Areas adjacent to the Project Area contain habitat suitable for wolves. Similar to the Canada lynx, existing habitat conditions preclude anything other than a slight chance for an incidental presence by wolves in the Project Area. Suitable, productive habitat for this species is not found along high-use primary roads, adjacent to residential developments, on commercially used private lands, or in areas receiving heavy recreation use. Transient or dispersing individuals may cross busy roads, especially during nighttime low-traffic periods, but regular occupancy is precluded by displacement effects associated with extensive development on private lands and chronic and unpredictable human presence.

Forest Service Sensitive Species

It is Forest Service policy to protect the habitat of Forest Service designated Sensitive species from adverse modification or destruction, as well as to protect individual organisms from harm or harassment as appropriate (Forest Service Manual, 2670.3). Sensitive species of wildlife and fish selected for analysis based on their habitat and known or potential occurrence in the Project Area include: grizzly bear, bald eagle, northern goshawk, boreal owl, great gray owl, flammulated owl, peregrine falcon, three-toed woodpecker, greater sage grouse, trumpeter swan, Snake River fine-spotted cutthroat, and Colorado River cutthroat. Additional information on these species and species not selected for analysis is contained in **Appendix F**. Known occurrences of some species are shown in **Figure 3-6**.

Management Indicator Species

The National Forest Management Act of 1976 provides direction for selecting MIS. These species are selected “because their population changes are believed to indicate the effects of management activities” (36 CFR 219.19). Management indicators are “any species, group of species, or species habitat element selected to focus management attention for the purpose of resource production, population recovery, maintenance of population viability, or ecosystem diversity” (FSM 2605). Four types of MIS are identified in the Forest Plan: Threatened and Endangered Species, important harvest species, ecological indicator species, and Sensitive Species. MIS selected for analysis include elk, mule deer, moose, pronghorn antelope, bighorn sheep, pine marten, Brewer’s sparrow, cutthroat trout (all subspecies), and boreal toad and boreal chorus frog, based on the potential of the proposed project to affect individuals of these species or their habitats. The species addressed in this section are species designated as MIS for the BTNF that have not already been discussed in previous sections (Threatened and Endangered Species and Forest Service Sensitive Species). Additional information on populations and trends for MIS in the BTNF is contained in the *Project File*. Known occurrences of some species are shown in **Figure 3-6**.

Elk, mule deer, moose, bighorn sheep, and pronghorn antelope are all important harvest species within the BTNF. Elk, mule deer, and moose are habitat generalists. Bighorn sheep prefer open, grassy slopes adjacent to steep cliffs that allow them to escape from predators, and are an ecological indicator species for mountain meadows. Pronghorn antelope use sagebrush and grassland habitats. Pine marten are an ecological indicator species for old growth coniferous and mixed forests. Brewer's sparrow is a sagebrush obligate species, which nests in live sagebrush or on the ground at the base of a live sagebrush shrub. Brewer's sparrow is an ecological indicator species for sagebrush. The boreal toad and boreal chorus frog have recently been selected as an ecological indicator species for wetland habitats. Cutthroat trout (all subspecies) have recently been selected as an ecological indicator species for riparian areas, and are an important harvest species and use aquatic habitats within the BTNF.

Crucial winter range has been identified for each of the big game species (elk, mule deer, moose, bighorn sheep, and pronghorn antelope) within the vicinity of the Project Area (**Figure 3-7**). Crucial winter range is any particular range or habitat component that determines whether a population maintains and reproduces itself at or above the WGFD population objective over the long term (Wyoming Chapter of the Wildlife Society [WCWS] 1990). Forest Plan management guidance restricts human activity and disturbance in big-game crucial winter range between November 15 and April 30 if big game are present in the area. Big game birthing or parturition areas (calving areas) for elk and moose have also been identified within the Project Area (**Figure 3-7**). Calving areas are those areas commonly used by a substantial number of females from a population to give birth. Forest Plan management guidance restricts human activity and disturbance in calving areas between May 15 and June 30 if big game are present.

Elk

Elk were once widely distributed across most of North America and inhabited all of the major forest and plains ecosystems except deserts and the humid southeast (Skovlin 1982). The present geographic distribution of elk in the western United States and Canada is limited to the mountain forests and grasslands. Increasing human activity, agriculture, hunting, and the establishment of feedgrounds has considerably altered elk winter range (Dean et al. 2004). Elk inhabit a wide range of habitats, including coniferous and aspen forests, alpine meadows, grasslands and shrublands, and riparian areas (USFS 2003b). Their diet varies seasonally depending on availability of forage. In the winter they feed on grasses and forbs. During the spring they focus primarily on grasses and switch to forbs as they become available in the summer. Deciduous shrubs are used year-round (USFS 2003b).

Elk are as abundant now in the western U.S. as perhaps any time in history. Part of the reason is the winter feeding programs practiced in several western states. Feedgrounds encourage elk to remain in small areas in winter where they are provided with basic nutrition. Fences are sometimes used to keep elk from leaving or entering the feedgrounds.

The proposed pipeline will cross the Camp Creek elk feedground within the Camp Creek WHMA and the Horse Creek elk feedground within the Horse Creek WHMA **(Figure 3-5)**. Elk using the Horse Creek and Camp Creek winter feedgrounds are part of the Fall Creek herd unit. There are eight elk herd units managed by the WGFD's Jackson/Pinedale Region. Elk in seven of the eight herd units are supplementally fed during the winter months (Dean et al. 2004). Herd units are defined as populations with less than 10 percent interchange with adjacent herd units. The winter of 2004 was average to above-average for snow accumulation. Subsequently, winter feedground attendance was above the long-term average for many feedgrounds. The number of elk counted within the Horse Creek winter feedground in 2004 was 1,346, which was above the long-term average for this winter feedground (1,046) and above the winter feedground objective of 1,250 elk (Dean et al. 2004). The number of elk counted within the Camp Creek winter feedground in 2004 was 1,004, which was above the long-term average for this winter feedground (754) and above the objective of 900 elk (Dean et al. 2004).

Figure 3-6 Special Status Species (Wildlife and Fisheries)

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Figure 3-7 Big Game Habitats

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Outside feedgrounds, elk use south and west-facing slopes with reduced snow depths and better mobility, and in many cases more available food sources. Higher elevations often have snow depths well in excess of a meter (adversely affecting mobility of elk), and do not provide food or conditions suitable for wintering elk. Calving areas and crucial winter range for elk are shown on **Figure 3-7**. An estimated 10,164 acres of crucial elk winter range and 2,735 acres of calving areas occur on NFS lands within the Project Area (**Figure 3-7**). There are many more acres of crucial elk winter range and calving areas outside the Project Area (**Figure 3-7**).

Five elk herd units overlap portions of the Project Area. **Table 3-25** presents the population averages for each herd unit and the WGFD herd objective (WGFD 2006).

TABLE 3-25 ELK HERD UNITS OVERLAPPING PORTIONS OF THE PROJECT AREA

Herd Unit	Population Average (1998-2004)	WGFD Population Objective
Fall Creek	4,931	4,392
Hoback	1,044	1,100
Piney	3,093	2,424
Afton	3,171	2,200
Green River	2,587	2,500

Mule Deer

The geographic distribution of mule deer ranges from northern British Columbia and Alberta, west to southeast Alaska, and south to central New Mexico and northern California (Mackie et al. 1987). Mule deer occupy plains and prairies, shrublands, woodlands, and mountain forests. The species prefers rough breaks at elevations near or at the subalpine zone in the mountains (Carpenter and Wallmo 1981), but can also be found in the alpine, montane, and foothill zones. Mule deer seek refuge at lower elevations when snow is deep.

Mule deer are primarily browsers in summer, fall, and winter, and will eat all exposed portions of woody plants (USFS 2003b). In the spring, grasses and forbs comprise the bulk of the species' diet. All of the BTNF is classified as some type of mule deer seasonal range (USFS 2004b). Mule deer are observed throughout the year within the Project Area. Winter range for mule deer is generally restricted to areas where snow depths are shallower, solar aspect is more conducive to survival, and browse is available. Crucial winter range for the Sublette mule deer herd occurs within the Project Area. About 6,140 acres of crucial mule deer winter range occur on NFS lands within the Project Area (**Figure 3-7**). Mule deer crucial winter range is mainly restricted to the Snake River and Hoback River Canyons (**Figure 3-7**). No mule deer fawning areas occur within the Project Area.

The Sublette mule deer herd unit had an estimated population of 34,022 in 2003 and 26,663 in 2004. The population average within this herd unit was 31,499 from 1998 to 2002. The WGFD population objective for this herd unit is 32,000 mule deer (WGFD 2006).

Moose

Moose range throughout the boreal forests of North America south into the Rocky Mountains to northwestern Colorado and central Utah (Fitzgerald et al. 1994). Moose use a variety of habitats, including dense coniferous forest, open meadows, and riparian areas. Within the GYE, moose typically move below 7,000 feet during winter (USFS 2003b). In the summer, moose feed extensively in wetland and riparian areas and on aquatic vegetation (USFS 2003b). Moose require cover throughout the year, and

typically will not use large, open areas with little screening vegetation. Moose are somewhat less immobilized by deep snow than elk or mule deer, but even this species cannot effectively use range with snows deeper than 2 meters without a firm crust or wind pack. Moose often move to valley or river bottoms during the winter where browse such as willows can be readily found. They also occasionally forage in sagebrush grasslands, where they select bitterbrush (USFS 2003b). Nearly all of the BTNF is classified as some type of moose seasonal range. Although moose occupy the Project Area year-round, they are present in larger numbers during the winter.

The Sublette moose herd is present within the Project Area. About 20,855 acres of crucial moose winter range and 19,023 acres of calving areas occur within the Project Area in the Snake River and Hoback River drainages (**Figure 3-7**). The Sublette moose herd unit had an estimated population of 4,028 in 2003 and 4,107 in 2004. The population average within this herd unit was 5,004 from 1998 to 2004. The WGFD population objective for this herd unit is 5,500 moose (WGFD 2006).

Bighorn Sheep

Bighorn sheep is an ecological species for mountain meadows. Sheep prefer open, grassy slopes adjacent to steep cliffs that allow them to escape from predators. They feed on a variety of grasses, forbs, and browse. Bighorn sheep in the Gros Ventre herd have been documented moving across the valley floor from the Jackson area to the Tetons (USFS 2004b). This supports the idea that the Tetons and Gros Ventre herds are each a meta-population, and that movement between both locations is crucial to the long-term genetic enrichment and viability of each herd. The same movement probably occurred along the Snake River Range, where sheep were known to exist in the Snake River Canyon in areas now occupied by introduced mountain goats.

Bighorn sheep are often observed in the Hoback Canyon during winter and early spring. The Jackson bighorn sheep herd occurs within the Project Area. About 2,812 acres of crucial bighorn sheep winter range occur in Hoback Canyon (**Figure 3-7**). No bighorn sheep lambing areas occur within the Project Area.

The Project Area is located within the Jackson herd unit, where the estimated population of bighorn sheep was 318 in 2003 and 292 in 2004. The population average within this herd unit was 473 from 1998 to 2004. The WGFD population objective for this herd unit is 500 bighorn sheep (WGFD 2006).

Pronghorn Antelope

Antelope primarily feed on shrubby plants, especially sagebrush, but will also use forbs in the spring as well as some grasses (USFS 2003b). No crucial antelope winter range or fawning areas occur within the Project Area. Pronghorn summer in the Hoback valley and throughout the Beaver drainage, and winter in the Green River Basin. There are summer resident herds in a large portion of the Project Area. Antelope also migrate through the Project Area in the spring, summer, and fall.

The Sublette antelope herd unit encompasses the entire Hoback drainage and Beaver drainage, including NFS lands within the Project Area. This herd unit had an estimated population of 44,200 in 2003 and 42,500 in 2004. The population average within this herd unit was 44,886 from 1998 to 2004. The WGFD population objective for this herd unit is 48,000 antelope (WGFD 2006).

Pine Marten

Although more widely distributed in Canada, pine marten occur in isolated pockets throughout the boreal forests of the United States, the Northeast, Pacific Northwest, and Rocky Mountains. Marten are most common in dense coniferous stands of Douglas-fir and lodgepole pine, as well as mixed forests with

dense overstory and sufficient understory cover for foraging, hiding and denning (USFS 2003b). They are rare or absent in forests that lack ground structure, such as open ponderosa pine maintained under frequent and low fire severity regime (USFS 2003b). Marten are also found on rocky slopes above timberline. Open areas, including meadows wider than 300 feet, are generally avoided, especially in winter, unless there is sufficient hiding cover or downfall with branches protruding above the snow. Dens often occur in rotten logs, but may be found in log piles, slash piles, and rock slides. Marten inhabit high-elevation basins in coniferous forests in the Rocky Mountains (Fitzgerald et al. 1994). They have undergone major reductions in distribution in the western United States. This is primarily a result of reduction and fragmentation of habitat from timber harvest (Ruggiero et al. 1994).

Marten generally prey on small mammals, primarily voles and mice, but will also eat insects, fruits, and nuts. Suitable habitat usually contains abundant fallen logs, stumps, and shrub cover to support rodent prey (Ruggiero et al. 1994). Downed trees and logs are also used as daytime resting sites. Home range size typically depends on prey density, and is roughly 1 to 12 square miles for males and less than 2 square miles for females. Pine marten are generally crepuscular or nocturnal, but some individuals (particularly females) are active during the day (Ruggiero et al. 1994). The pattern of nocturnal activity coincides with the time of greatest activity of their rodent prey species.

Marten are most likely to occur in the coniferous and conifer/aspen forests within the Hoback Canyon portion of the Project Area. Forty-five percent of NFS lands within the Project Area contain coniferous or aspen forests that may contain habitat for pine marten foraging and denning.

The WGFD maintains open trapping seasons on pine marten in most of Wyoming. Trapping records can be used to estimate the size and extent of the population, however, in recent years reporting of trapping harvest in the state has been reduced because of budget constraints. Therefore, trapping figures are not available for the most recent years (2001 to 2004). Harvest of pine marten in Wyoming fluctuated widely between 1992 and 2000. Fifty-nine pine marten were harvested in the hunt areas that encompass the BTNF in the 1999-2000 trapping year, however, that number does not include all trappers, and would underestimate the true harvest (USFS 2004b).

Brewer's Sparrow

Brewer's sparrows inhabit prairie and foothills shrublands where sagebrush is present. They are common summer residents of suitable habitats in Wyoming. Brewer's sparrow is a sagebrush obligate species, which nests in live sagebrush or on the ground at the base of a live sagebrush shrub (USFS 2004b). Brewer's sparrows are neotropical migrants; they summer in North America and winter in Central or South America. They are a common cowbird host, and parasitized nests are occasionally deserted. They feed on insects and seeds gleaned from the ground (USFS 2004b).

Brewer's sparrows are commonly observed south of the Project Area, along the Green River north of Daniel Junction (Dorn and Dorn 1999). The non-forest portion of the Project Area south of Bondurant may provide suitable nesting and foraging habitat for this species. Nesting Brewer's sparrows have been documented at the same latitude and longitude as the Project Area (Cerovski et al. 2004). However, no nesting Brewer's sparrows have been documented within the Project Area (WYNDD 2004).

Nationwide, Brewer's sparrow populations have declined from historic levels, but Breeding Bird Survey data from 1980 to 2003 indicate that populations in Wyoming were approximately stable (USFS 2004b).

Boreal Toad and Boreal Chorus Frog

Two amphibian species, boreal toad and boreal chorus frog, have recently been selected as ecological indicator species for wetland habitats on the BTNF. These two species are discussed as a group because they share similar habitat requirements.

In general, these species are relatively common throughout the BTNF where suitable wetland habitats are found. Population status and trend data for these species are not currently available. One documented occurrence of the boreal toad is located within the Project Area in the Hoback Basin north of Bondurant (WYNDD 2004) (**Figure 3-6**). Monitoring of these species to develop population trend and status data was begun in 2005 (Johnson 2005).

The boreal toad occurs from Alaska to northern New Mexico, extending from within the Rocky Mountains west to the Pacific Coast. In Wyoming, it is restricted to mountains and foothills and relatively moist conditions (Baxter and Stone 1992).

The boreal chorus frog is the most widespread amphibian in Wyoming (Baxter and Stone 1992). They occupy any wetland habitats from low elevation deserts to alpine areas above timberline. The boreal chorus frog is not tracked as a sensitive species in Wyoming, therefore no observation data for this species is reported by WYNDD.

Cutthroat Trout (All Subspecies)

Cutthroat trout are an ecological indicator species for riparian areas and aquatic habitat. Cutthroat trout are found in relatively silt free cool mountain streams, and are common inhabitants of the streams, rivers, and lakes in the BTNF, where habitat for the species is abundant. Cutthroat trout have a tendency to interbreed and be out competed for favorable habitat. Cutthroat require cobble or pebble substrate and relatively moderate stream gradients to spawn. Current population information indicates that Snake River cutthroat trout populations are steady to increasing on a forest-wide basis (USFS 2004b). Bonneville and Colorado River cutthroat trout populations on the BTNF appear to be steady (USFS 2004b). Snake River fine-spotted cutthroat trout and Colorado River cutthroat trout are discussed in **Appendix F**. Bonneville cutthroat trout are not known to occur in the Project Area.

The Forest Plan contains standards for the protection of fish habitat and populations within the Project Area. For fish habitat providing a fishery at or near its potential, fish populations should be maintained at existing levels. For habitat below its potential, habitat should be improved or maintained to at least 90 percent of its natural potential. At least 90 percent of the natural bank stability should be maintained for streams that support a fishery, particularly Threatened, Endangered, and Sensitive species, and all trout species. Streambank vegetation should be maintained to 80 percent of its natural potential condition.

Migratory Birds

Executive Order (EO) 13186, signed January 10, 2001, lists responsibilities of federal agencies for protection of migratory birds. A Memorandum of Understanding (MOU) between the Forest Service and U.S. Fish and Wildlife Service, signed on January 17, 2001, provides additional guidance regarding migratory birds. Migratory birds use a variety of habitats in the Project Area during the breeding season.

Aspen and conifer forests are preferred by many species of both resident and migratory birds, such as vireos, warblers, flycatchers and western tanagers. Aspen stands support a particularly high diversity of avian species, such as sapsuckers, flickers, swallows, juncos, and bluebirds.

Sagebrush openings within the Project Area are used by migratory shrub-steppe obligates, such as sage sparrows (*Amphispiza belli*), sage thrashers (*Oreoscoptes montanus*), and Brewer's sparrows (*Spizella breweri*) (WYNDD 2004).

No suitable habitat for mountain plover exists within the Project Area. The FWS provided the following summary of habitat preferences for the mountain plover when withdrawing a proposal to list this species (FWS 2003b). Historically, the mountain plover was found on grasslands. Grazing, wallowing, and burrowing activities created and maintained the type of habitat that mountain plovers prefer. Currently, mountain plovers commonly show a preference for prairie dog towns and sites that are heavily grazed by domestic livestock. They also can be found on sod farms, alkali flats, cultivated fields, and other types of agricultural lands which mimic their preferred habitat. A mixture of short vegetation and bare ground, and a flat topography are habitat defining characteristics of mountain plovers at both breeding and wintering locations. This species is not discussed further.

3.4 THE HUMAN ENVIRONMENT

Humans have an undeniable effect on ecosystems, especially in changing the physical and biological environments. The Forest Service is committed to balancing human needs and desires with protecting the physical and biological environment. The human environment is presented in seven sections: heritage resources, land use, recreation, transportation, pipeline safety, scenic resources, and social and economic resources.

3.4.1 Heritage Resources

Resource Description

Heritage resources include prehistoric sites, historical sites, cultural landscapes, traditional use areas, and traditional cultural properties (TCPs). These resources are the remains of past patterned human activities in the area. The following characteristics of heritage resources may be of historic or cultural significance:

- association with specific events or patterns of events important in our past;
- association with the significant contributions of persons important in our past;
- embodiment of significant design principles, methods of construction, or artistic values;
- ability to yield information important in our past; or
- importance to the cultural practices or beliefs and the continuing cultural identity of a cultural group or community.

Heritage resources that have historic or cultural significance and are listed on or eligible for listing on the National Register of Historic Places (NRHP) are called historic properties. The regulations and criteria for the NRHP are presented in 36 CFR 60.4. Unevaluated heritage resources are considered potentially eligible for the NRHP and are considered as historic properties.

Heritage resources are non-renewable resources. Various federal statutes and regulations direct the protection and management of historic properties on federal land or when federal permits, licenses, or funding are involved. Key statutes include the National Historic Preservation Act (NHPA), the Archaeological Resources Protection Act (ARPA), the American Indian Religious Freedom Act (AIRFA), and the Native American Graves Protection and Repatriation Act (NAGPRA).

Section 106 of the NHPA and its implementing regulations require inventory and consideration of potential effects of any federal undertaking on historic properties or heritage resources that are listed on or

eligible for the NRHP. Pipeline construction can be designed and implemented to avoid direct or indirect impacts to known eligible sites. The entire Area of Potential Effects (APE) for the proposed pipeline has been surveyed at a Class III level. The alignment for the proposed pipeline will avoid all known eligible sites within the APE.

Known sites along portions of the pipeline corridor that have been previously surveyed to current standards were not revisited. Approximately 12.0 miles of the pipeline corridor are completely within previous cultural resource survey areas. These areas were not resurveyed. Wildlife Habitat Management Areas (WHMAs), which have been tilled and seeded, were surveyed as well as conditions allowed.

Potential exists for a small number of unknown heritage resources in buried contexts or in areas of poor surface visibility along some portions of the APE. The potential for buried sites is low along most of the APE. Holocene and Pleistocene terrace settings near creeks, where unanticipated discoveries may occur, should be monitored during surface clearing and trenching activities **(Appendix D)**. If potential heritage resources are identified during project implementation, the Forest Service will immediately evaluate those resources, notify the State Historic Preservation Office, and propose actions to resolve adverse effects. These actions may include avoidance and/or data recovery.

Indicators

- Potential effects on heritage resources
- Potential effects on eligible sites
- Potential effects on unknown sites

Forest Plan Direction

The land and resource management goals and objectives for cultural resources include the following:

- 4.9 - Cultural resources are preserved.
- 4.9 (a) - Find and protect cultural resources so that their scientific, historic, and social values are retained.

Any undertaking under the jurisdiction of the Forest will comply with Section 106 of the NHPA and its implementing regulations and any other federal regulations that apply to heritage resources. Any heritage resources within the APE will be evaluated under the NRHP Criteria for Evaluation (36 CFR 60.4). Any heritage resource that is listed in or eligible for listing in the NRHP will be considered as a historic property in all planning and implementation of the undertakings. Heritage resources that have not been evaluated for eligibility are considered potentially eligible for the NRHP, and are treated as historic properties. Impacts to historic properties will be avoided wherever feasible. In cases where avoidance is not possible in the planning and construction of the pipeline, approved data recovery plans will be developed and implemented on affected sites in order to retain their scientific, historic, and social values.

Desired Condition

Cultural resources are studied and evaluated, and the results are the basis for informing people about relationships with the past. A program for the maintenance, protection, and rehabilitation of cultural resources exists.

Temporal Scope

The temporal scope includes the period of construction and subsequent operation of the pipeline. Most potential effects to heritage resources result directly from the ground disturbance of construction.

Maintenance and operation generally occur within the area of construction disturbance and do not introduce new effects to heritage resources. Some indirect impacts may occur after construction from soil erosion, runoff, and sediment transport. The first year following disturbance is anticipated to be the period of greatest alteration of the factors influencing soil erosion, runoff, and sediment transport. In addition, some historic sites within or near the APE may be significant as the locations of important events. Construction of the pipeline will introduce temporary visual intrusions to the setting and feeling of these sites. These visual effects will diminish with reclamation of the pipeline corridor.

Geographical Scope

The area within which heritage resources may be directly or indirectly affected is the pipeline right-of-way, a 200 foot wide corridor centered on the proposed pipeline route.

Affected Environment

This narrative was largely adapted from USFS (2004b). Heritage resources along the pipeline corridor include prehistoric artifact scatters, some prehistoric hearth features, some early historic localities associated with the exploration and fur trapping period (ca. A.D. 1805 to 1840), livestock-related resources, settlement and community resources, Forest facilities, and hunting and recreation resources. Most of the prehistoric resources lack diagnostic artifacts or dateable materials, and have not been securely dated. This area is likely to have been a corridor of interaction between the Green River Basin and the Grand Teton and Yellowstone areas. The prevalence of obsidian on prehistoric sites indicates interaction with the Yellowstone area. Historic resources include identifiable locations that were described by early explorers and trappers, beginning with the Wilson Price Hunt party that passed through the area in 1811 and again on their return from Astoria the following year. However, little physical evidence of the exploration and fur trapping period has been found.

Prehistoric people inhabited northwestern Wyoming from at least 10,000 years ago. These people were hunter-gatherers who probably occupied the study area on a seasonal basis following big-game animals and gathering seasonally available plant resources. Portions of the Project Area were most likely visited between late spring and fall when resources are more available and accessible. There have been few prehistoric artifacts found in the Project Area dating earlier than about 5,000 years ago. One of the few earlier artifacts is a Folsom point base found during inventories of the Proposed Action.

The first Europeans entering the area found many native trails that followed natural corridors through the rugged mountains. The principal tribes in the area were the Eastern Shoshone and the Shoshone-Bannock. There were also small bands or family groups of Shoshone referred to as Sheepeaters. Like the Diggers of the interior basins, they did not adopt the horse, and retreated to harsher and more rugged areas. Other tribes observed in the area were the Blackfeet, Gros Ventre, and Crow. The Fort Bridger Treaty of 1868 guaranteed the Shoshone-Bannock and Eastern Shoshone hunting and fishing rights on public land in Idaho and Wyoming.

The earliest Europeans in the area were fur trappers. The first documented entry into the area was John Colter’s expedition in 1807. John Colter had come to the region with Lewis and Clark, and had asked to remain behind in the west. Accounts of Colter’s travels do not provide details of his routes. In 1811, John Jacob Astor sent a party led by Wilson Price Hunt through the area to the new settlement of Astoria in Oregon. They were led through the Project Area by a fur trapper named John Hoback. On their return east the following year, they followed a similar route back through this region. In 1822, William Ashley, the founder of the Rocky Mountain Fur Company, initiated the rendezvous system. Trappers and Indians gathered annually at rendezvous locations, rather than fixed trading forts, to exchange furs and hides for goods. Rendezvous locations ranged widely from Virginia Dale near the Colorado-Wyoming state line, through southwestern Wyoming and into Utah and Idaho. Many of them were in the upper Green River

region near the Project Area. During this period, Reverend Samuel Parker passed through the Project Area in the company of Jim Bridger and a group of trappers on his way to establish a mission in the Pacific Northwest. He gave a sermon near a campsite in the Hoback Basin, and there is a monument marking what is considered to be the first Christian service in the Rocky Mountains.

In the heyday of the rendezvous, bison were common in western Wyoming, but when the Fremont expedition crossed Wyoming in 1843 and returned in 1844, they encountered no bison west of Atlantic Rim and the Sierra Madre Range. The market for bison hides had been low during the fur trade, but they were important locally for meat. The herds of the mountains and interior basins had not been as vast as those of the plains. The Rocky Mountain fur trade ended in the early 1840s, and trappers did not return to the region in any numbers until the 1870s. Near the end of the Rocky Mountain fur trade, the demand for buffalo robes and hides for industrial belts had increased greatly, and the western herds dwindled.

Forest Service management began with the passage of the Forest Reserve Act in 1891. In subsequent years, 15 National Forest Reserves were set aside for protection and management. Among these was the Yellowstone Forest Reserve. The Yellowstone Forest Reserve, including portions of the Project Area, was established in 1904. In 1907, the name was changed to Yellowstone National Forest, and in 1908 it was subdivided into six separate forests, including the Teton National Forest and the Wyoming National Forest (renamed the Bridger National Forest). The Bridger and Teton Forests were combined in 1973. Management goals have included the preservation of the forests and wildlife. Historic uses within the forest have focused on recreation, controlled livestock grazing, and limited timber harvesting. In 1906, the Forest Homestead Act authorized federal forest lands suitable for agriculture to be opened for homesteading. Extensive areas of the Hoback Basin were settled at this time. The land was more favorable for ranching than for farming, and mostly ranches were established. Most of the ranching operations in this area began after the droughts and devastating winters of the mid to late 1880s. But even ranching was marginal in this area, and ranchers supplemented their income with dude ranches and outfitting for hunters. One of the earliest outfitters and dude ranches was established by B. F. Bondurant, where the small, dispersed community now bears his name. Other ranch operations that began in the Project Area in the early 1900s included the Triangle F Ranch and the V-V Ranch.

The development of roads and settlements in the Project Area had been very limited. In the late 1800s and early 1900s, the major routes into Jackson Hole had been the Togwotee route through Moran Junction, the Teton Pass route through Wilson, and the Gros Ventre River route from the upper Green River, entering Jackson Hole near Kelly. The Hoback Canyon trail was still little more than a horse trail. Both the Hoback and Snake River Canyons were treacherous and were not used by wagons. There are some indications that there were attempts to develop a wagon road into Hoback Canyon as early as 1912, but the automobile road through Hoback Canyon was not built until 1916 and did not become a major route to Jackson until the 1930s. According to a local newspaper, *The Pinedale Roundup*, construction was begun on a road through Hoback Canyon in June 1910, and plans were being made to dedicate the highway in July 1922. The canyon presented serious maintenance problems, many of which involved rockslides and severe storms. Major sections of the road were frequently buried in snow or washed out.

There have been 14 heritage resource inventories and one testing investigation within the pipeline corridor. There have also been two historical overviews. **Table 3-26** lists the types of investigations that have been conducted in the Project Area and within the APE. These have been clustered near the highway, but have also included some block areas away from the highway. Many of the inventories have been clustered in the same area as the APE. The entire APE has been inventoried.

TABLE 3-26 CULTURAL RESOURCE INVESTIGATIONS

Survey Type	Number of Surveys in Project Area	Number of Surveys in APE
Class III - 1983 and later[1]		
Road Improvement	14	4
Gravel Pits	7	3
Land Sale or Exchange	3	1
Well and Access	4	0
Utility Corridors (Linear)[2]	9	1
Miscellaneous Blocks[3]	14	5
Subtotal	51	14
Other Surveys and Reports	15	3
Total	66	17

[1] Class III, 1983 or later excludes "Other" (surveys conducted before 1983, Class II sample surveys, Class I or overview reports, excavations, monitoring, and thematic surveys, including bridge surveys and historic structure evaluations).
[2] Utility corridors includes linear surveys for pipelines, power lines, water lines, and buried cables.
[3] Miscellaneous blocks include small block surveys for subdivisions, range improvement, maintenance facilities, prescribed burns, timber sales, landfills, campgrounds, and ditch improvements.

In addition to the surveys listed above, surveys were completed for this analysis at geotechnical testing locations along the Proposed Action corridor, and along segments of alternative corridors within the National Forest that are not being considered in detail. The surveys were completed to evaluate the feasibility of corridor alternatives and to fill gaps in survey coverage along the Proposed Action corridor. Detailed records searches were completed for these corridors at the State Historic Preservation Office (SHPO) Cultural Records Office and at the Forest Supervisor's office in September 2004. An on-line records search for the 2-mile-wide Project Area was completed through the SHPO Cultural Records Office database on December 27, 2004. In addition, General Land Office (GLO) plat maps of the townships crossed by the study corridor were reviewed for historic features that may be present in the study area. **Table 3-27** lists the numbers of sites in the Project Area and APE, and **Table 3-28** lists the known sites by site type.

TABLE 3-27 KNOWN SITES

	Project Area			APE		
	Eligible or Unknown	Not Eligible	Total	Eligible or Unknown	Not Eligible	Total
Historic	10	10	20	2	3	5
Historic and Prehistoric	3	0	3	3	0	3
Prehistoric	20	18	38	5	5	10
Unknown	2	0	2	0	0	0
Total	35	28	63	10	8	18

TABLE 3-28 SITE TYPES

Site Type	Project Area		APE	
	Eligible or Unknown	Total	Eligible or Unknown	Total
Historic				
Artifacts or Debris	0	4	0	2
Bridge	0	1	0	0
Canal	0	1	0	0
Cabin(s)	2	3	0	0

TABLE 3-28 SITE TYPES

Site Type	Project Area		APE	
	Eligible or Unknown	Total	Eligible or Unknown	Total
CCC Camp	0	1	0	0
Church or Shrine	1	1	0	0
Event	1	1	0	0
Guard Station	1	1	0	0
Inscriptions	1	1	0	0
Ranch	2	3	1	2
Resort/Lodge	0	1	0	1
Stage Stop	1	1	0	0
Unknown	1	1	0	0
Subtotal	**10**	**20**	**1**	**5**
Historic/Prehistoric				
Artifact Scatter	2	2	2	2
Building, Artifact Scatter	1	1	1	1
Subtotal	**3**	**3**	**3**	**3**
Prehistoric				
Artifact Scatter	10	22	3	9
Artifacts and Features	8	12	1	1
Features	1	3	0	0
Rockshelter	1	1	0	0
Subtotal	**20**	**38**	**4**	**10**
Unknown Age				
Cairns	1	1	0	0
Unknown	1	1	0	0
Subtotal	**2**	**2**	**0**	**0**
Total	**35**	**63**	**8**	**18**

There are more prehistoric sites within the Project Area than there are historic sites. The prehistoric sites are dominated by artifact scatters and artifact scatters with features. Fifty-five percent of the prehistoric sites are recommended as eligible or unevaluated. There are a variety of historic site types. Several of the sites are associated with the dispersed community of Bondurant, and the majority of the remaining sites are associated with ranching, the National Forest, or the transportation corridor. One site is associated with an early historic event (Reverend Parker's sermon in 1835) and another is an inscription site associated with early travelers.

Eighteen sites have been identified within the APE. Known sites in the APE include ten prehistoric sites, five historic sites, and three sites with both prehistoric and historic materials. Four of the prehistoric sites, one of the historic sites, and all three sites with both prehistoric and historic materials are recommended eligible or unevaluated. Three areas along the proposed route that had a moderate potential to contain sites were obscured by dense vegetation or eolian sand. The sandy area is near a prehistoric site that may be partially buried. These areas should be monitored during pipeline construction.

A review of the GLO plat maps for the townships crossed by the Project Area revealed few historic features that may remain as heritage resources. These GLO plat maps were mostly completed between 1893 and 1908. Township 39 North, Range 114 West, was not platted until 1953, and then only Section 27 and the southwest quarter of Section 23 were platted. Through most of the National Forest, from Township 38 North, Range 114 West to Township 39 North, Range 116 West, only limited areas in each township were platted, and the remaining areas are labeled “Yellowstone National Forest Unsurveyed”.

There are no improved roads evident on these maps along Hoback Canyon, but they may be obscured by the depiction of steep slopes. Unimproved trails are shown in a few locations. Improved roads, some of which are in the approximate location of the early highway alignment, are shown in portions of the north end of the Project Area, beginning near Stinking Springs. Few historic features are shown on the plat maps. Notably, a location is recorded in Township 38 North, Range 114 West, Section 24 as a historic stage stop, but there are no roads or buildings shown along the Hoback River. However, a cabin and stables are shown to the north along a smaller creek. Among the few other historic features shown near Hoback Canyon are a camp and a cabin along Cliff Creek. Several of the creeks are shown with names different from those on current topographic maps, a reminder that names of landscape features may change over the years.

3.4.2 Land Use

Resource Description

The proposed pipeline could affect existing land uses, private interests, and federally recognized conservation easements.

Indicators

- Effects on existing land uses
- Effects on landlines, private property, and federally recognized conservation easements

Forest Plan Direction

Forest Plan direction for land uses specifies that utilities and utility corridors are permitted on the BTNF (Forest Plan, page 137) and identifies the lands program as an essential component of managing the BTNF (Forest Plan, page 138).

Applicable Forest Plan goals include the following:

- 1.1(i) - Help utilities provide services.
- 2.6 - Scenic values of certain private tracts highly visible to the BTNF visitor are protected from visual impact.

Applicable Forest-wide guidelines include the following:

- Road Easement Guideline – Road easements should be granted, acquired, or exchanged with other agencies, states, counties, and private interests to ensure that management objectives are met for all ownerships (Forest Plan, page 138).
- Utility Corridors Guideline – Utilities should be constrained to one utility corridor except as needed to meet other resource objectives (Forest Plan, page 138).
- Utility Corridor Rights-of-Way Guideline - When new corridors are designed and existing corridors re-evaluated, features that allow off-highway-vehicle use in the rights-of-way, including use by snowmobiles, should be considered. The features considered should include wider corridors and connections to adjacent cleared areas (Forest Plan, page 138).

Desired Condition

The desired condition for land uses includes the management of lands, minerals, and special uses to provide for multiple uses in an environmentally acceptable manner. Property boundary lines should be visible on the ground, and should accurately depict the location of landownership lines for the protection

and management of NFS lands and resources. Occupancy and use should serve the interests of the public and the United States, and should be consistent with the purpose of the National Forests. Management of special uses should meet the needs of private interests, intermingled and adjacent landowners, and other jurisdictions for access to and across NFS lands, including reasonable access to private land.

Temporal Scope

The short-term impact on land uses, private property, and conservation easements is anticipated to occur for the duration of construction activities, over a period of 6 months. Long-term impacts could occur for the foreseeable future.

Geographic Scope

The geographic scope of the analysis is limited to the Project Area.

Affected Environment

The proposed pipeline would cross NFS lands, State of Wyoming lands, and private lands. The Project Area contains 63,767 acres and encompasses lands within 1 mile of the pipeline route (refer to **Figure 2-1** in Chapter 2), including 40,184 acres of NFS lands, 1,534 acres managed by BLM, 1,364 acres of state-owned lands, and 20,685 acres of privately owned lands. Although BLM lands are included in the Project Area, no lands managed by BLM would be crossed by the pipeline. Primary uses of the Project Area are recreation, wildlife habitat, agriculture, including irrigated hay fields, livestock grazing, and scattered ranch, residential, and commercial structures. Important wildlife habitat, including two state-owned elk feedgrounds, three Forest Service facilities (Hoback and Kozy campgrounds and the Hoback guard station), and the small community of Bondurant are located along or near the proposed pipeline route.

The Master Title (MT) plats for all townships along the Hoback Canyon highway were reviewed at the Wyoming State Office (WSO) of the BLM to determine the land status and title interests of federal agencies along the highway route. As the successor to the U.S. General Land Office, BLM maintains deeds and surveys involving all public lands, including National Forests. MT plats of each township are maintained by the BLM to document the land and mineral titles of all public lands held by the United States, and the rights, titles, and interests in these public lands that have been transferred to other parties.

No records were found to document that the BLM or the Forest Service took any action with regard to the highway route prior to 1953, when the Forest Service made an application to BLM for a recreation and public purpose withdrawal for a roadside zone. In 1955, some federal lands along the highway route on both sides of the Hoback River in T.38N. R114W. were included in a withdrawal for a power site classification. In 1959, a roadside zone encompassing 200 feet on each side of the Hoback Canyon highway was withdrawn from mineral entry and all forms of disposition under the public land laws by the Secretary of the Interior under Public Land Order (PLO) 1923.

As stated in the PLO, the withdrawn roadside zone is subject to Forest Service management. The PLO did not transfer any legal interest in the land to another party. The approximate location of the withdrawn area is described by legal land description. The withdrawal prohibited further appropriation of the specified lands under the public land laws, such as homestead acts or the mining law.

Federal actions associated with rights-of-way or easements have only affected the following lands in the Project Area that are not included in the Proposed Action. In 1966, BLM granted a right-of-way to WYDOT for public lands in T.40N. R.116W., Sections 33 and 34, which were involved in a realignment

of the highway. In 1970, a highway easement deed was granted by the U.S. Department of Transportation to WYDOT for some of the National Forest administered lands in T.39N. R. 116W., Sections 11 and 14, which were also involved in realignment of the highway. A right-of-way was issued in 1970 by BLM from the easement deed. Other WYDOT-owned interests in the Project Area include deeded rights-of-way across some of the private lands along the Hoback Canyon highway.

Conservation easements protect the scenic, wildlife, and agricultural open space values of the properties that are subject to the easements. The easements protect these properties from development and other activities or uses that are not consistent with the preservation of their scenic characteristics. Generally, the placement of utilities is not a prohibited use of conservation easement properties, however, the specific wording of each easement document must be consulted for guidance, and the holder of the easement must be consulted for concurrence with planned activities and uses. The proposed pipeline route avoids most properties with conservation easements; however, it crosses conservation properties in three areas that are held by two different organizations (**Appendix E**):

- Conservation easements in the Melody Ranch area south of Jackson, held by the Teton County Scenic Preserve Trust. These agricultural open space easements are located west of the highway.
- A conservation property located north of the highway at Poison Creek between Camp Creek and Stinking Springs that is owned by the Jackson Hole Land Trust.
- A conservation easement for the River Bend Ranch, located near the Upper Hoback River, held by the Jackson Hole Land Trust.

3.4.3 Recreation

Resource Description

Recreation is a highly visible use of the Project Area. Both residents and tourists rely on the BTNF as a source of recreational opportunities and could be affected by changes in recreation opportunities or a reduction in the quality of recreation experiences.

Indicators

- Effects on Gros Ventre Wilderness and the Shoal Creek wilderness study area (WSA)
- Effects on recreation values along segments and corridors of the Hoback River and its tributaries (Shoal, Cliff, Granite, and Willow Creeks) within the Nationwide Rivers Inventory (NRI) that are eligible for designation as wild, scenic, or recreation rivers
- Effects on the undeveloped character of roadless areas
- Effects on recreation opportunities and Recreation Opportunity Spectrum (ROS) Class
- Effects on recreation use, including displacement of recreation activities
- Effects on existing recreation facilities (campgrounds, trailheads, other facilities)
- Effects on recreation special uses

Forest Plan Direction

The overall direction for managing recreation resources on the BTNF is to provide outdoor recreation opportunities in natural forest settings that respond to the needs of forest visitors and local communities, promote access to recreation opportunities, and provide primitive types of experiences in wilderness and backcountry settings.

Management guidance for recreation responds to the following Forest Plan goals and objectives:

- 2.2 - High quality developed recreation facilities exist to serve BTNF visitors.
- 2.3 - High quality dispersed recreation opportunities exist to serve BTNF visitors.

- 4.6 (a) – Retain and, where necessary, restore high quality wilderness environments and corridors for Wild, Scenic, and Recreation Rivers (as modified by Attachment One to the Forest Plan Record of Decision).
- 4.10 – Natural features and landmarks are preserved and retain their settings.
- 4.10 (a) Find and protect natural features and landmarks so that their conditions and settings are retained.

Overall guidance for recreation is contained in the Recreation Prescription: The Recreation Opportunity Spectrum (ROS) is used for facility planning and to direct management. Recreation on the BTNF provides the full range of recreation opportunities, managed to create a balance of public and private uses responsive to local, regional, and national demand (Forest Plan, page 122).

Forest-wide standards and guidelines provide additional management guidance for recreation applicable to the proposed project.

- Wild and Scenic Rivers Standard – River segments and a corridor at least ¼ mile on either side, that have been determined eligible for inclusion in the Wild and Scenic Rivers System will be managed to protect or enhance their outstanding values (Forest Plan, page 142).
- Wild and Scenic Rivers Management Standard – Resource development that would diminish the free-flowing characteristics, water quality, and scenic, recreational, fish and wildlife, or other values of eligible segments will be prohibited. (Forest Plan, page 174).
- Scenic Byway and Wild and Scenic Rivers Visual Standard – A sensitive travel corridor, a designated scenic byway, exists along U.S. Routes 26, 89, 189, 191, and 287 from Pinedale to Dubois, Wyoming through the BTNF, the Shoshone National Forest, and Grand Teton National Park (GTNP). For areas adjacent to the scenic byway and within the foreground of potential Wild and Scenic Rivers, a visual quality objective (VQO) of Retention in the foreground and Retention or Partial Retention in the middle ground will be met (Forest Plan, p. 123, as added by Attachment One to the Forest Plan Record of Decision).

The following standards associated with MAs and DFCs would be applicable to the proposed project.

- River Qualities Standard (MAs 21, 47, and 48) – The Hoback River, including DFC 12 along the river in MA 47, and DFC 2B and 12 in MA 21, will be managed to protect the scenic and recreational values that make it eligible for designation as a Scenic or Recreation River.
- Visual Quality Standard (MA 21) – The foreground zone relative to the Hoback River and U.S. 189/191 will be managed to meet a VQO of Retention. Middle ground and background zones will be managed to meet Partial Retention.

Desired Condition

The desired condition for recreation requires balancing the needs to provide diverse recreation opportunities, facilitate user access, and protect resource values. The desired condition includes improving the capability to provide diverse, high-quality outdoor recreation opportunities, and managing wilderness so that changes are primarily a consequence of natural forces.

Temporal Scope

Short-term impacts on recreation resources in the Project Area are anticipated to occur for the duration of proposed construction activities, over a period of 6 months. Long-term impacts could occur for the foreseeable future.

Geographical Scope

The area analyzed for recreation resources is the Project Area.

Affected Environment

General Setting and Recreation Attributes

The BTNF is recognized as a nationally significant recreation resource, with a variety of outstanding recreation settings and heavy use. About 2.7 million National Forest visits, each averaging just under one day in length, and 52,000 wilderness visits were estimated for the BTNF during 2001-2002 (Kocis et al. 2003). Day use represents an estimated 51 percent of the National Forest visits to the BTNF (Stynes and White 2004). The Forest provides a large part of the region's recreation resource, which is also shared by other federal agencies, state and local government, and the private sector. There are approximately 1.3 million acres in designated wilderness; there is also considerable roadless backcountry, which offers far less crowding and development than some of the trail corridors within designated wilderness. The expansive backcountry on the Forest is one of the features that contribute to its value to the entire NFS. These areas are sought by recreationists, and provide undisturbed habitat for wildlife and outstanding opportunities for such popular activities as big game hunting, horsepacking, and hiking into remote areas.

The attractions of the Forest and surrounding region have encouraged a high level of recreation use. The northern portion of the Forest is influenced by tourism associated with Grand Teton and Yellowstone National Parks, although attractions on the Forest draw many visitors as well. Major tourist attractions include the Snake River, Jackson Hole Ski Area, and backcountry settings for big game hunting and winter sports. The east side of the Forest is dominated by the Wind River Range, and attracts a great number of visitors from all over the nation. The Bridger Wilderness is the primary attraction, although the large lakes along the range front and the upper Green River are also major recreation destinations. The area in between, where Hoback Canyon and the Hoback Basin are located, has been largely overlooked in the past by travelers, but has seen increasing recreational use in the past decade. There are few developments here and the area attracts those who wish to camp and have a recreation experience in a more primitive setting. Big game hunters, weekend campers, trail users, and fishermen come to this area from many parts of the United States, attracted by natural settings with good road access. Increasing development of nearby private lands, including subdivisions, is also having an effect on the number of people seeking recreation experiences on the NFS lands in Hoback Canyon and the Hoback Basin.

The Hoback Basin, known for its expansive views of the mountains on all sides, includes the Upper Hoback River and tributaries. Access to the Wyoming Range National Recreation Trail and the Gros Ventre Wilderness exists at many trailhead locations, including Shoal Creek, Cliff Creek, and the Upper Hoback River. Bryan Flat, Granite Creek, and Cliff Creek provide the primary road access to NFS lands from Hoback Canyon. These roads provide access to trailheads, summer home sites, developed recreation sites, undeveloped areas, backcountry, and wilderness. There are two developed campground in the Project Area (Kozy and Hoback), as well as popular established camps in Fisherman Creek, Cliff Creek, Riling and Parody Draws, and the upper canyon of the Hoback River. The Granite Creek Campground is approximately 5 miles east of the Project Area in the main Granite Creek drainage. Horse Creek, Bryan Flat, Red Creek, Granite Creek, Tin Can Park and Shoal Creek are popular destinations for hunters. The Shoal Creek, Granite Creek and Horse Creek Trails are the main trails into the Gros Ventre Wilderness. Several outfitter-guides base their operations in these drainages, which are well-known for their hunting opportunities in a remote, wild setting.

Recreation Opportunity Spectrum

Recreation Opportunity Spectrum (ROS) classes have been adopted for all NFS lands within the Project Area in accordance with Forest Plan guidance (**Table 3-29**, **Figure 3-8**). ROS is a system developed by the Forest Service that classifies recreation opportunities according to their physical, social, and managerial characteristics. The ROS classes include: Semi-Primitive Non-Motorized, Semi-Primitive Motorized, and Roaded Natural. Each ROS setting is described below.

- Semi-Primitive Wilderness - A natural or natural-appearing environment of moderate to large size. Interaction among users in this setting is low, but there is often evidence of other users. Closed roads may be present. The area is managed to be essentially free of human-induced restrictions and controls. About 7 percent of the Project Area is within this category. This ROS class is found within the Gros Ventre Wilderness from Stinking Springs to the Cow Creek drainage about 4 miles east.
- Semi-Primitive Non-Motorized - A natural or natural-appearing environment of moderate to large size. The concentration of users is low, but there is often evidence of other users. No roads are present. This designation encompasses about 29 percent of the Project Area. These areas include crucial big game winter ranges and areas where topographic features preclude motorized access.
- Semi-Primitive Motorized - A natural or natural-appearing environment of moderate to large size. Interaction among users in this setting is low, but there is often evidence of other users. Local roads used for other resource management activities may be present. This designation includes about 7 percent of the Project Area. These lands typically include access points and undeveloped trailheads for non-motorized access to the back country.
- Roaded Natural - A natural or natural-appearing environment of moderate size with moderate evidence of the sights and sounds of humans. Such evidence usually harmonizes with the natural environment. Interaction among users may be moderate to high, with evidence of other users prevalent. Motorized use is allowed. Rural - An area characterized by a substantially modified natural environment. The sights and sounds of humans are readily evident, and the interaction between users is often moderate to high. A considerable number of facilities are designed for use by a large number of people. Facilities for intensified motorized use and parking areas are available. This designation includes about 57 percent of the Project Area. These lands have access to developed sites, trailheads, home sites and general access to the National Forest.

TABLE 3-29 RECREATION OPPORTUNITIES ON NATIONAL FOREST LANDS WITHIN THE PROJECT AREA

ROS Class	Acres
Semi-Primitive Wilderness	2,769
Semi-Primitive Non-Motorized	11,877
Semi-Primitive Motorized	2,663
Roaded Natural	22,875
Total NFS Acres	40,184

Developed Recreation

Developed recreation facilities include the eight-unit Kozy Campground and the 13-unit Hoback Campground, both located along the south side of U.S. 189/191. Kozy Campground is located 13 miles southeast of Hoback Junction, and is open from May 20 through September 10 (weather permitting), with sites costing $12.00 per night. Hoback Campground is located 8 miles southeast of Hoback Junction, and is open from May 20 through September 30 (weather permitting), with sites costing $15.00 per night.

Figure 3-8 Recreation Opportunity Spectrum

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Other developed recreation facilities within the Project Area, or reached by road access from the Project Area include the Granite Creek recreation complex, with summer homes, the 52-unit Granite Campground (open May 20 through September 30, weather permitting, with sites costing $15.00 per night) and Granite Hot Springs pool (open year-round), a Girl Scout camp, the American Wilderness Leadership School, and the private resorts in and near Bondurant. Cliff Creek, Granite Creek, Bryan Flat and Horse Creek are the primary developed trailheads in the area.

Dispersed Recreation

Much of the dispersed recreation setting can be described as semi-primitive or primitive. These include areas managed for both motorized and non-motorized uses; the area south of Bondurant is available for snowmobile use in winter with the exception of the designated big game winter ranges. Semi-primitive motorized settings include trails suitable for all-terrain vehicle (ATV) or motorbike use and unimproved two-track roads for jeeps and other four-wheel-drive (4WD) vehicles. Opportunities for semi-primitive motorized use are limited because of soil and terrain constraints; legislative, policy, and regulatory restrictions; and the desire on the part of forest managers to continue providing non-motorized recreation opportunities and secure wildlife habitat.

Other dispersed outdoor recreation opportunities include a good trail system which offers opportunities for hiking, horseback riding, camping, hunting, photography, and skiing. The known opportunities for mountain climbing, the Gros Ventre Peaks, are all within the existing wilderness. Special feature opportunities along the pipeline corridor include outdoor education on extended trips as well as day excursions, with a focus on geology, waterfalls, and the geologic feature at Stinking Springs near Bryan Flat.

Wildlife is diverse in response to the varying habitats along the highway corridor in the Gros Ventre Wilderness and the Shoal Creek. The areas contain habitat for elk, moose, mule deer, mountain lion, Rocky Mountain bighorn sheep, migratory songbirds, and small mammals. It contains important winter range for elk, deer, and moose; the Horse Creek, Camp Creek, and Dell Creek Wyoming Game and Fish Department (WGFD) feedgrounds are nearby. Opportunities for viewing wildlife are outstanding throughout the year.

Gros Ventre Wilderness and Shoal Creek Wilderness Study Area

The Wyoming Wilderness Act of 1984 provided for designation of the Gros Ventre Wilderness and Shoal Creek Wilderness Study Area (WSA), which are contiguous areas. The Shoal Creek WSA encompasses 29,700 acres just south of the 287,000-acre Gros Ventre Wilderness. The Project Area contains a portion of the Gros Ventre Wilderness, however, no wilderness lands would be crossed by the proposed pipeline. No Shoal Creek WSA lands are included in the Project Area.

The Gros Ventre Wilderness is located in reasonably close proximity to U.S. Highway 189/191 along the pipeline corridor from the Jackson distribution center along the Snake and Hoback Rivers to Granite Creek, where it is contiguous with the Shoal Creek WSA, and ends near Bondurant. Several trails lead into these areas along the entire corridor. The corridor and area from Bondurant to Merna is utilized primarily for dispersed recreation, including hunting, off-road vehicle use, and snowmobiling.

Though national studies indicate that people are taking shorter vacations and staying closer to home, use of the Bridger, Gros Ventre, and Teton Wildernesses continues to be high. Use was down for 2004-2005, which has been attributed to late snow and high gas prices. Many wilderness users are from Wyoming and adjacent states. Most of the use from out-of-state on summer weekends is from Utah, Idaho, Montana, and Colorado. In addition, the Bridger Wilderness continues to draw visitation from all over the country. Many visitors are loyal, long-time users who have come back year after year.

Wild and Scenic Rivers System

Wild and Scenic River candidates were identified in 1991. The Snake River from Jackson to the mouth of the Hoback River has been found eligible and suitable for classification as a Recreational River under the Wild and Scenic Rivers Act. The Upper Hoback River from its source to the National Forest boundary has been found eligible and suitable for classification as a Wild River. The canyon section of the Hoback River, from Cliff Creek to the confluence with the Snake River, is eligible as a Recreational River. Other eligible streams include Shoal Creek, Cliff Creek, and Granite Creek. Forest Plan standards protect values of eligible rivers.

Roadless Character and Unroaded Areas

The existence of an expansive roadless backcountry attracts recreation visitors. This area offers backcountry settings for big game hunting, self-supported pack trips and hiking, and other activities to the visiting public. Although reasons differ, forest users strongly believe that roadless areas have value for watershed health, wildlife habitat, scenery, and that they lend the forest its dominant character, which is that of a relatively undisturbed ecosystem. The roadless character in these areas embodies a "sense of place" associated with the expansive backcountry of the Yellowstone region, which is largely an image of one of the last intact ecosystems in the country, a large area of wildlands that can still support populations of wildlife, including large predators. The Forest Plan recognizes the importance of backcountry areas for that sense of place in the DFCs, as expressed through traditional outfitter operations, big game habitat, and primitive recreation experiences.

Approximately half of the Hoback Basin outside designated wilderness is included in roadless areas (**Figure 3-9**). Much of the roadless acreage borders the Shoal Creek WSA north of U.S. 189/191. Some popular trails cross the roadless areas here, including the Shoal Creek, Parody Draw, and Dell Creek trails. The Monument Ridge roadless area has several popular trails, including a road from the Clark Draw Road to the lookout.

Unroaded areas in the vicinity of the Project Area are described below. Very few acres near the periphery of these areas are situated along the U.S. 189/191 highway corridor and the Camp Creek saddle areas that contain the proposed pipeline corridor.

Grayback Ridge Roadless Area

Natural Integrity – High in most parts of the area. The Grayback Ridge roadless area is the largest roadless area on the forest, this area includes Grayback Ridge and all contiguous roadless lands south to McDougal Gap. Evidence of livestock grazing is found in shale gullies north of Mount McDougal and in places with reduced species diversity such as Pickle Pass, Blind Bull summit, the hills above Roosevelt Meadows and Horse Heaven Meadows. The west slope of Hoback Peak, in the upper Little Greys River area, has tall forb parks in excellent condition. The condition of tall forb sites is variable in the roadless area; Blind Bull summit is showing recovery; Deadman Peak area still has problems, as do the Bradley-Elk Mountain area, Middle Ridge, and Roosevelt Meadows.

Most of the area is within a backcountry setting with human intrusions including trails and campsites, range allotment fences and water developments, evidence of timber harvest activities, scattered cabins and other remnants of past development activities, and minor structures in support of permitted activities such as outfitted hunting trips. Northern portions of the roadless area, within and near the Project Area, are near private ranchlands that remain largely pastoral in nature. However, in places, many of the larger ranchlands are being subdivided and additional lights, traffic, and visible structures are increasing. These private lands are not located within the roadless area but are nearby and are visible from some locations in the roadless area.

Figure 3-9 Roadless Areas

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Apparent Naturalness – High in most parts of the area. Most of the area appears natural; old cabins near Blind Bull summit and the workings of past coal mines remain. There is little sign of an old airstrip near Blind Bull Summit but there are some closed roads in the area. Roads and some timber harvest areas are located just north of Sheep Creek in the Bug Creek and Black Canyon drainages. The Telephone Pass All-Terrain-Vehicle (ATV) trail (part of which is a seasonal road) is within the roadless area. Non-wilderness land uses are visible, including timber harvest areas, highways, settlements, and agriculture. These are distant views and don't detract greatly from the apparent naturalness.

Remoteness – There is a high degree of remoteness in much of this large area. Some of the most remote parts of the forest backcountry are within this roadless area, particularly in the central core where the Little Greys and Hoback Rivers, and Cliff and Willow Creeks begin. However, some portions of the roadless area are relatively close to roads and developments. Forest roads, including roads that follow Cliff Creek, Willow Creek, and the Upper Hoback River, pass nearby and lead to access points in the backcountry. The use of motor vehicles in parts of the roadless area has an effect on the area's sense of remoteness.

Solitude – This is the Forest's largest primitive/semi-primitive area outside wilderness. It offers considerably more solitude than most areas that are in wilderness. The opportunity for solitude is quite high most of the summer. During the fall deer and elk hunting seasons, much more use takes place, especially along trails and parts of the roadless area near popular access roads. There is a very good chance of seeing few to no other parties on most trails except in popular hunting locations during the fall. Cliff Creek has become more popular in recent years, especially with people on mountain bikes, but even that trail (up to the falls) gets relatively light use.

Special Features – Grayback Ridge is a landmark of scenic and historic importance associated with Theodore Roosevelt, who hunted here. The Wyoming Range National Recreation Trail passes through the roadless area from Bryan Flat to McDougal Gap. The area also includes Deadman Mountain and Hoback Peak, two high landmarks.

Manageability/Boundaries – The area is quite manageable as wilderness or backcountry; the only potential boundary problems have to do with mapping errors. During the RARE inventory and evaluation processes, this roadless area was rated very high as potential wilderness; however, it is also popular for motorized recreation uses.

Monument Ridge Roadless Area

Natural Integrity – Moderate to High. Most of the Monument Ridge roadless area is within a backcountry setting and the only human intrusions are trails. The exception is the primitive road that leads to the Monument Ridge fire lookout, open to 4WD vehicles and maintained as a shelter for year-round use. The area includes a cattle grazing allotment, with associated fences and minor facilities, but there is no obvious reduction in productivity, species diversity, etc. as a result of grazing by either livestock or big game. The area includes year-round habitat for wildlife and important winter ranges on the west slope are closed to human entry to provide refuge for big game.

Vegetation communities do not contain evidence of overgrazing or changes in plant diversity; riparian areas are mostly vigorous and healthy in appearance. There is some private land adjacent to the roadless area; these private lands remain largely pastoral in nature, but in the Bondurant area, many of the larger ranchlands are being subdivided and additional lights, traffic, and visible structures are increasing. These private lands are not located within the roadless area but are nearby and are visible from it.

Apparent Naturalness – High. The average viewer on foot or horseback would see a natural-appearing landscape here, whether using the roadless area or seeing it from adjacent areas. Even at slow speeds and long durations of viewing, the landscape appears natural. Nearby non-wilderness land uses are visible, including a highway, settlements, and agriculture.

Remoteness – This roadless area is relatively close to roads, including a main highway, and developments on nearby private land. There is considerable private land north and east of the roadless area; in the Bondurant area, many of the larger ranchlands are being subdivided and additional lights, traffic, and visible structures are increasing. Although adjacent developments are close and highly visible from many parts of the roadless area, the character of the Hoback Basin remains rural and developments are somewhat dwarfed by the vista of wild mountains on all sides. The Monument Ridge roadless area is closed to motor vehicles except for the road to the lookout; there is considerable unauthorized use of motor vehicles and this is having an effect on the sense of remoteness. There is a winter range closure on the west slope and Little Cliff Creek; the remainder of the area is open to snowmobile use; the lookout is maintained as an emergency shelter.

Solitude – Considering the size and proximity of this area to the highway and community of Bondurant, the opportunity for solitude is high. An exception is the area immediately surrounding the lookout, which is a scenic attraction and therefore invites somewhat more use. Still, compared to other better-known wild areas in this part of Wyoming, the opportunities for solitude are high.

The opportunity for solitude is high during most of the summer. During the deer and elk hunting seasons, much more use takes place. This is also the time of year when much of the unauthorized use of motor vehicles in closed areas takes place; this results in a reduction of the sense of solitude, especially in some of the areas where noise travels.

Special Features – A feature of interest is the Monument Ridge summit, which offers a panoramic view of the nearby Gros Ventre and Wyoming Ranges.

Manageability/Boundaries – This area would be somewhat difficult to manage as wilderness because it is isolated from other backcountry areas by roads and is fairly small. As far as definable boundaries are concerned, it would be relatively easy to use the surrounding road corridors as margins. Topographic features are less obvious.

Gros Ventre Roadless Area

Natural Integrity – Moderate to High. Most of the Gros Ventre roadless area is within a backcountry setting, and the only human intrusions are trails and campsites, range allotment fences, and minor structures in support of permitted activities such as outfitted hunting trips. Salvage logging occurred in Shoal and Dell Creeks after forest fires in the late 1980s and early 1990s. Most of the logging activity is not in the roadless area itself (Slide Creek and lower Shoal Creek are exceptions). Harvested areas in Dell Creek and Slide Creek are highly visible from the roadless area and the adjacent WSA, and do not meet visual quality objectives, but they are starting to grow back and the intrusion on scenic quality is lower. The roadless area contains portions of several cattle grazing allotments, with associated fences and water developments. Vegetation communities do not contain evidence of overgrazing or changes in plant diversity. Riparian areas are mostly vigorous and appear healthy. There is some private land within and adjacent to the roadless area. These private lands remain largely pastoral in nature, but in the Bondurant area many of the larger ranchlands are being subdivided, and lights, traffic, and visible structures are increasing. These features are not located within the roadless area but are nearby and are visible from it.

Apparent Naturalness - High. The average viewer is on foot or horseback, and even at slow speeds and long duration of viewing, the landscape appears natural. There are exceptions where past timber harvest is

still evident, on the west slope of Pass Peak (Slide Creek), parts of lower Shoal Creek, and in the fire salvage area between Parody Draw and Shoal Creek. On open ridges non-wilderness land uses are visible, including timber harvest areas, highways, settlements, and agriculture. These are distant views and don't detract greatly from the apparent naturalness.

Remoteness – The remaining portion of this roadless area (that is not already part of the Gros Ventre Wilderness or the Shoal Creek WSA) is relatively close to roads and developments. Forest access roads in Dell Creek and North Fork Fisherman Creek pass nearby and lead to access points. Roads in Riling Draw, Granite Creek, Parody Draw, Rock Creek, and West Dell Creek provide access to trailheads leading into the backcountry. Because of topographic and vegetation screening, the backcountry visitor may begin to feel the area's remoteness quite soon after leaving a trailhead.

Solitude - The opportunity for solitude is quite high for most of the summer. The area is used much more extensively during the deer and elk hunting seasons, especially along trails (and in parts of the roadless area near popular access roads such as North Fork Fisherman Creek), and in heavy-use campsites, such as those in West Dell and House Creeks. Much of the hunting is from trailheads and roadside camps outside the roadless area, so there is not much crowding in popular backcountry campsites.

Special Features - Several candidates for natural landmarks occur in the area, though none have been officially designated. These include the Battle Mountain Thrust and the Granite Hot Springs area. Other features of interest include diverse vegetation communities, such as moist shrublands that provide summer habitat for numerous neotropical songbirds, small areas of wetland enhanced by beaver activity, and mixed aspen, conifer, and parklands that offer scenic views. The roadless area provides important habitat for big game.

Manageability/Boundaries – This area would be reasonably easy to manage as wilderness because it is contiguous with the Gros Ventre Wilderness and Shoal Creek WSA, which together comprise a large and remote backcountry area. However, the area has been cherry-stemmed by roads in Shoal Creek, Dell and Fisherman Creeks, Slide Creek and in other areas. Although some of these roads are no longer open to vehicles, they remain obvious as roads, and in some areas the timber harvest units also remain obvious. The likely configuration of any future wilderness in this roadless area would be difficult to manage as wilderness without further site restoration.

3.4.4 Transportation

Resource Description

Road- and traffic-related issues were specifically identified during project scoping. Project activities could affect transportation in the Project Area by impacting traffic flow, public travel, and safety on a portion of the Wyoming Centennial Scenic Byway (U.S. 189/191), a sensitive travel route.

Indicators

- Effects of pipeline construction, operation, and maintenance on the highway corridor, existing road facilities and structures, and public travel
- Effects of pipeline construction, operation, and maintenance on a portion of the Wyoming Centennial Scenic Byway (U.S. 189/191), a sensitive travel route
- Effects of liquefied natural gas (LNG) delivery by truck on highway corridors, existing road facilities and structures, and public travel

Forest Plan Direction

Management guidance for road access responds to the following Forest Plan goals and objectives:

- 1.2 - A safe transportation system meets the needs of commercial users of the BTNF.
- 2.5 - A safe road and trail system provides access to a range of recreation opportunities and settings.
- 4.1 - Road management preserves wildlife security, soil, visual resource, and water-quality values.
- 4.1 (b) - Design roads and structures to retain soil, visual quality, and water-quality values.

Other guidance for roads is contained in the following management prescriptions:

- Access: General – A network of roads and trails reflects designs adapted to resource conditions and meets the needs of National Forest users (Forest Plan, page 139).
- Access: Roads – The road system provides access to BTNF resources for National Forest users using appropriate service and maintenance levels (Forest Plan, page 139).

Forest-wide standards and guidelines provide additional management guidance for roads that may be applicable to the proposed project.

- Sensitive Travel Route Standard – Along certain visually sensitive travel routes, the visual quality objective (VQO) will be Retention or Partial Retention (Forest Plan, p. 123, as modified by Attachment One to the Forest Plan Record of Decision).
- Scenic Byway and Wild and Scenic Rivers Visual Standard – A sensitive travel corridor, a designated scenic byway, exists along U.S. Routes 26, 89, 189, 191, and 287 from Pinedale to Dubois, Wyoming through the BTNF, the Shoshone National Forest, and (Grand Teton National Park) GTNP. For areas adjacent to the scenic byway and within the foreground of eligible Wild and Scenic Rivers, a VQO of Retention in the foreground and retention or Partial Retention in the middle ground will be met (Forest Plan, p. 123, as added by Attachment One to the Forest Plan Record of Decision).
- Road and Trail Drainage Standard - Existing roads will be evaluated for sediment delivery to live streams, lakes, and riparian areas. Roads and trails will be designed and maintained so that drainage from the road or trail surface does not directly enter live streams, ponds, lakes, or impoundments. Water will be directed off the road or trail into vegetation buffer strips or controlled through other sediment-reduction practices (Forest Plan, page 139).
- Road Maintenance in Riparian Areas Standard - Maintenance, improvement, or repair of roads within riparian zones will avoid or mitigate water quality and fish habitat degradation (Forest Plan, page 140).
- Signing Guideline – Informational and directional signing should be consistent with the setting of the road and adjacent area (Forest Plan, page 140).

There are no transportation standards and guidelines associated with MAs or DFCs that would be applicable to the proposed project.

Desired Condition

Roads serve the access needs of a wide variety of National Forest users for many different recreational or commodity activities. Traffic intensities and road standards usually decrease as the traveler drives from the highway onto Forest Development Roads (FDRs) in the National Forest. The road system remaining open will be maintained or improved to provide the necessary road standard for low erosion potential and good traffic flow.

Temporal Scope

The temporal scope evaluated includes the short-term impacts in the Project Area for the duration of proposed construction activities and long-term impacts after areas disturbed during pipeline construction are reclaimed and the Project Area reverts back to existing road transportation system condition.

Geographic Scope

The area of analysis is the Project Area.

Affected Environment

This section provides an overview of the condition of road transportation system within and near the Project Area. Existing roads identified in **Table 3-30** and private roads provide access to the Project Area.

TABLE 3-30 EXISTING ACCESS ROADS IN THE PROJECT AREA

Road or Highway Name/Number	Surface Ownership
U.S. 89/191	Private, State of Wyoming
U.S. 189/191	Private, National Forest
Game Creek Road (FDR 30455)	Private, National Forest
Granite Creek Road (FDR 30500)	National Forest
Cliff Creek Road (FDR 30530)	National Forest
FDR 30686	National Forest
FDR 30461	Private, National Forest, Wyoming Game and Fish

FDR = Forest Development Road

Transportation Network

The Hoback Canyon highway traversing the Project Area, part of the Wyoming Centennial Scenic Byway, is an important regional route in northwestern Wyoming. It provides year-round access to area towns in Sublette and Teton Counties, Grand Teton and Yellowstone National Parks, and the BTNF.

U.S. Highway 189/191

The main road corridor that traverses the Project Area is U.S. 189/191, which is classified as a rural minor arterial by the U.S. Department of Transportation (DOT). At Hoback Junction, the northern terminus of U.S.189/191, U.S. 191 joins U.S. 26/89. From Hoback Junction, U.S. 89/191 heads north to Jackson and U.S. 26/89 heads southwest through the Snake River Canyon to Alpine. At Daniel Junction, the southern terminus of U.S. 189/191, the highway splits. U.S. 189 heads south to Marbleton and Big Piney, and eventually connects with Interstate 80 (I-80). U.S. 191 continues south to Pinedale and also connects with I-80.

U.S. 189/191 collects traffic from state highways, county roads, FDRs, and rural private roads as it passes through the Project Area. It provides access to ranches, homes, businesses, community facilities in Bondurant, and Forest Service facilities such as campgrounds and the Hoback guard station (DOT 2004).

The road surface of U.S. 189/191 typically has a 24-foot top width, consisting of two 12-foot travel lanes with shoulder widths ranging from no shoulders to 8 feet wide; there are no paved shoulders for much of the corridor. Depending on highway design traffic volume, paved roadway shoulder widths should be

between 6 and 8 feet for safe vehicle operation and emergency stopping (AASHTO 2001 in DOT 2004). The existing shoulders are a safety hazard for vehicles traveling the highway and vehicles stopped or disabled that are not able to move off the travel lanes (DOT 2004).

The existing pavement condition of U.S.189/191 was rated as "fair" in 1999. This rating refers to the ride quality, and a "fair" rating means that the riding qualities of the pavement are noticeably inferior to those of new pavement and may be barely tolerable for high-speed traffic. Surface defects include rutting, map cracking, and extensive patching (DOT 2004).

Maintenance of the road surface in the Project Area has required considerable expense in recent years because of the poor condition of the existing pavement, as well as other maintenance issues such as the upkeep of fencing. If the road is not reconstructed it will require substantial maintenance. (DOT 2004).

Scenic Byway

A designated scenic byway exists along U.S. highways 26, 89, 189, 191, and 287 from Pinedale to Dubois, Wyoming through the BTNF, the Shoshone National Forest, and GTNP. This scenic byway, the Wyoming Centennial Scenic Byway, is included in both the federal and state scenic byway systems. An interpretive and management plan that directs future waysides and signs was written in 2000. The Wyoming Centennial Scenic Byway passes through the Project Area on U.S 189/191. The byway begins in Dubois, Wyoming and continues west to Moran Junction. The byway turns south at that point and continues through Jackson to Hoback Junction. There, the byway continues southeast on U.S. 189/191 to its end in Pinedale, Wyoming. The Wyoming Centennial Scenic Byway provides travelers with a rich scenic, cultural, and historical experience, as well as views of diverse landscapes and ecosystems. The route provides a loop opportunity for visitors, and is part of the federal highway system (WTT 2005).

Teton County Roads

The roadway network in Teton County falls under five public jurisdictions: Town of Jackson, Teton County, WYDOT, Forest Service, and GTNP. In addition, private roadways serving multiple property owners make up a substantial portion of the county's roadway network. In general, the road network is determined by topography, land use, and past political conditions. The result, in general, is a system that lacks redundancy, with several destinations served by only one route. Four highways falling within WYDOT's jurisdiction serve as primary linkages in the roadway network: U.S. Highways 26, 89, and 191 and Wyoming (WY) 22, classified as a secondary state highway.

These highways bring people, goods, and services into Jackson from outside the area, and act as the main arterial roadway network within the area. The road system under Teton County's jurisdiction consists of a series of roadways that interconnect the state highway system. The county has adopted a functional roadway classification system. U.S. Highways 26, 89, 191 and WY 22 are the only roadways classified as arterials within Teton County's functional classification.

Teton County's 1994 Comprehensive Plan recommended establishing a classification with standards and criteria for, at a minimum, minor streets, collector streets, and arterials. Roads falling under the jurisdiction of the Forest Service and GTNP are planned and maintained by these agencies. Presently, town land development regulations, county land development regulations, and WYDOT rules have level-of-service requirements on roads within their respective jurisdictions.

Sublette County Roads

The road system in Sublette County has three functions: to serve residents and route traffic through the county, support economic and commercial activities, and support recreational activities. U.S. Highways

189/191 are part of the federal system of highways that cross Sublette County. State Highways 350, 351, 352, 353, and 354 are also found in the county. WYDOT maintains all of these roadways. The BLM and Forest Service provide approximately 3,095 and 865 miles of unpaved roads, respectively, according to the Sublette County Planning and Zoning Office (2003). These roads provide access to public lands for recreation, grazing, natural resource extraction, and other uses.

Sublette County has 107 county roads that cover approximately 444 miles. The County Road and Bridge Department maintains these roads. The majority of the roads are gravel-based. Steps are underway to stabilize the soil on a number of roads.

Subdivision roads are designated as either private for the use of the subdivision property owners and their guests, or public. Even if designated for public use, these roads are not part of the county-maintained system. The roads must be built according to county specifications. A property owners' association is typically formed to oversee the maintenance of the roads after their initial construction.

Forest Service Roads

The Project Area includes NFS lands administered by the Big Piney and Jackson Ranger Districts of the BTNF. The road system on the BTNF varies from federal access highways to two-track primitive roads. The system serves the access needs of a wide variety of Forest users for many different recreational or commodity activities. Traffic volume and road standards usually decrease as the traveler drives from the highway onto a Forest arterial road and then subsequently onto collector, local, and two-track roads at the far reaches of the road network. The federal highways connect outlying areas with the small, high-elevation communities and federal lands of western Wyoming. Except for periodic closure because of winter snowfall, highway travel is maintained year-long. Arterial and collector roads provide good access into most non-wilderness areas of the Forest. Except for a few recreation roads, most of the present Forest road network was originally built for mineral or timber access. Most arterial and collector roads are gravel-surfaced and maintained for sedan travel. These roads presently serve a variety of recreational and commodity traffic. Most such roads are blocked by snow in the winter (USFS 1990).

National Forest local roads are built to a more primitive standard than arterial and collector roads, and are often closed to public access. Where traffic is allowed, they provide access for such activities as firewood gathering and hunting. Local roads are often unsurfaced and can impede travel by low-clearance vehicles. The lowest-standard road on the Forest is commonly called a "two-track" road. Such roads are not designed and built, but simply develop from continuous vehicle travel. Many of these roads developed in parallel with the popularity of four-wheel-drive vehicles since the 1960s. Most of these roads are poorly located and cause visual or erosion problems. In recent years, such use of the Forest has been discouraged. Some areas of the BTNF are physically unsuited for roads. Geological features, active landslides, and fine-textured soils impose major limits on roaded access into many areas (USFS 1990).

Forest Service Geographic Information Systems (GIS) coverage provides the descriptions in **Table 3-31** for roads located in the Project Area.

TABLE 3-31 FOREST SERVICE GIS COVERAGE OF ROADS LOCATED IN PROJECT AREA

Forest Service Code	Road Name	Road Description	Length of Road in Project Area (Miles)
82		Road- 4wd- Class 5- Loc Ap	0.28
89		Road- 4wd- Class 5	5.08

101	U.S. 189/191	Highway- Primary- Class 1	44.85
103	Frontage Road	Highway- Secondary- Class 2	4.73
105		Road- Light- Comp Unsp - Class 3	13.32
106	Forest Service Roads	Road- Unimproved- Class 4	65.01
515		Road- Light- Dirt- Class 3c	15.42
517		Road- Light- Paved- Class 3a	0.19
518		Road- Light- Gravel- Class 3b	4.41

Traffic Flows and Volumes

The Annual Average Daily Traffic (AADT) for the U.S. 189/191 between Daniel Junction and Hoback Junction was estimated in 2000 at 1,900 vehicles. The estimated AADT for the year 2021 is 2,855 vehicles. The AADT is expected to increase by approximately 50 percent in the Project Area between 2000 and 2021. The projected traffic volume for a 20-year period is used in design criteria for highways. Commercial trucks currently make up 9 percent of total vehicles, and this percentage is expected to remain the same over the next 20 years. Increasing traffic volumes on a substandard highway can compound existing roadway deficiencies and affect safety (DOT 2004).

WYDOT reports Average Daily Traffic (ADT) counts at Daniel Junction in Sublette County, where U.S. Highways 189/191 split. ADT counts are reported at station number 00017 (mile post 110.467) for both east and west traffic flow directions. Daniel Junction is located just south of the Project Area, but ADT counts on U.S. Highways 189/191 in the Project Area are inferred to be similar (**Table 3-32** and **Table 3-33**). ADTs are reported by month for 2003, and are highest in July and August (WYDOT 2005).

TABLE 3-32 AVERAGE DAILY TRAFFIC COUNTS FOR DANIEL JUNCTION IN 2003, EASTBOUND

Month	Average Sunday	Average Monday	Average Tuesday	Average Wednesday	Average Thursday	Average Friday	Average Saturday
January	1,214	1,649	1,562	1,547	1,648	1,886	1,567
February	1,097	1,489	1,559	1,600	1,679	1,753	1,384
March	1,282	1,537	1,544	1,554	2,597	1,756	1,490
April	1,230	1,795	1,726	1,741	1,866	1,839	1,400
May	1,669	2,179	2,262	2,225	2,232	2,417	1,869
June	2,523	2,752	2,759	2,890	2,945	3,085	2,753
July	3,237	3,366	3,233	3,389	3,671	3,356	3,280
August	3,166	3,266	3,128	3,234	3,479	3,682	3,257
September	2,394	2,763	2,797	2,783	2,860	3,050	2,563
October	2,036	2,266	2,383	2,374	2,349	2,602	2,159
November	1,188	1,697	1,802	1,092	1,489	1,804	1,477
December	1,235	1,620	1,689	1,668	1,508	1,666	1,451
ADT	1,856	2,200	2,204	2,242	2,277	2,425	2,054

TABLE 3-33 AVERAGE DAILY TRAFFIC COUNTS FOR DANIEL JUNCTION IN 2003, WESTBOUND

Month	Average Sunday	Average Monday	Average Tuesday	Average Wednesday	Average Thursday	Average Friday	Average Saturday
January	1,023	1,233	1,177	1,104	1,241	1,433	1,277
February	1,004	1,197	1,156	1,191	1,288	1,397	1,160
March	1,217	1,224	1,676	1,169	1,244	1,414	1,283
April	1,088	1,413	1,311	1,345	1,458	1,501	1,176
May	1,550	1,912	1,874	1,849	1,867	2,070	1,673

June	2,468	2,476	2,388	2,578	2,627	2,789	2,512
July	3,270	3,118	2,939	3,093	3,365	3,295	3,080
August	3,087	3,032	2,888	3,041	3,200	3,471	3,092
September	2,481	2,575	5,252	2,580	2,639	2,860	2,497
October	2,024	2,003	2,096	2,080	2,075	2,364	2,063
November	1,106	1,408	1,445	1,553	1,244	1,485	1,250
December	1,118	1,264	1,332	1,328	1,205	1,338	1,205
ADT	1,787	1,905	1,858	1,909	1,954	2,118	1,856

WYDOT also reports ADT counts at the intersection of U.S. Highways 26/89 south of Jackson, Wyoming in Teton County. ADT counts are reported at station number 00036 (mile post 141.304) for north traffic flow direction. This location is north of Hoback Junction. ADT counts are shown in **Table 3-34** by month for 2003, and are highest in July and August (WYDOT 2005).

TABLE 3-34 AVERAGE DAILY TRAFFIC COUNTS NEAR HOBACK JUNCTION IN 2003, NORTHBOUND

Month	Average Sunday	Average Monday	Average Tuesday	Average Wednesday	Average Thursday	Average Friday	Average Saturday
January	2,412	3,955	3,948	3,771	4,176	4,284	3,024
February	2,496	3,903	3,917	4,010	4,135	4,283	3.053
March	3,162	4,013	4,038	4,154	4,241	4,600	3,422
April	2,739	4,373	4,316	4,258	4,374	4,429	3,148
May	3,915	5,349	5,628	5,467	5,662	6.048	4,582
June	6,331	7,112	7,057	7,352	7,516	7,776	6,749
July	7,921	8,495	8,551	9,063	9,554	9,530	8,625
August	7,756	8,266	8,240	8,361	8,779	9,338	8,094
September	5,885	6,619	6,803	6,815	6,985	7,220	6,019
October	4,156	5,265	5,484	5,431	5,417	5,884	4,572
November	2,450	4,099	4,108	4,415	3,483	4,174	2,914
December	2,592	3,987	4,152	4,181	3,652	4,059	3,004
ADT	4,316	5,453	5,520	5,607	5,665	5,969	4,767

Public Safety

During the 10-year period from 1992 to 2001, a total of 102 crashes occurred on U.S. 189/191 between Daniel Junction and Hoback Junction (**Table 3-35**). The number of crashes shows a general increase during the 10-year period, with a low of three crashes in 1993 and a high of 19 crashes in both 1999 and 2000. The annual crash rate has shown a similar trend. The annual crash rate in the Project Area was higher than the state-wide rural primary crash rate in 5 of the 10 years, including the 3 most recent years 1999, 2000, and 2001. Property damage crashes were the most common type of crash, followed by injury crashes. Two fatal crashes occurred in the Project Area during the 10-year period. The distribution of crashes was fairly even throughout the Project Area, with the highest peaks near mile posts 139 and 146.

Animals were the first harmful event involved in 38 out of the 102 crashes, including 30 crashes involving big game (deer, elk, and moose) and eight crashes involving livestock (cows and horses). There were 24 overturns and 12 motor vehicle - motor vehicle collisions. Fixed objects, such as fences, delineator posts, signs, and bridge rails, were the first harmful event in 17 of the 102 crashes. Other factors included berms/ditches (five crashes), snow banks (one crash), cut slopes (one crash), and other non-collision/fire (two crashes). Nine of the 102 crashes occurred at driveways or intersections; the remainder were not at a roadway junction. About a third of the crashes (33) occurred during icy, snowy, wet, or slushy conditions; the remainder occurred on dry roadway (WYDOT 2004).

TABLE 3-35 CRASH SEVERITY AND CRASH RATES FOR U.S. HIGHWAY 189/191 BETWEEN DANIEL JUNCTION AND HOBACK JUNCTION

Year	Number Persons Injured	Number of Persons Killed	Property Damage Only Crashes	Injury Crashes	Fatal Crashes	Total Crashes	Crash Rate	State-wide Rural Primary Crash Rate
1992	4	0	3	2	0	5	1.21	1.21
1993	0	0	3	0	0	3	0.46	1.3
1994	4	0	1	4	0	5	1.75	1.24
1995	10	0	3	4	0	7	1.03	1.22
1996	5	0	7	4	0	11	1.60	1.55
1997	5	0	5	4	0	9	1.31	1.55
1998	4	0	7	3	0	10	1.39	1.54
1999	6	1	14	4	1	19	2.59	1.42
2000	1	1	17	1	1	19	2.60	1.47
2001	4	0	11	3	0	14	1.98	1.34
Total	43	2	71	29	2	102	--	--

Source: WYDOT 2004

WYDOT records indicate that the number of crashes in Wyoming involving trucks showed a noticeable increase between 2005 and 2006 (WYDOT 2007b). In 2005, there were 1,391 crashes involving trucks. That number increased to 1,785 in 2006. Crashes involving trucks accounted for 8.8 percent of all crashes in 2005 and 10.5 percent of all crashes in 2006. Fatal crashes involving trucks increased from 23 to 31 crashes and total persons killed increased from 31 to 43 over the same period. Total persons injured in crashes involving trucks increased from 492 to 719 from 2005 to 2006. Truck crash costs (excluding cargo costs) increased from 55 to 77 million dollars over the same period, representing an increase from 13.2 to 16.5 percent of all crash costs in Wyoming for the same period. Explosion or fire was associated with 32 truck crashes in 2005 and 25 crashes in 2006.

An accident involving a full tanker truck and pup trailer carrying LNG occurred on U.S. 189/191 near Camp Creek in January 2006. According to the Wyoming Highway Patrol, there was no breach, rupture, spillage, or injury when the pup trailer overturned due to speeding. The highway was blocked for several hours.

Bridges were involved in 283 total crashes in Wyoming in 2006. Bridges also were involved in 5 of 169 total fatal crashes in Wyoming in 2006 (WYDOT 2007a).

Transportation of Liquefied Natural Gas

Liquid natural gas (LNG) is trucked daily to Lower Valley Energy's (LVE's) facility in the Jackson area. Delivery requires that trucks travel approximately 240 miles round-trip on public highways (U.S. 287/191/26 and 189/191) daily. Between 2000 and 2003, the number of trips by tanker trucks steadily increased from 392 to 492 round trips per year, and is projected to steadily increase to approximately 665 round trips per year by 2010, as reported by LVE in 2004.

Highway safety along a portion of the route traveled by LNG delivery trucks (U.S. 189/191 in Sublette County) is considered inadequate by the DOT/WYDOT because of design and safety deficiencies (DOT

2004). Traffic volumes are expected to increase 50 percent by 2021. The number of traffic crashes on this stretch of highway has generally increased between 1993 and 2003. Highway reconstruction by WYDOT on U.S. 189/191 is scheduled to correct these deficiencies and improve highway safety.

3.4.5 Pipeline Safety

Resource Description

Pipeline safety analysis provides public awareness and demonstrates the reliability and safety of natural gas pipelines, as related to pipeline construction, operation, and maintenance. Public safety issues related to the proposed pipeline were raised during the project scoping.

Indicators

- Effects on public safety during pipeline construction
- Effects on public safety related to pipeline operation and maintenance
- Effects on public safety related to delivery of liquefied natural gas (LNG) by truck

Forest Plan Direction

Applicable management guidance responds to the following Forest Plan goals and objectives:

- 1.1(i) - Help utilities provide services.
- 1.2 - A safe transportation system meets the needs of commercial users of the BTNF.

Forest plan direction specifies that utilities and utility corridors are permitted on the BTNF (Forest Plan, page 137), and that utilities should be constrained to one utility corridor except as needed to meet other resource objectives (Forest Plan, page 138).

Desired Condition

The desired condition for pipeline safety is to provide for the safe enjoyment and use of the BTNF by the public while helping utilities provide services.

Temporal Scope

Project activities could affect public safety for 6 months during construction of the pipeline, and for the foreseeable future during the operation and maintenance of the pipeline. The effects of project activities after construction is completed would last as long as the pipeline remains in service.

Geographical Scope

The scope of this analysis is the Project Area.

Affected Environment

This section presents the affected environment as it relates to pipeline safety, including a discussion of factors that contribute to pipeline safety, the causes of pipeline system accidents, and the inherent safety risks based on pipeline and trucking incident rates.

According to the Transportation Research Board (TRB), transportation of energy fuels via transmission pipelines is safer than transportation via other modes, but a significant failure can result in loss of life, personal injury, property damage, and environmental damage (TRB 2004). In the U.S. from 2000 through

2002 natural gas transmission pipeline incidents resulted in an annual average of 6 deaths, 10 injuries, and $20 million in property damage (TRB 2004). Only a small fraction of natural gas operators experienced safety incidents. No more than 6.5 percent of operators have had reportable incidents in any year (TRB 2004).

There are many causes and contributors to pipeline failures, including construction errors, material defects, internal and external corrosion, operational errors, malfunctions of control systems or relief equipment, and outside force damage, e.g., by third parties during excavation (TRB 2004). Vandalism accounts for fewer than 1 percent of incidents (TRB 2004). Excavation and construction-related damage to pipelines remain the leading causes of pipeline failure. Such failures were estimated by DOT in 2003 to contribute to 24 percent of natural gas transmission pipeline incidents. With the growth in population, urbanization, and land development activity near transmission pipelines and the addition of new facilities, the likelihood of pipeline damage due to human activity and the exposure of people and property to pipeline failures may increase (TRB 2004).

The main risks associated with a natural gas transmission pipeline incident are a fireball or flash fire caused by the flow of flammable gas when pipe rupture occurs; and an explosion or the delayed ignition of a gas and air cloud in a semi-confined area. The escape of a fire associated with a pipeline incident to start a wildland fire would be an additional risk.

The principal pipeline failure mechanisms are external impact with the pipeline, corrosion of the pipe wall, a metal defect in the pipe wall, operation of the pipeline outside its design limits, and natural events such as floods, landslides, or other earth movements. Older natural gas pipelines (installed in 1950 or earlier) have a significantly higher rate of incidents compared with pipelines installed since 1950 (TRB 2004). This may be partially due to a higher frequency of corrosion, which is a time-dependent process. Since 1971, pipelines have been required to have external protective coating and cathodic protection to reduce corrosion potential (TRB 2004).

External impact with the pipeline is most the likely cause of rupture of most pipelines, and is most likely to occur in populated areas where mechanical diggers are used for installing drains, services etc. Digging and drilling operations can cause large size punctures and ruptures, which can be prevented by frequent surveillance of pipeline routes using helicopters and road patrols, and extensive efforts to introduce “one-call” systems so that utility companies and landowners can easily check routes of pipelines before they start to dig.

Other failure mechanisms include a metal defect in the pipe wall, which includes original defects in the metal used to make the pipe and defects introduced during construction or pipe-laying operations. Metal defects tend to get worse over time, and with pressure cycles, etc. Problems are detected by checks on the pipe wall, and the use of “intelligent pigging”. The affected section of pipe will eventually have to be replaced.

The DOT has developed minimum pipeline safety regulations that are based upon industry best practices. In many cases the design exceeds the regulatory requirements when there is an opportunity to enhance public safety. A partial list of the applicable best management practices includes: increased pipe wall thickness, higher strength material specifications, 100 percent radiographic weld examination, increased pipe depth, increased hydrostatic test pressure and an increased number of valves.

Pipeline Safety

After passage of the Natural Gas Pipeline Safety Act of 1968 (NGPSA), the Office of Pipeline Safety (OPS) of the U.S. Department of Transportation (DOT) established permanent safety standards for natural

gas pipelines. The DOT pipeline safety regulations are contained in 49 CFR Parts 190 through 199, and include federal pipeline safety regulations that ensure safety in design, construction, inspection, testing, operation, and maintenance of natural gas pipeline facilities. Since the basic safety standards were established, OPS has been involved in programs that enhance and enforce these standards.

In 1992, DOT's jurisdiction under the NGPSA was expanded to include environmental protection. The environmental amendments required OPS to: (1) mandate that operators submit safety-related condition reports on hazards to the environment; (2) consider a pipeline's proximity to "unusual sensitive environmental areas" when determining the type and frequency of testing and inspection required of operators; (3) consider the extent to which the operator's inspection and maintenance plan protects the environment; and (4) design any pipeline safety standard to protect the environment.

A wide variety of methods can be used to monitor and protect pipelines from the most likely causes of failure. The combination of methods chosen by an operator must factor in known risks that a particular pipeline faces (e.g., corrosion, excavation-related, material defects). Some of the more common methods are: cathodic protection systems that control external corrosion, close-interval surveys to detect external corrosion, leak-detection systems that detect releases of product, pipeline corridor monitoring (via foot, vehicle, or from a plane), and inspection and testing of valves and overpressure devices (OPS 2005a, b).

Several inspection techniques are available to pipeline operators to check the line conditions. The most sophisticated method involves passing instrumented inspection tools called smart pigs through the line. The tools have sensors that can detect dents, deformities, and changes in wall thickness, but cannot be used in sections of pipe that have sharp bends or valves that do not allow the tools to pass through. Other inspection techniques involve using magnetic particles or ultrasound to measure the pipe wall's thickness, which can indicate a corrosion problem. Inspectors must excavate a pipe to measure wall thickness.

The Pipeline Safety Improvement Act of 2002 strengthened federal pipeline safety programs, state oversight of pipeline operators, and public education regarding pipeline safety. In 2004, pipeline regulations for natural gas pipelines in 49 CFR Part 192 were amended to require operators to develop pipeline integrity programs for natural gas pipelines located where leak or rupture could do the most harm, such as in high consequence areas (HCAs). HCAs are defined in 49 CFR Part 192, and generally include high-density populated areas. The amendments require that natural gas pipeline operators perform ongoing pipeline assessments.

Owners of underground facilities in Wyoming are required under the Wyoming Underground Facilities Notification Act of 1996 to be a member of One-Call of Wyoming, and provide a cost-free means for excavators to contact them for locates before digging. The goal of One-Call is to ensure the personal safety of those engaged in excavation activities and help prevent damage to underground pipes, lines, cables, and other equipment by digging (One-Call of Wyoming 2004). Any excavator, including an individual, partnership, municipality, state, county, political subdivision, utility, joint venture, corporation, limited liability company, statutory trust, or other business entity, including the employer of an individual, shall obtain information regarding underground facilities before excavation.

Safe excavation practices near underground facilities, including pipelines, are described in the Excavator's Handbook (One-Call of Wyoming 2004). Digging should not occur without locate marks. If mechanical equipment will be used within 24 inches of a locate mark, expose the line first by hand digging or vacuum excavation methods. If planned excavation would parallel an underground line, expose the line every 100 feet by hand digging or vacuum excavation methods.

The Common Ground Alliance (CGA) reporting tool, the Damage Information Reporting Tool (DIRT) serves as a clearinghouse for damage data collection, analysis, and dissemination of information. About

51,000 events (damage, near misses, and excavator down time) were reported confidentially in DIRT by damage prevention stakeholders in 2005, which was double the number of reports for 2004. The DIRT annual report facilitates the understanding and characterization of the state of damage prevention and effectiveness of One Call, as One Call using the 811 national number is implemented. DIRT also can be used for analysis of successes, areas needing improvement, trends, and root causes (CGA 2006). In 2005, the following root causes were associated with events reported in DIRT: notification practices not sufficient (33.7 percent), which included 31.2 percent of all events, where no notification was made to the One Call notification center; locating practices not sufficient (11.1 percent); excavating practices not sufficient (22.2 percent); miscellaneous root causes (6.7 percent); and data not collected (26.3 percent). Additionally, industry best practices designed to mitigate third party damage wherever possible and enhance the effectiveness of One Call have been compiled and updated by CGA (2007).

Pipeline Incidents

The safety and security of oil and gas pipeline systems in the U.S. have been summarized by the Congressional Research Service (CRS) of the Library of Congress (CRS 2004, 2007) and is presented below and in the following three paragraphs. According to DOT, there were 124 oil pipeline incidents and 172 gas transmission pipeline incidents in the U.S. in 2005.

The U.S. natural gas pipeline network consists of around 210,000 miles of interstate transmission, plus approximately 75,000 miles of intrastate transmission. Collectively, these gas pipelines transport nearly all of the natural gas in the U.S. Releases from pipelines cause relatively few annual fatalities. Taken as a whole, releases from pipelines cause few annual fatalities compared to other product transportation modes. Oil pipelines reported an average of 1.4 deaths per year from 1997-2004. Gas pipelines reported an average of 18.6 deaths per year during 1997-2001 and 17.0 deaths per year from 2000-2004. Direct safety comparisons between pipelines and other transportation modes are difficult due to data limitations. DOT statistics suggest that pipelines are associated with many fewer fatalities per ton-mile than truck, rail or waterborne transport.

The environmental safety record of oil pipelines is comparable to other transportation modes. According to the oil industry estimates, from 1995-2000 oil pipelines spilled an average of 0.9 gallons per million barrel-miles of oil transported, compared to 1.5 for trucks, 0.7 for rail and 0.7 for barges. Similar direct comparisons for gas pipelines are not available. Accidental pipeline releases result from a variety of causes, including outside force (e.g., third-party excavation), corrosion, mechanical failure, control system failure and operator error. Natural forces, such as floods and earthquakes, can also damage pipelines. According to DOT, for 183 gas pipeline accidents reported in 2002, outside forces were by far the leading cause, accounting for 46 percent of reported failures.

Although pipeline releases have caused relatively few fatalities in absolute numbers, a single pipeline incident can be catastrophic. For example, a 1999 gasoline pipeline explosion in Bellingham, Washington killed two children and an 18-year-old man, and caused $45 million in damage to a city water plant and other property. Large incidents generate substantial scrutiny of pipeline regulation and increase state and community activism related to pipeline safety. Incidents also highlight the danger of pipelines as possible terror weapons because of their potential to harm people and damage property in their vicinity. Pipelines are vulnerable to vandalism and terrorist attack that could disrupt flows and cause a release of pipeline contents. Underground pipelines reduce exposure to external threats, but required markings that inform emergency responders and homeowners can also highlight pipeline locations to terrorists.

The Pipeline and Hazardous Materials Safety Administration (PHMSA) of the DOT reports a 10-year average from 1997-2006 for significant incidents involving onshore gas transmission lines in Wyoming. Significant incidents involve injury, fatality, or property damage of $50,000 or more. The annual average

in Wyoming over the last 10 years is 1 incident involving 0 fatalities and 0 injuries, with property damage of $319,422 for 6,539 miles of gas transmission lines (PHMSA 2007). This would be equivalent to about 1.5 significant incidents per 10,000 miles of gas transmission line.

Restreppo et al. (2006) analyzed OPS records from 2002-2005 and found 2.66 to 3.5 reportable incidents annually per 10,000 miles of gas transmission pipeline in Wyoming. Their analysis of OPS records also showed that Wyoming has the highest concentration of gas transmission lines in the U.S. when relative miles of existing pipeline and total population for Wyoming are compared with the U.S. as a whole.

The OPS categorizes the causes of pipeline accidents into 28 categories (OPS 2005a), including internal and external corrosion, third-party excavation damage, malfunctions, vehicle damage, rains and floods, earth movement, failed welds, and other designated causes. In 2004, the two leading causes of pipeline accidents were a result of internal and external corrosion (34 percent) and third-party damage (19 percent) (OPS 2005b). The remaining categories accounted for 47 percent of the incidents. Of the 109 incidents reported in the U.S. in 2004, pipeline accidents resulted in one fatality and three injuries, none of which were related to the leading causes of incidents.

Mechanical damage is the single largest cause of incidents on gas transmission pipelines. Damage usually is caused by excavation equipment after a pipeline is constructed, by deforming the shape of the pipe, scraping away metal and coating, or changing the mechanical properties of the pipe (OPS 2001).

Pipelines operate more safely than any other transportation mode for petroleum products. **Table 3-36** compares the relative annual risk of pipeline accidents resulting in death, fire/explosion, or injury with other methods of transportation. The Association of Oil Pipe Lines (AOPL) reported that transporting petroleum by truck is 87 times more likely to result in fatalities than by pipeline. Fire/explosion resulting from trucking is likely to occur about 35 times more frequently than transport by pipeline (AOPL 2004).

TABLE 3-36 RELATIVE ANNUAL RISK OF ACCIDENTS BY TRANSPORTATION METHOD

	Death	Fire/Explosion	Injury
Pipeline	1	1	1
Truck	87	35	2
Rail	3	9	<1
Barge	<1	4	4
Tank Ship	4	1	3

Comparisons based on calculated rates per ton-mile (AOPL 2004)

Analysis of historical OPS incident data for natural gas pipelines suggests that they are operating more safely than in the past. The data indicate that the number of incidents per year has increased slightly from 83 incidents in 1986 to 109 incidents in 2004 (OPS 2005b). However, the fatalities and injuries resulting from these incidents have declined significantly over time.

Major events often change the focus or direction of a policy, and in the case of pipeline safety programs, a major failure or accident often redirects the program. Some major accidents have occurred over the life of OPS, and have resulted in a change in direction to the program. In 2000, an El Paso Natural Gas Company 30-inch gas transmission pipeline, attached to a bridge at a river crossing in a rural area southeast of Carlsbad, New Mexico, ruptured and ignited. Twelve fatalities, all people camping next to the river, resulted from this incident and were the most from a transmission pipeline failure since the beginning of the OPS pipeline safety program. The pipeline was built in 1950, and significant areas of internal corrosion were found in the ruptured pipe. After this incident, natural gas pipeline operators were required to develop more stringent testing programs that could identify pipeline corrosion.

A May 1994 accident in Wyoming has affected the safety requirements for pipelines along highways in Wyoming. A gas pipeline along I-80 between Evanston and Green River ruptured and exploded during a highway project involving reconstruction and repairs to a shoulder section. A 10-inch natural gas gathering pipeline was ruptured by highway contractor employees operating excavation equipment. Three contractor employees died as a result of this accident, and another was injured. The One-Call notification center for the area was not used for modifications to the geographic scope of the highway project (National Transportation Safety Board 1996). The Supreme Court of Wyoming ruled in 1998 WY 103, 963 P2d 996, Case Nos. 97-21 and 97-52 decided August 17, 1998, that no waiver of immunity applied to the State of Wyoming regarding this accident, and its public employees while acting within the scope of duties were granted immunity from liability (Supreme Court of Wyoming 1998).

Safety Standards in Populated Areas

Area classifications defined in 49 CFR 192 are based on population densities in the vicinity of the pipeline, which in turn determine the safety requirements for populated areas. Class locations representing more populated areas require higher safety factors in pipeline design, testing, and operation to ensure adequate protection for the public and to prevent natural gas facility accidents and failures. Pipe wall thickness and pipeline design pressures, hydrostatic test pressures, maximum allowable operating pressure, inspection and testing of welds, and frequency of pipeline patrols and leak surveys must conform with the higher federal safety standards in more populated areas.

Safety Standards for Parallel Encroachments along Highways

WYDOT Rules contained in Chapter 9, Gas Pipelines Transmission and Distribution, WYDOT Document No. 6080, October 25, 2005 (WYDOT 2005) specify state regulations concerning occupancy of and construction within highway rights-of-way. WYDOT and LVE have collaborated on the development of appropriate requirements for a pipeline located along the highway corridor of U.S. 189/191. An independent engineering design review addressing the location of portions of the pipeline route within the highway corridor was conducted for WYDOT by PB Energy Storage Services, Inc. (2005). The results of this review are being addressed in the final design of the proposed action, in consultation with WYDOT.

In summary, the results of this collaboration are as follows. WYDOT requirements for burial of the pipeline 48 inches (4 feet) below the ground surface wherever the pipeline would be within 50 feet of the edge of the highway pavement would be met. Where there is a likelihood of increased WYDOT maintenance and construction activity with the potential to penetrate to the level of the pipe, WYDOT requirements for burial of the pipeline 72 inches (6 feet) below the ground surface would be met. Where the pipeline crosses beneath the highway, the elevation of the pipe for the crossing will match the elevation of the pipe at either end of the crossing. WYDOT construction monitoring requirements and specifications for identifying the pipeline location and marking the pipeline route will be met. Any deviations from these requirements at specific locations would be determined in consultation with WYDOT and the Forest Service and documented in the Forest Service authorization for the pipeline.

3.4.6 Scenic Resources

Resource Description

Scenic resources are important to the expectations and experiences of both visitors and local residents. Scenery and related aesthetic values have long been recognized in the Greater Yellowstone Area as an

important resource to protect. Evidence of this goes back to the establishment of Yellowstone and Grand Teton National Parks, the Gros Ventre and Teton Wildernesses, and more recently, with the designation of scenic byways and establishment of scenic or conservation easements. With ever-increasing development pressures, the conservation of open space and natural and cultural features – which define the unique qualities of the region – has become the focus of local and regional planning efforts. Beyond state, federal, and county recognition, local groups, organizations, and individuals emphasize, and even market, the incredible scenic resources of this area.

The intrinsic beauty of the Project Area is a valued resource. Project activities could impact the quality of views from recreation use areas, residences, and travel routes that access a major portion of the Project Area. The existing landscape character reflects influences of natural processes and human activities. Changes in landscape character are managed by the BTNF using Visual Management System (VMS) objectives. Project activities have the potential to affect scenic quality, landscape character, and desired scenic condition in the Project Area.

Indicators

- Effects on existing scenic integrity and scenic attractiveness
- Visibility from Gros Ventre Wilderness and the Shoal Creek Wilderness Study Area (WSA)
- Visibility from residential areas
- Visibility from existing recreation facilities
- Effects on the scenic byway corridor (a sensitive travel route), including compliance with the Scenic Byway and Wild and Scenic Rivers Visual Standard (Forest Plan, p. 123, as added by Attachment One to the Forest Plan Record of Decision)
- Effects on visual quality along segments and corridors of the Hoback River and its tributaries (Shoal, Cliff, Granite, and Willow Creeks) within the Nationwide Rivers Inventory (NRI) that are eligible for designation as wild, scenic, or recreation rivers, including compliance with the Wild and Scenic Rivers Standard and Visual Quality Standard (Forest Plan, p. 142, as added by Attachment One to the Forest Plan Record of Decision)
- Visual quality objectives (VQOs) of preservation or retention met or not met in the foreground viewing zone along the Hoback River and the scenic byway

Forest Plan Direction

Forest-wide management guidance specifies that VQOs serve as a classification system used to set objectives for facility planning and resource management. The Sensitive Travel Route Standard indicates that, along certain visually sensitive travel routes, the VQO will be Retention or Partial Retention. The following Forest-wide standard also applies to the proposed project:

- Scenic Byway and Wild and Scenic Rivers Visual Standard – A sensitive travel corridor, a designated scenic byway, exists along U.S. Routes 26, 89, 189, 191, and 287 from Pinedale to Dubois, Wyoming through the BTNF, the Shoshone National Forest, and GTNP. For areas adjacent to the scenic byway and within the foreground of eligible Wild and Scenic Rivers, a VQO of Retention in the foreground and Retention or Partial Retention in the middle ground will be met (Forest Plan, p. 123, as added by Attachment One to the Forest Plan Record of Decision).

The management guidance for visual quality in MAs within in the Project Area is summarized below:

- MA 21 – The foreground zone relative to the Hoback River and U.S. 189/191 will be managed to meet a VQO of Retention. Middle ground and background zones will be managed to meet Partial Retention.

- MA 22 – The foreground zones, relative to the Hoback River and U.S. 189/191, will be managed to meet a VQO of Retention. Partial Retention will apply to middle ground and background.
- MA 23 – There are no specific visual quality standards for MA 23; however, the DFCs applied to the MA within the Project Area include DFCs 10 and 12, which are achieved by applying VQOs of Retention or Partial Retention.
- MA 41 – There are no specific visual quality standards for MA 41; however, the DFCs applied to the MA within the Project Area include DFC 12, which is achieved by applying VQOs of Retention or Partial Retention.
- MA 49 - There are no specific visual quality standards for MA 41; however, the DFCs applied to the MA within the Project Area include DFCs 2A, 3, 10, and 12, which are achieved by applying VQOs of Retention or Partial Retention.

Each of the seven DFCs in the Project Area is managed with a predominant VQO, which is achieved by the application of visual quality prescriptions. The predominant VQOs and applicable management prescription for each DFC are:

- DFC 2A – Retention.
- DFC 2B – Retention
- DFC 3 – Retention or Partial Retention
- DFC 9A – Retention or Partial Retention
- DFC 10 – Retention, Partial Retention, or Modification.
- DFC 12 – Retention or Partial Retention.

The existing visual resource condition and future trend for visual resource management of areas classified as Retention and Partial Retention is to retain the natural appearance of areas managed with these VQOs, even if landscape-altering activities occur.

Desired Condition

The goal is to create and maintain landscapes having high scenic diversity, harmony, and unity for the benefit of society in general. Proposed project activities can affect landscape character, and the purpose of VMS is to manage those changes within an aesthetic and ecological framework. Scenic integrity indicates the degree of intactness, or wholeness, of the landscape character.

Temporal Scope

The scenic resource may be impacted immediately (implementation to 2 years), in the short term (2 to 5 years), in the intermediate term (5 to 25 years), and in the long term (25 to more than 100 years). The duration of impact depends highly on the vegetation type.

Geographical Scope

The area that could be indirectly and cumulatively affected is the Project Area and any area outside the Project Area from which the proposed pipeline corridor can be seen.

Affected Environment

The major physiographic features are Jackson Hole, the Gros Ventre Range, the Hoback Range, and the Green River Basin. Each of these features is characterized by different topography, vegetation, and geologic formations that provide diverse landscapes and scenic experiences to travelers and residents of the area. The northernmost portion of the Project Area lies in the Snake River floodplain within Jackson

Hole. This portion of the Project Area is rural in character, and includes the most man-made development within the Project Area. The Gros Ventre Range is characterized by rugged peaks and rolling sagebrush flats. The Hoback Range in the Project Area includes Hoback Canyon. The Upper Green River Basin portion of the Project Area is characterized by rolling sagebrush flats, ranching, and residential development, which occurs in the east portion of the Project Area.

Existing visual modification to the natural setting of the Project Area consists of urban development, industrial, agriculture, transportation routes, utilities, and rural residential uses. U.S. 189/191 is one of the primary transportation routes through the region, and connects Jackson in Teton County with Pinedale in Sublette County. In addition to U.S. 189/191 and residences, human modification includes power transmission lines, distribution lines, and paved and other improved roads that link to the highway and developed recreation areas. The Project Area is surrounded by mountain ranges that provide a scenic backdrop to views seen from U.S 189/191 and other areas within the Project Area. The region is characterized by high levels of scenic attractiveness, with many areas featuring distinctive (Class A) landscapes. The quality of the landscape is high because there is a wide range in the variety and contrast in landform, vegetation, and interesting features.

Recreational activities are a primary use of BTNF lands in Teton and Sublette Counties, and drive the local economy. The public generally engages in viewing scenery along with other recreational activities. In general, the level of concern for the surrounding scenic landscape is high.

Scenic Integrity – Landscape Character Trends

Landscape character and scenic integrity are two primary indicators used in assessing the scenic resources of this area. Landscape character describes the overall impression created by biophysical attributes, natural processes, and human influences on a geographic area. Natural attributes include geology, soils, landforms, vegetation, and water features. Cultural components include constructed features, such as buildings, roads and fences, as well as human activities, such as livestock grazing, mining, and timber extraction. Depending on the type and degree of human interface with the natural landscape, a variety of landscape themes emerge. Landscape themes range from Naturally Evolving (typically in Wilderness areas), to Rural in character, to moderately developed in adjacent privately-owned properties.

Once the landscape themes and overall character have been described, the scenic integrity of the area can be evaluated. Scenic integrity describes the degree to which the landscape character is intact. Where human influences are indiscernible, or complement the overall theme of the setting, the scenic integrity is considered high. Where human influences appear out of context, or landscapes contain discordant and contrasting features such as geometric shapes resulting from vegetative treatment, structures that do not blend with their surroundings, or roads that create visible cut and fill slopes across hillsides, landscapes are rated as having low scenic integrity. Together, landscape character and scenic integrity serve as a frame of reference, or baseline, from which past and future changes can be measured in relative terms.

Where there is little evidence of management or where cultural features fit within the context of the landscape character, the scenic integrity of the landscape is rated as very high. By describing the existing scenic integrity of an area, a baseline is established from which proposed actions and potential effects to the scenic resources can be evaluated.

Alterations to the natural landscape have resulted from management activities and human use throughout the assessment area. Roads, trails, signs, fences, homesteads and housing developments, pastures, past oil and gas activity, recreation facilities, timber harvest, and vegetation treatments are some of the features present.

Visual Management

The Forest Service Visual Management System (VMS) was developed to inventory, classify, analyze, and manage visual resources on NFS lands (USFS 1973). The system's main objective is maintenance and enhancement of the natural appearance of the characteristic landscape while actively managing for various resource benefits such as timber, grazing, wildlife, and recreation. The landscape variety classes and user-related sensitivity levels are combined to produce visual quality objectives (VQOs). There are five VQOs in the VMS system, each representing a different degree of acceptable alteration of the natural-appearing landscape. These are Preservation, Retention, Partial Retention, Modification, and Maximum Modification. NFS lands in the Project Area are managed with the Preservation, Retention, Partial Retention, and Modification VQOs, which are defined as:

- *Preservation (P):* This visual quality objective allows ecological changes only. Management activities, except for very low-visual-impact recreation facilities, are prohibited.

- *Retention (R):* This visual quality objective provides for management activities that are not visually evident. Under Retention, activities may only repeat form, line, color, and texture, which are frequently found in the characteristic landscape. Changes in their qualities of size, amount, intensity, direction, pattern, etc., should not be evident.

- *Partial Retention (PR):* Management activities are visually evident but subordinate to the characteristic landscape when managed according to the Partial Retention visual quality objective. Activities may repeat form, line, color, or texture common to the characteristic landscape, but changes in their qualities of size, amount, intensity, direction, pattern, etc., remain visually subordinate to the characteristic landscape.

- *Modification (M):* Management activities may visually dominate the original characteristic landscape. However, management activities and introductions to the natural setting must be designed to blend with the landscape by using lines, forms, colors, and textures found in the surrounding natural landscape.

Scenic resources on NFS lands in the Project Area are assessed within the framework of the VMS, which is used by the Forest Service to inventory and manage the scenic resources of a landscape. VQOs are associated with the degree to which a landscape is perceived to be intact, or whole, and are consistent with MA direction for maintenance and enhancement of the natural appearance of the characteristic landscape.

VQOs for NFS lands in the Project Area are shown on **Figure 3-10**. Most of the Project Area is classified with a VQO of Retention, including lands along the U.S.189/191 highway corridor for approximately 0.5 miles on either side of the highway, and on NFS lands next to private lands that have been developed with residential uses. Smaller areas of land located outside the highway corridor and other road corridors are managed with a VQO of Partial Retention. The portion of the Gros Ventre Wilderness within the Project Area is managed with a VQO of Preservation.

Sensitive Viewing Areas

The primary views of the Project Area are from travel routes, recreation-use areas within the Project Area, and residences located within or near to the Project Area. U.S. 189/191 traverses most of the Project Area. County or National Forest roads provide access from the highway onto public and private lands in the Project Area. Recreationists access developed and dispersed opportunities on public lands within and adjacent to the Project Area. These areas are described in the Recreation section of this chapter.

Figure 3-10 Visual Quality Objectives

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Travel Routes

All of U.S 189/191 within the Project Area is part of the Wyoming Centennial Scenic Byway, which is part of the National Scenic Byways Program of the Federal Highway Administration (America's Byways 2005). It has also been adopted by the Wyoming Transportation Commission for inclusion in the Wyoming Scenic Byways and Backways Program (WYDOT 2003). The byway provides a loop opportunity to view diverse landscapes, as well as providing access to National Forests, GTNP, the National Elk Refuge, and numerous private resorts and services.

Most of the Project Area is visible in the foreground distance zones to travelers on U.S. 189/191. Views along the north end of the Project Area between the LVE's facility and Horse Creek Road include a portion of the Snake River Valley. This portion of the Project Area consists mostly of private lands on either side of the highway, and is developed with commercial and residential uses. The Snake River and the lower slopes of the Gros Ventre Range provide a scenic backdrop to foreground views.

The Project Area is also visible from U.S. 189/191 between Camp Creek and Hay Gulch, which is near the south end of the Project Area. This portion of the Project Area includes Hoback Canyon, one of the most scenic segments of the highway. The canyon is characterized by rugged rock walls and steep slopes rising above the Hoback River. North-facing slopes are vegetated with dense stands of lodgepole pine and Douglas-fir. Views of the canyon are limited to immediate foreground views because of the steep terrain.

East of Hoback Canyon, foreground views seen from U.S. 189/191 open up to reveal rugged rock formations and fir stands on steep, north-facing slopes interspersed with broad, rolling hills vegetated with grasses and sagebrush. The land is progressively less rugged to the east, providing broad, open views of rolling sagebrush-vegetated hills. The easternmost portion of the Project Area consists of private lands used primarily for grazing.

Several BTNF system roads link U.S. 189/191 with NFS and private lands along the length of the Project Area. The roads provide access to dispersed and developed recreation opportunities on NFS lands, and residential subdivisions and isolated residences on private lands. Foreground views of the Project Area from these roads are generally limited to the junction of the roads with the highway and the portion of each road that is within the Project Area boundary. The terrain beyond most of the Project Area is rugged, and views of the Project Area are screened from many locations outside the Project Area.

Game Creek Road is the only county road (Teton County Road 22-41) that accesses U.S. 89/191 along the Project Area (Teton County Road and Levee Department 2005). The road is designated as Forest Development Road (FDR) 30455 on BTNF lands. Game Creek Road provides access from U.S. 89/191 to a trailhead and several subdivisions. The road crosses through a natural, mostly undeveloped setting.

Residential Areas

Residential subdivisions within the Project Area or that provide views of the foreground distance zone of the Project Area are Rafter J, Melody Ranch (Lower Ranch), Little Horsethief Canyon, Porcupine Springs, Game Creek, Western Tanager, CB Ranch, Glassburn, Falcon Springs Ranch, Hoback Vistas, and Knepfield (Teton County GIS 2005). There are also numerous isolated rural residences.

Much of the Project Area between Game Creek Road and Horse Creek Road is on private land. This area is a few miles south of Jackson, and is developed with several subdivisions containing large lots set in the valleys and upper flats of the Gros Ventre Range east of U.S. 89/191. The subdivisions are accessed by Game Creek Road and Old Stage Road.

Game Creek residences are set in the valley bottom and lower slopes along Game Creek. Views of the Project Area are limited to the immediate foreground because of the steep, rugged terrain.

The Western Tanager, CB Ranch, and Glassburn subdivisions are developments on large lots located along the upper, flat open lands of the Gros Ventre Range. Views to the east and northeast are of the rugged peaks and upper slopes of the Gros Ventre Wilderness. Views to the west and southwest are of broad, grass-and-sage-vegetated flats interspersed with narrow bands of trees along riparian areas that are located at a lower elevation than most of the residences.

Hoback Vistas and the Knepfield subdivisions are located along the valley bottom of the Hoback River west of Hoback Canyon. The flat, grassy meadow of the valley bottom has a backdrop of steep slopes vegetated with Douglas-fir.

Recreation Sites

Recreation sites located in the Project Area are described in the Recreation section of this chapter. Developed recreation sites that provide views of the Project Area include trails and campsites. Dispersed activities in the vicinity of the Project Area are primarily water-related activities on the Hoback River through Hoback Canyon.

Portions of two Forest trails and one Teton County trail are within the Project Area. The Wilson Canyon trailhead is located near LVE's facility, and follows the existing electric transmission line before diverging towards Wilson Canyon. The trailhead setting is a broad, flat grassy area on a bench located between forested slopes to the east and the developed industrial setting of the LVE facility to the west. The Game Creek trailhead is located at the east end of Game Creek Road in the Game Creek drainage, and provides limited foreground views of forested slopes, the road, and the parking area. There is a paved trail along the west side of U.S. 89/191, south of the Melody Ranch subdivision. Other National Forest trails originating within the Project Area include Willow Creek #3142, Shoal Creek #3119, Hoback GS #3132, and Cow Creek #3120.

Hoback and Kozy Campgrounds are BTNF-administered sites in Hoback Canyon, along the Hoback River (USFS 2005). Both campgrounds are situated on broad, relatively flat areas next to the river, with Kozy Campground located south of the river, and Hoback Campground located north of the river. Lodgepole pine screens many of the campsites in Hoback Campground from the highway. The steep, forested slopes of the canyon provide a scenic and sheltering backdrop for Hoback Campground. Kozy Campground is located between the Hoback River and U.S. 189/191. There are few trees at the campground, and the highway is an obvious linear feature as viewed from the campground.

Wild and Scenic Rivers System

The Hoback River has been determined to be eligible for inclusion in the National Wild and Scenic Rivers System. The eligible 15-mile segment is between Cliff Creek, located nearly 6 miles east of the Teton-Sublette county line, and the river's confluence with the Snake River. The segment has been given a preliminary classification of Recreational River. The Outstandingly Remarkable Values (ORVs) are scenery, recreation, geology, and wildlife. According to the Nationwide River Inventory, the visual quality of the corridor is outstanding in its uppermost stretches. The landscape elements and scenic attractions of the lower canyon are highly diverse. The entire length of this segment of the river is used for water-related recreation activities, primarily fly-fishing and rafting.

The Wild and Scenic Rivers System standard states that river segments that have been determined eligible for inclusion in the Wild and Scenic Rivers System, and a corridor of at least 0.25 mile on either side, will be managed to protect or enhance their outstanding values.

Teton County Scenic Resource Management

The Teton County Comprehensive Plan (Teton County 2002) identifies the protection of natural and scenic resources as a primary element of the community character. Natural and scenic resource issues have a direct effect on the economic well-being of the county. In pursuit of this goal, the county has developed a regulatory system that includes an objective to protect key scenic vistas and scenic areas. Implementation strategies include the development of a Scenic Resources Overlay (SRO) map to identify scenic vistas and corridors. The protection of scenic vistas permits development that does not detract from the visual quality of the foreground, and avoids the interruption of the skyline on ridgeline and butte tops. There are no Teton County designated scenic corridors in the Project Area.

Scenic vistas within the Project Area mapped with an SRO layer include the Melody Ranch area abutting the west side of U.S. 89/191, and lands currently used for agriculture and residential uses on the west side of the highway surrounding the Wyoming Department of Transportation offices. These areas are part of the South Highway 89 (U.S. 191) Scenic Area.

The Hoback Canyon Scenic Area extends along both sides of U.S. 189/191 between the county line and a location about 1 mile east of Hoback Junction. The scenic area encompasses those areas that are at approximately level with or at a higher elevation than the highway.

There are conservation easements on open space adjacent to residential developments throughout the county. Conservation easements have been established to protect scenic resources and preserve the agricultural or community character. The easements are legal agreements between the landowners and grantees to restrict and specify the type and amount of development that takes place on the property (Teton County 2002). Conservation easements crossed by the proposed pipeline are listed in the Land Use section of this chapter.

3.4.7 Social and Economic Resources

Resource Description

The proposed project has the potential to affect social and economic resources in communities near the Project Area. The local economy is highly dependent on recreation and tourism, and could be affected by changes in recreation opportunities. Local residents rely on the BTNF as a source of both economic and recreation opportunities. The remoteness of western Wyoming presents a significant challenge for supplying utilities and services from distant locations to a low but growing local population. Local communities use extensive areas of land to supply tourists with desired experiences. Changes to the areas depended upon for recreation experiences could adversely affect businesses that provide services.

Indicators

- Effects on employment, wages, housing, and community infrastructure in the Jackson Human Resource Unit (HRU), including the community of Bondurant
- Effects on employment, wages, housing, and community infrastructure in the Big Piney HRU
- Effects on employment, wages, housing, and community infrastructure in the Pinedale HRU
- Socioeconomic effects of liquefied natural gas (LNG) delivery by truck
- Socioeconomic effects on communities and tourism from changes in recreation, hunting, or wildlife viewing opportunities, or changes in scenery

Forest Plan Direction

The Land and Resource Management Goals and Objectives for the BTNF identify a Forest challenge to support community prosperity. Forest-wide goals and objectives to meet the challenge include the following:

- 1.1 - Communities continue or gain greater prosperity; and
- 1.1(i) - Help utilities provide services.

There is no management guidance for MAs or DFCs within the Project Area that provides direction specific to social and economic resources.

Desired Condition

Provide extensive areas of land so that communities can supply tourists with desired experiences while meeting the challenge of providing sufficient commodity or service opportunities. The desired condition is that existing industries do not fail for lack of dependable supply (of land or commodities) and desirable new industries have the chance to begin.

Temporal Scope

The short-term impact on social and economic activities is anticipated to occur for the duration of construction activities over a period of 6 months. Long-term impacts to the local economy and social conditions could occur for the foreseeable future.

Geographic Scope

The Project Area is located within Sublette and Teton Counties. Bondurant, Jackson, and Pinedale are the communities most likely to be directly affected by the proposed project.

Affected Environment

This section provides a brief overview of the condition of the social and economic resources within the Project Area. The Forest Plan and Final EIS (USFS 1990) give a complete description of the social and economic environment within the boundaries of the Project Area.

Activities on the BTNF have some effect on nearly every person who lives in western Wyoming. Many residents of communities in Teton and Sublette Counties depend on tourism and resort-based activities, particularly in Jackson and the surrounding area, including the Jackson Hole Ski Area.

Both local and non-local visitors use the area for a wide range of recreation activities, including sightseeing, alpine skiing, hunting, fishing, camping, hiking, mountain biking, wildlife viewing, snowmobiling, cross country skiing, and snowshoeing.

Demographics

The counties and communities likely to be impacted by the project have had significant changes in population between 1990 and 2003, as shown in **Table 3-34**. Most of the population that resides within or near the proposed Project Area are Teton County residents. Since 1990, the population in Teton County has increased nearly 68 percent. Much of the growth occurred in Jackson, which increased more than 97 percent between 1990 and 2003. In 1990, Jackson accounted for 40 percent of the total Teton County population, while in 2003, Jackson accounted for 47 percent of the county population. Substantial growth also occurred in unincorporated Teton County near Jackson, primarily in the Wilson area west of Jackson, and the South Park and Hoback Junction areas south of Jackson. Teton County is projected to grow by 3.9

percent between 2003 and 2008, while Jackson is projected to grow an additional 14.3 percent. The average annual growth rates shown in **Table 3-34** show that the growth rate for Teton County and Jackson are expected to slow between 2003 and 2008 relative to average annual growth rates between 1990 and 2003. Some of the growth in Jackson has occurred because the incorporated town boundary expanded between 1990 and 2000.

The population of Sublette County also grew at a considerably higher rate than the state, increasing by nearly 35 percent between 1990 and 2003. Most of the growth, associated with gas development activities, occurred in unincorporated areas of the county, although Pinedale, located southeast of the Project Area, increased in population by 27 percent between 1990 and 2003. The Bondurant census designated place (CDP), located along Highway 189 in Sublette County, is an unincorporated residential community that had 155 residents in 2000. The Bondurant CDP was created as part of the 2000 census redistricting. Bondurant is a small ranching community that is within commuting distance of Jackson and Pinedale. The number of arrests in Sublette County has increased by nearly 270 percent since 1995, growing from 110 arrests to 439 arrests in 2004. From 2000 to 2004, the number of arrests has increased by more than 94 percent. Since 1996, the number of index crimes, which are regarded as serious and felony crimes, has increased by 66 percent while the crime rate increased by 40 percent. (Jacquet 2005)

It is anticipated that populations in the Jackson area and Sublette County will continue to grow at rates faster than those for the state between 2003 and 2008, as shown in **Table 3-37**. It is likely that Teton and Sublette Counties will continue to attract economic and population growth for the foreseeable future because the scenic setting and variety of developed and undeveloped year-round recreational activities make the region an attractive destination for tourists and residents.

TABLE 3-37 POPULATION TRENDS IN TETON AND SUBLETTE COUNTIES

Location	1990 Census	2000 Census	2003 Estimate	2008 Projection	Change from 1990 to 2003	Change from 2003 to 2008	Average Annual Change 1990 to 2003	Average Annual Change 2003 to 2008
Wyoming	453,588	493,782	501,242	514,912	10.5%	2.7%	1.1%	0.3%
Teton County	11,173	18,251	18,737	19,471	67.7%	3.9%	6.8%	0.4%
Jackson	4,472	8,647	8,825	10,090	97.3%	14.3%	9.7%	1.4%
Hoback Junction CDP	na	1,453	na	na	na	na	na	na
Sublette County	4,750	5,920	6,387	7,088	34.5%	11.0%	3.4%	1.1%
Pinedale	1,181	1,412	1,501	1,635	27.1%	8.9%	2.7%	0.9%
Bondurant CDP	na	155	na	na	na	na	na	na

Notes: CDP = Census designated place; na = not available Source: WY DEA 2005a, 2005b, 2005c; U.S. Census 2000a, 2000b

Employment and Income

Employment in Teton County, including communities near the Project Area, is dominated by recreation and tourism. **Table 3-38** highlights the number of jobs in 2002 for each industry and the percentage of total employment for each sector. Employment in Teton and Sublette Counties is compared with employment throughout Wyoming in **Table 3-38** to indicate the relative strength of industry sectors in the local economies. In 2002, 23 percent of all reported jobs in Teton County were in the accommodation and food services sector. This sector includes lodging places and restaurants, and is an indicator of trends in recreation and tourism, although employment in the sector includes dollars spent by residents of the counties as well as by tourists. Construction sector employment, with nearly 14 percent of all jobs, is a

reflection of the continued growth in recreational facilities, commercial activities, and housing to accommodate growth in the tourist- and recreation-based economy.

Employment in Sublette County more closely mirrors employment in the state, as shown in **Table 3-38**. State and local governments account for the highest proportions of employment in the state and the county. Construction and mining are both strong employers in the county economy; however, mining activities consist primarily of oil and gas activities that do not occur within the Project Area. The strength of the construction sector is a result of the strong population and economic growth of the county relative to the state.

TABLE 3-38 2002 EMPLOYMENT BY INDUSTRY SECTOR IN WYOMING, TETON COUNTY, AND SUBLETTE COUNTY

Industry Sector	Wyoming		Teton County		Sublette County	
	Number of Jobs	Percentage of Total	Number of Jobs	Percentage of Total	Number of Jobs	Percentage of Total
Total employment	339,121	100.0%	23,700	100.0%	4,417	100.0%
Farm employment	12,397	3.7%	151	0.6%	398	9.0%
Forestry, fishing, related activities, and other[1]	2,735	0.8%	(D)	Na	74	1.7%
Mining	20,287	6.0%	(D)	na	480	10.9%
Utilities	(D)	na	(D)	(D)	(D)	na
Construction	(D)	na	3,284	13.9%	482	10.9%
Manufacturing	(D)	na	274	1.2%	(D)	na
Wholesale trade	8,073	2.4%	(D)	(D)	(D)	na
Retail trade	39,633	11.7%	2,535	10.7%	454	10.3%
Transportation and warehousing	(D)	na	385	1.6%	81	1.8%
Information	(D)	na	404	1.7%	46	1.0%
Finance and insurance	10,940	3.2%	869	3.7%	95	2.2%
Real estate and rental and leasing	13,730	4.0%	1,961	8.3%	192	4.3%
Professional and technical services	15,004	4.4%	1,692	7.1%	235	5.3%
Management of companies and enterprises	865	0.3%	76	0.3%	(D)	na
Administrative and waste services	11,418	3.4%	1,026	4.3%	(D)	na
Educational services	2,489	0.7%	193	0.8%	(D)	na
Health care and social assistance	24,766	7.3%	808	3.4%	(D)	na
Arts, entertainment, and recreation	6,276	1.9%	898	3.8%	122	2.8%
Accommodation and food services	30,145	8.9%	5,457	23.0%	392	8.9%
Other services, except public administration	(D)	(D)	1,091	4.6%	220	5.0%
Federal, civilian	7,317	2.2%	413	1.7%	112	2.5%
Military	5,850	1.7%	90	0.4%	36	0.8%
State and local	52,820	15.6%	1,636	6.9%	592	13.4%

[1] "Other" consists of jobs held by U.S. residents employed by international organizations, foreign embassies and consulates in the U.S.
(D) = Not shown to avoid disclosure of confidential information, but the estimates for this category are included in the totals.
na = Not available
Source: WY DEA 2005d

According to estimates prepared for recreation uses in the Snake/Salt River Basin Plan, which encompasses the project area, the summer months represent the peak tourist season for outdoor recreational opportunities. **Table 3-39** summarizes summer and winter visitor days and expenditures made by seasonal residents and tourists.

TABLE 3-39 VISITOR DAYS, VISITOR EXPENDITURES AND JOBS SUPPORTED BY TOURISM IN SNAKE/SALT RIVER BASINS, 2000-2001

Visitor Use Category	Number of Visitor Days (thousands)	Total Visitor Expenditures (millions)	Total Supporting Jobs
Seasonal Residents	2,038	$234	6,231
Summer	1,257	$140	3,724
Winter	195	$23	620
Other	585	$71	1,887
Destination Tourists	5,137	$507	13,473
Summer	3,169	$290	7,706
Winter	493	$53	1,407
Other	1,476	$164	4,361
All Tourists	7,175	$741	19,704
Summer	4,426	$430	11,430
Winter	688	$76	2,027
Other	2,061	$235	6,248

Source: BBC Research and Consulting 2002

Forest Service monitoring of recreation visitors to the BTNF shows that local day use represents an estimated 51 percent of visits to the BTNF (Stynes and White 2004). For all BTNF visits, travel parties average 2.0 people per vehicle (Kocis et al. 2003) and spend $82 during each visit, which is around the national average for spending during National Forest visits (Stynes and White 2004). The national average for spending associated with local day use is $30 per National Forest visit (Stynes and White 2004).

Housing

Housing in Sublette County is summarized by BLM (2006). There is a shortage of available housing, which can be attributed to the continuing expansion of oil and gas development activities and the anticipated 12.4 percent growth in the county's population between 2000 and 2004. The housing shortage in Sublette County varies, with the most notable shortages occurring in the Town of Pinedale and surrounding areas, where businesses have had to supply employees with housing. Housing shortages have affected housing costs. New building permits have increased by 72 percent between 2000 and 2004, with the most significant increases in housing and motel/hotel units.

Housing stock in Teton County increased by 45 percent between 1990 and 2000, while the median value of all housing stock rose by nearly 173.9 percent, from $133,400 in 1990 to $365,400 in 2000. According to the Teton County Housing Authority, there is a severe shortage of rental housing and for-sale housing priced for working residents. The availability of land suitable for housing limits the construction of additional housing, particularly affordable housing for residents with an annual income of under $100,000. The Housing Needs Analysis, prepared by the Teton County Housing Authority (2001), concludes that 1,800 new ownership housing units would be needed in Teton County between 2000 and 2006.

As shown in **Table 3-40**, the housing characteristics of Sublette County are very different than those for housing in Teton County. There is a large gap in median housing values between the two counties. The western portion of Sublette County is in close proximity to the Jackson area, and it is likely that the lack of affordable housing in Teton County will stimulate development in Sublette County on private lands along U.S. 189/191.

TABLE 3-40 HOUSING CHARACTERISTICS IN TETON AND SUBLETTE COUNTIES, 1990 AND 2000

	Teton County		Sublette County	
	1990	2000	1990	2000
Total housing units	7,060	10,267	2,911	3,552
Occupied housing units	4,568	7,688	1,834	2,371
Owner occupied	2,691	4,215	1,281	1,737
Renter occupied	1,877	3,473	553	634
Vacant housing units	2,492	2,579	1,077	1,181
For seasonal, recreational, or occasional use	1,457	2,121	747	930
Homeowner vacancy rate	1.5	1.3	3.6	2.4
Rental vacancy rate	17.4%	5.2%	12.9%	7.4%
Median value	$133,400	$365,400	$64,400	$112,000

Source: U.S. Census 2000a, b, c

Community Infrastructure

Law enforcement in the Project Area is provided by the Teton County Sheriff's Department, the Sublette County Sheriff's Department, and the Wyoming Highway Patrol. The Teton County Sheriff's Department provides volunteer search and rescue and a communication center that serves as the emergency response dispatch for the county, as well as several patrol and investigation deputies. Four patrol deputies serve Sublette County outside of the Pinedale area. In addition, the department provides a seasonal patrol deputy.

Fire protection in the Project Area is provided by the BTNF, the Jackson/Teton County Volunteer Fire Department, the Bondurant Volunteer Fire Department, and the Pinedale Volunteer Fire Department. Stations nearest to the Project Area are in Bondurant, Jackson, and Hoback Junction (Teton County Fire Administration Office 2005).

The BTNF shares wildland fire suppression resources with other federal government agencies nationwide. Interagency wildland fire crews are dispatched where they are needed. Contractors are also used for wildland fire suppression activities.

The nearest hospital is St. John's Hospital in Jackson. The hospital provides 24-hour emergency services, general surgery, professional home care, and an outpatient SurgiCenter. Many other medical services also are available in Jackson.

According to the Teton County Comprehensive Plan, the current water supply and sewage treatment systems provide some constraint to the projected growth of the area. However, the plan indicates that these constraints can be technically overcome at some cost to the Town of Jackson and Teton County, and would not prevent growth. Also, according to the county's Urban Land Institute report, both Teton County and Jackson had expressed concern over their ability to deliver services to area residents.