CHAPTER 3
Affected Environment

Introduction

This chapter describes the resources and values that Final/Plan EIS alternatives could potentially affect. The NPS selected these resources and values based on public comment and review of environmental statutes, regulations, executive orders, and NPS Management Policies (NPS 2001). Several topics were dismissed in Chapter 1 from further in-depth analysis, including

- Floodplains.
- Wild and scenic rivers.
- Air quality.
- Soundscapes.
- Historic structures and cultural landscapes.
- Ethnographic resources.
- Museum collections.
- American Indian Trust resources.
- Land use.
- Environmental justice.
- Lightscape management.
- Prime and unique agricultural lands.
- Certain threatened and endangered species (whooping crane).
- Certain species of special concern (wolverine, harlequin duck, and trumpeter swan).
- Certain wildlife species (white-tailed deer, bighorn sheep, and fish).
- Energy consumption.
- Wilderness.

Refer to the "Impact Topics Dismissed from Further Analysis" section of Chapter 1 for the specific reasons for dismissal.

The resource descriptions in this chapter are intended to encompass only such information as is necessary to understand the probable effects of the alternatives. Chapter 4, "Environmental Consequences," describes the potential impacts of the alternatives on each of these resources and values.

Visual and Scenic Quality

The towering granite peaks of the Teton Range are the dominant scenic attribute of Grand Teton National Park. A notable example of fault-block topography is the range's high alpine environment, which exposes visitors to glacial cirques, glaciers, high angle canyons, tumbling streams, and a series of lakes. Meandering through the valley's foreground in a southwest direction is the Snake River, which provides a rich riparian habitat for the area's wildlife. The Snake River terraces are covered with a mix of open sagebrush (*Artemisia* spp.), conifers, and deciduous trees. These scenic resources are among the most spectacular in the western United States and are a primary reason for the region's popularity as a tourist destination.

Sightseeing, wildlife viewing, and experiencing the wilderness and open space are the most frequently mentioned reasons for visiting the Park (Littlejohn 1998). Ninety-eight percent of visitors reported sightseeing in the Park during their visit; 88 percent reported viewing wildlife; 71 percent took pleasure drives; and 59 percent viewed roadside or interpretive exhibits. The most popular places to visit, as reported in this survey, are South Jenny Lake (72 percent of visitors), Colter Bay (57 percent), and Jackson Lake Lodge (42 percent). Some 96 percent of visitors reported that scenic views were "very or extremely important" to their experience of the Park, while only 57 percent reported the same for recreational activities.

The three types of views within the Park include background, mid-ground, and foreground, as discussed below.

Background Views

These are seen at infinite distance from the viewer. In the Park, high-value background views are long or panoramic views of the Teton Range to the west, and the sagebrush flats to the east.

Mid-ground Views

These focus on elements that occupy the middle of the view plane. Examples of mid-ground views within the Park might be the Snake River valley floor, as seen from U.S. Highway 26/89/191; views of Willow Flats from the Jackson Lake Lodge observation deck; or views of Mormon Row from the Teton Park Road or Antelope Flats Road.

Foreground Views

These are the scenes in closest proximity to the viewer. Examples of foreground views might be the Taggart Corrals along the Teton Park Road; the immediate surroundings of an activity area; or a relatively enclosed setting (e.g., the Moose-Wilson Road), where dense vegetation obscures mid-ground and background views.

The area that would experience impacts encompasses a number of travel routes and destinations that provide exceptional opportunities to view the Park's unique and distinctive scenic resources. For example, the Moose-Wilson Road corridor is known for its natural rural character and potential for viewing wildlife.

Soils

Soils in the Jackson Hole area are a direct result of various cycles of glaciation dating to the Pleistocene era. The glaciers underwent several cycles of advance and retreat in the Park area, directly or indirectly modifying the valley floor terrain and soils, gouging basins (such as the one now occupied by Jackson Lake), and depositing undulating moraines during their recession. As the glaciers retreated, melt-water outwash streams further modified the landscape by transporting glacial debris and redepositing alluvial material.

The project area includes 18 unique soil types based on the Soil Survey of Teton County, Wyoming, Grand Teton National Park (Young 1982). Table 7 provides the characteristics of the most dominant soil types within Grand Teton National Park, while Figure 12 illustrates the locations of these soil types within the Park. Glacial melt-water deposited these generally loamy soils and sustains the Park's dominant vegetative communities. The soils are generally well drained and nearly level to gently sloping.

In contrast to most of the project area where one or two soil types are dominant, the segments between Colter Bay and Jackson Lake Lodge, as well as the segment along the Moose-Wilson Road, represent a mosaic of soil and drainage types. The varied soil conditions support a range of vegetation types, from wetlands to spruce fir forest.

The flat meadows of the valley floor that comprise the bulk of the project area generally comprise Tineman-Bearmouth or Bearmouth gravelly loams or Taglake-Sebud association. These soils developed from the porous quartzite sand and gravel deposited by glacial melt water. Small basins, or kettles, are left in the moraine deposits from glacial outwash material. These glacial outwash soils are generally very deep and well drained and have less water retention capability than moraine-derived soils. They are generally nutrient-poor and support a fragile sagebrush/grassland community. Vegetation in these areas is easily impacted by use, and revegetation may be difficult after disturbance. Manual methods of reclamation are usually necessary to loosen compacted soil. In these areas, previous vehicular and human uses have eliminated some ground cover.

The Snake River and Cottonwood Creek floodplains consist of more recent alluvial soils, generally from the Tetonville series, which developed when modern streams reworked glacial material. Braided stream channels supporting wetland riparian vegetation (i.e., cottonwood, willows, blue spruce, and sedges [*Carex* spp.]) characterize these areas. Erosion hazard for these soils is minimal.

Soils within the Mormon Row area are composed of two main types: the Youga-Tineman complex on alluvial fans and the Leavitt-Youga complex on stream terraces along the Snake River. Both soils form on nearly level slopes of 0 to 3 percent. The Youga-Tineman soils formed in alluvium at elevations of 6,000 to 7,000 ft (1,828 to 2,133 m) northeast of Blacktail Butte.

The very deep, well-drained Youga soil is composed of silty clay loam, formed in layers approximately 6 inches thick. The Youga soil has a moderate permeability and a high ratio of available water capacity. Surface runoff is slow, and the erosion hazard is slight. The Tineman soils are also very deep and well drained, having formed in alluvium. The surface layer is brown, gravelly loam about 7 inches thick. Permeability is moderate, and the available water capacity is low. Like the Youga soils, surface runoff is slow, and the erosion hazard is slight.

TABLE 7 DOMINANT SOIL TYPES WITHIN GRAND TETON NATIONAL PARK	
Soil Type	**Characteristics**
Aquic Cryoborolis-Aquic Cryoboralfs complex	Moderately deep, somewhat poorly drained soils formed on steep soils (30 to 70 percent) in residuum and landslide deposits. In the Park, they are found on the mountainsides east of Lizard Point. It is made up of approximately 50 percent Aquic Cryoborolis, 35 percent Aquic Cryoboralfs, and 15 percent Typic Cryochrepts and Rock outcrop.
Bearmouth gravelly loam	Deep, well-drained gravelly loam soils found in floodplain areas, stream terraces, and fans with slopes ranging from 2 to 8 percent. These soils are formed in alluvium over extremely cobbly or gravelly sand.
Charlos loam	Deep, well drained soils of grayish brown loam at the surface and grayish brown sandy clay loam below. Found throughout the central part of the Grand Teton National Park area.
Cryaquolls-Cryofibrists complex	Nearly level, sandy loam and loam soils in seep areas surrounding springs and old stream oxbows. Boggy or marshy soils exhibiting a deep horizon of organic material.
Greyback-Charlos complex	Very deep, well-drained, nearly level soils found on stream terraces east of Teton Village. Area is approximately 45 percent Greyback gravelly loam and 45 percent Charlos loam.
Grobutte-Thayne Gravelly loams	Deep, well-drained soils composed of approximately 50 percent Grobutte gravelly loam, 20 percent Thayne gravelly loam, 20 percent Greyback gravelly loam, and 10 percent Crow Creek soils and rock outcrop. They are found on south and west facing slopes of mountains and buttes in the southern portions of the Park.
Leavitt-Youga complex	The very deep, well-drained soils are approximately 45 percent Leavitt loam and gravelly loam and 45 percent Youga silty clay loam. They are nearly level soils on alluvial fans and stream terraces.
Sebud complex, 10 to 20 percent slopes	Sloping soils on alluvial fans and foot slopes along the mountain fronts. They are approximately 55 percent Sebud Stony loam, 35 percent Sebud gravelly loam, and 10 percent soil that has more advanced development in the subsoil but otherwise similar to these Sebud soils.
Starman-Owlcan association	Steep and very steep soils on mountainsides of the Teton Range. They are made up of approximately 25 percent Starman very stony loam, 25 percent Owlcan loam, 25 percent Midfork very stony loam, and 25 percent Sheege and Spearhead soils, rock outcrop, and a fine-textured soil associated with shale.
Taglake-Sebud association	Deep, well-drained soils are made up of approximately 75 percent Taglake very stony, sandy loam, 15 percent Sebud stony sandy loam, and 10 percent Walcott soils. These soils are on alluvial fans, till plains, moraines, hills, and mountains.
Tetonia-Lantonia silt loams	Very deep, well-drained, moderately permeable soils on loess-mantled terraces and hills in the southern part of the Park. Area is approximately 45 percent Tetonia silt loam and 45 percent Lantonia silt loam.
Tetonville complex	Deep, poorly drained soils found on flood plains along the Snake River. The soil is made up of 60 percent Tetonville very gravelly sandy loam, 30 percent Tetonville fine sandy loam, and 10 percent Wilsonville and Newfork soils. The soil is subject to occasional brief to long periods of flooding.
Tetonville gravelly loam	Very deep, somewhat poorly drained gravelly loam soil along the Snake River and its tributaries. The soil is subject to occasional brief to long periods of flooding.
Tetonville-Riverwash complex	Nearly level soils and flood plains along the Snake and Gros Ventre Rivers. It is made up of approximately 40 percent Tetonville fine sandy loam, 40 percent Riverwash, and 20 percent Wilsonville and calcareous soils. Seasonal high water table is 1 to 3 ft (0.3 to 0.9 m) during May to July. Surface runoff is slow and erosion hazard is slight.
Tetonville-Wilsonville fine sandy loams	Nearly level soils in old, braided stream channels in flood plains along the Snake River. It is made up of approximately 40 percent Tetonville fine sandy loam, 40 percent Wilsonville fine sandy loam, and 20 percent Tetonville very gravelly sandy loam. Seasonal high water table is 1 to 3 ft (0.3 to 0.9 m) during May to July.
Tineman association	Nearly level to sloping soils on stream terraces and alluvial fans along the Snake River and its major tributaries. It is made up of approximately 40 percent Tineman gravelly loam, 25 percent Tineman gravelly loam-wet, and 35 percent Aquic Cryoborolis and other gravelly or cobbly surfaces.

TABLE 7 DOMINANT SOIL TYPES WITHIN GRAND TETON NATIONAL PARK	
Soil Type	**Characteristics**
Tineman gravelly loam	Very deep, well-drained gravelly loam soil is found along the Snake River; soils are on nearly level to steep alluvial fans, stream terraces, mountains, and moraines. Slopes are 0 to 40 percent.
Tineman-Bearmouth gravelly loams	Very deep, well-drained gravelly loam soils formed in alluvium that is 10 to 20 ft (3 to 6 m) deep over extremely cobbly or extremely gravelly sand. These soils are on flood plains, stream terraces, and fans in mountain valleys.
Turnerville silt loam 0-30 percent slopes	Very deep, well-drained soil along the mountain front surrounding the southern part of Jackson Hole. Most of the acreage is forest.
Youga-Tineman complex	Deep, well-drained soils formed from glacial till or outwash materials. It is made up of approximately 55 percent Youga silty clay loam, 35 percent Tineman gravelly loam, and 10 percent Greback, Leavitt, and Adel soils. Generally found on upland hills, plateaus, foot slopes, or fans. Runoff is medium to rapid.
Soil Survey of Teton County, Wyoming, Grand Teton National Park. USDA, SCS, DOI, NPS in cooperation with Wyoming Agricultural Experiment Station. Issued April 1982.	

Vegetation

The Teton Range dominates the landscape in the Park and supports montane forests (lodgepole pine [Pinus contorta], Douglas-fir, and limber pine [*Pinus flexilis*]); subalpine forests (Engelmann spruce [*Picea engelmannii*], subalpine fir [*Abies lasiocarpa*], and whitebark pine [*Pinus albicaulis*]); and mountain shrub communities (chokecherry [*Prunus virginiana*], serviceberry [*Amelanchier arborea*], Scouler willow [*Salix scouleriana*], and sagebrush) at the lower and mid-elevations. Where vegetated, the higher elevations support grass-, forb-, and shrub-dominated alpine communities. Park roads are primarily located on glacial moraines and outwash plains of the Jackson Hole Valley where sagebrush and lodgepole pine communities dominate. The Snake River bisects the outwash plain, and riparian communities associated with this river and its tributaries support Colorado blue spruce (*Picea pungens*), narrowleaf cottonwood (Populus angustifolia), silver buffaloberry (*Shepherdia argentea*) and various willow species. Hydrology associated with Jackson Lake also supports a large and diverse willow community (e.g., Willow Flats). Aspen communities are located in moist upland areas at lower elevations in the Park and are often intermixed with sagebrush steppe and Douglas-fir woodlands. The vegetation along the Moose-Wilson Road is comprised of sagebrush shrubland, conifer forest, grassland meadow, riparian/wetland, aspen, and cottonwood.

Cover Types

The most recent vegetation map and land-cover type classification for the Park was completed in 2005 (Cogan et al. 2005). The mapping and vegetation classification identified and described 207 plant associations that occur in the Park. These associations are represented by 52 different map units. Map units were combined to create the simplified cover types used in this Final/Plan EIS. Table 8 provides a description of the vegetation types in the project area, while Table 9 describes the dominant cover type by major roadways affected by the proposed activities. Figure 13 shows the primary cover types and Figure 14 shows tree density found along transportation corridors in the Park.

FIGURE 12
DOMINANT SOIL TYPES IN THE VICINITY OF THE PROJECT AREA

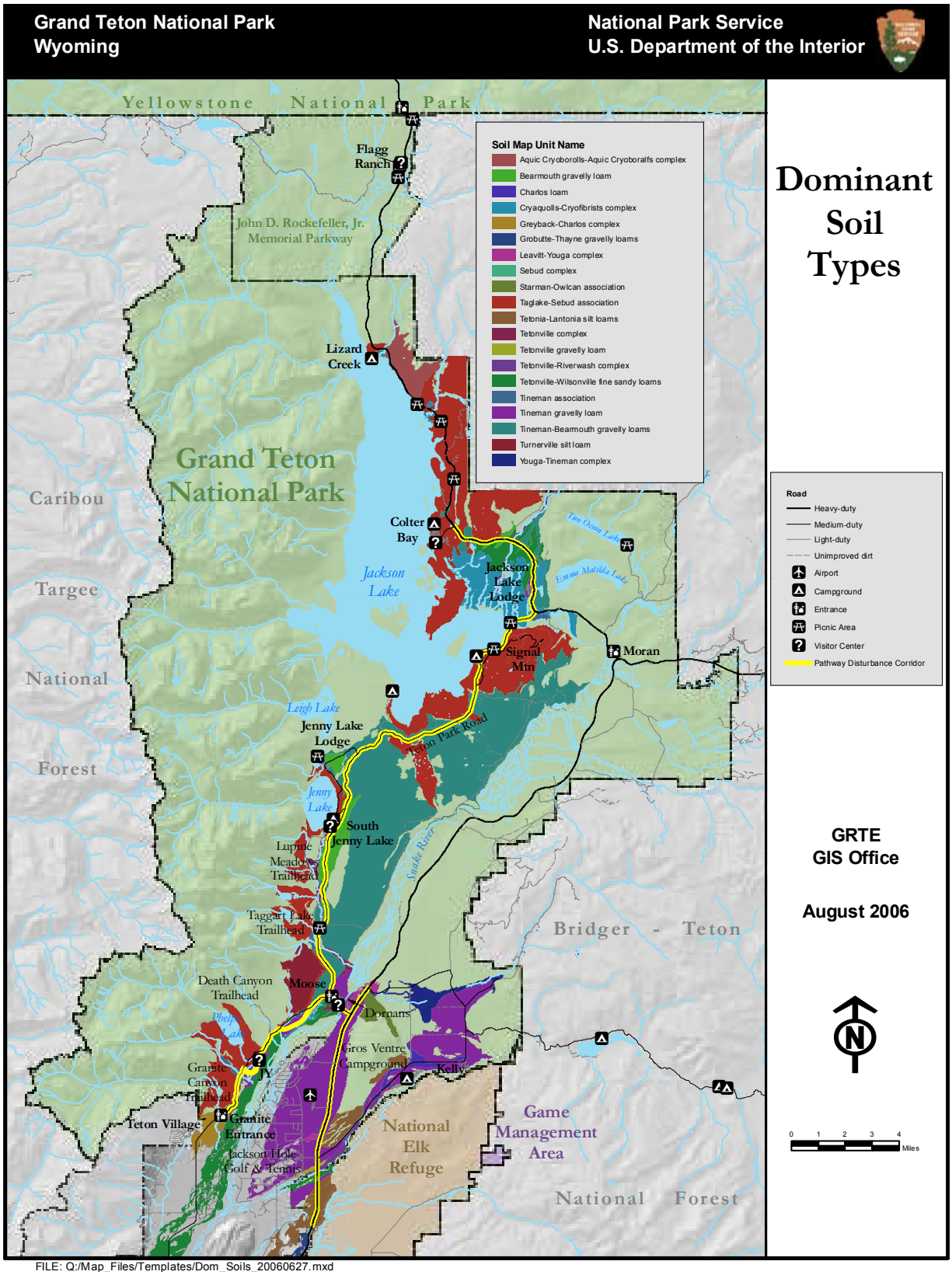

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TABLE 8 DESCRIPTION OF VEGETATION TYPES FOUND IN THE PROJECT AREA		
Forested Cover Type	**Descriptions**	**Percent of Project Area**
Coniferous Forest	Conifer species, including any combination of lodgepole pine, Douglas-fir, subalpine fir, blue spruce, Engelmann spruce, or whitebark pine, dominate the overstory with at least 20 percent cover. Several tree species may be present. The understory may be primarily comprised of grasses and forbs or may include cover with shrubs such as huckleberry (*Vaccinium* spp.) and russet buffaloberry (*Shepherdia canadensis*).	3.19
Coniferous Woodland	The overstory is dominated by conifer species, but it is sparse, with less than 20 percent tree canopy cover. The understory is usually dominated by grasses and forbs or may be dominated by sagebrush.	2.18
Deciduous Forest	Sapling to overmature aspen or cottonwood trees dominate the overstory, with at least 20 percent canopy cover and few conifers present; understory consists of shrubs, forbs, and grasses.	0.21
Deciduous Woodland	Sparse cottonwood or aspen overstory is present. Understory usually consists primarily of sagebrush with a mixed forb and grass component.	1.57
Dwarf Shrubland	Short shrubs dominate the vegetation, with greater than 20 percent canopy cover. Most often, the dominant shrub is low sage (*Artemisia arbuscula*). The community has a minor forb component and includes several different grasses. At elevations above 9,000 ft (2,743 m), the dominant shrub is a willow rather than a sage.	6.58
Herbaceous Vegetation	A combination of forbs and grasses are present, with less than 10 percent cover of shrubs or trees. Herbaceous vegetation can range from wetlands with 100 percent canopy cover to dry hill slopes with less than 20 percent canopy cover of grasses.	3.40
Mixed Forest	Coniferous and deciduous trees co-dominate the overstory, with at least 20 percent cover. Along the Snake River, this is a mix of cottonwood and blue spruce; in more upland areas, it is often lodgepole pine or Douglas-fir mixed with aspen. The understory can vary widely from shrubs to grasses to tall forbs.	0.04
Mixed Woodland	Coniferous and deciduous trees co-dominate the sparse overstory, providing less than 20 percent canopy cover. The understory ranges from shrubs to grasses.	1.11
Shrubland	Sagebrush and antelope bitterbrush (*Purshia tridentata*) or deciduous shrubs (e.g., chokecherry or serviceberry) are the tallest vegetation layer. Shrub canopy cover can vary from 20 to 80 percent. Diverse forbs and grasses are often present.	43.94
Coniferous Forest	Conifer species, including any combination of lodgepole pine, Douglas-fir, subalpine fir, blue spruce, Engelmann spruce, or whitebark pine, dominate the overstory with at least 20 percent cover. Several tree species may be present. The understory may be primarily comprised of grasses and forbs or may include cover with shrubs such as huckleberry and russet buffaloberry.	3.19
Coniferous Woodland	The overstory is dominated by conifer species, but it is sparse, with less than 20 percent tree canopy cover. The understory is usually dominated by grasses and forbs or may be dominated by sagebrush.	2.18
Sparse Vegetation	Total vegetation cover is less than 20 percent, usually comprised of grasses, forbs, or shrubs. Most often occurring on steep hill slopes, on riparian islands, or in the alpine.	0.25
Barren	Non-vegetated areas, including rock, snow, open water, cobble, and roadways.	37.54
Total		100.00

TABLE 9 DOMINANT COVER TYPES BY PROJECT AREA ROADWAY	
Road	**Cover Type Description**
U.S. Highway 26/89/191	Dry sagebrush shrubland is the dominant cover type between the south boundary of the Park and Moose Junction. A cottonwood-dominated riparian zone occurs along the Gros Ventre River. Vegetation along Sagebrush Drive/Spring Gulch Road to Jackson Hole Golf and Tennis is the same as along the main road – sporadic sagebrush and cottonwood. From Moose Junction, the road parallels the Snake River to the east and vegetation varies depending on distance from the river. The southern portion of the road is well above the river in the sagebrush-dominated outwash plain. The road descends through a lodgepole pine forest toward the river near Deadman's Bar and enters into a mosaic of moister cover types (wet meadow, tall shrub, and cottonwood) interspersed with sagebrush. The road crosses the Buffalo Fork River at Moran and continues east above the river through a mix of dry sagebrush shrubland, agricultural lands, and tall shrub cover types.
Teton Park Road	Beginning at Moose Junction, the road crosses over the Snake River to the town of Moose and then on to Lupine Meadows. Dry sagebrush shrublands are present along the majority of this segment except for the developed area at Moose, small patches of aspen and spruce/fir east of Moose, and tall shrubs and cottonwoods adjacent to Beaver Creek and Cottonwood Creek. Vegetation in the vicinity of the road from Lupine Meadows to North Jenny Lake Junction is predominantly dry sagebrush shrubland. Jenny Lake Loop Road is dry sagebrush shrubland on the east and lodgepole pine forest on the glacial moraine associated with Jenny Lake on the west. From North Jenny Lake Junction, the road winds through sagebrush shrublands and lodgepole pine forests to Jackson Lake Dam. North of the dam, the vegetation consists of wet meadow, moist forb meadow, and tall shrub cover types through an area known as Willow Flats. On the North Jenny Lake to String Lake section, vegetation along the pathway would be the same as that in the North Jenny Lake area – primarily sporadic sagebrush cover with one section of heavily forested vegetation.
North Park Road	At Jackson Lake Junction, the road ascends out of the tall shrub communities of Willow Flats, crosses Christian Creek, and passes Jackson Lake Lodge. Dry sagebrush and lodgepole pine are the dominant cover types north of Jackson Lake Lodge. The road passes through a small portion of tall shrub communities at the north end of Willow Flats and spruce/fir cover types at Pilgrim Creek and Colter Bay. After passing the Willow Flats area on the way to Lizard Creek, the route traverses lodgepole pine forests with occasional wet meadows and aspen groves on the east side of the highway. In some areas, the road is closer to the lakeshore where willows and deciduous forests dominate.
Moose-Wilson Road	The Moose-Wilson Road is dominated by lodgepole pine forest but has dry sagebrush shrubland and scattered aspen cover types on the south end and tall shrub, spruce/fir, and aspen cover types on the north end.

FIGURE 13
DOMINANT VEGETATION IN THE VICINITY OF THE PROJECT AREA

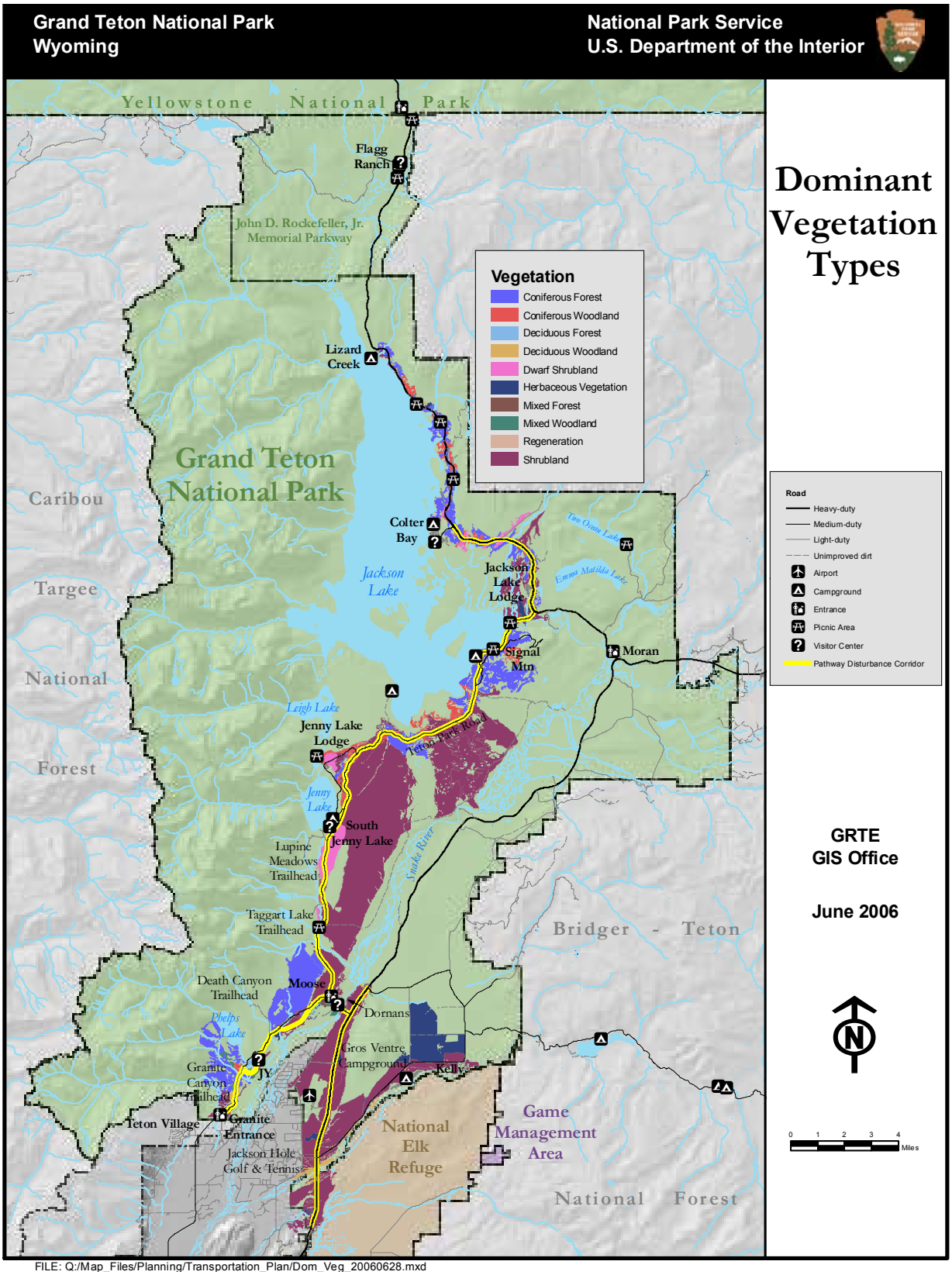

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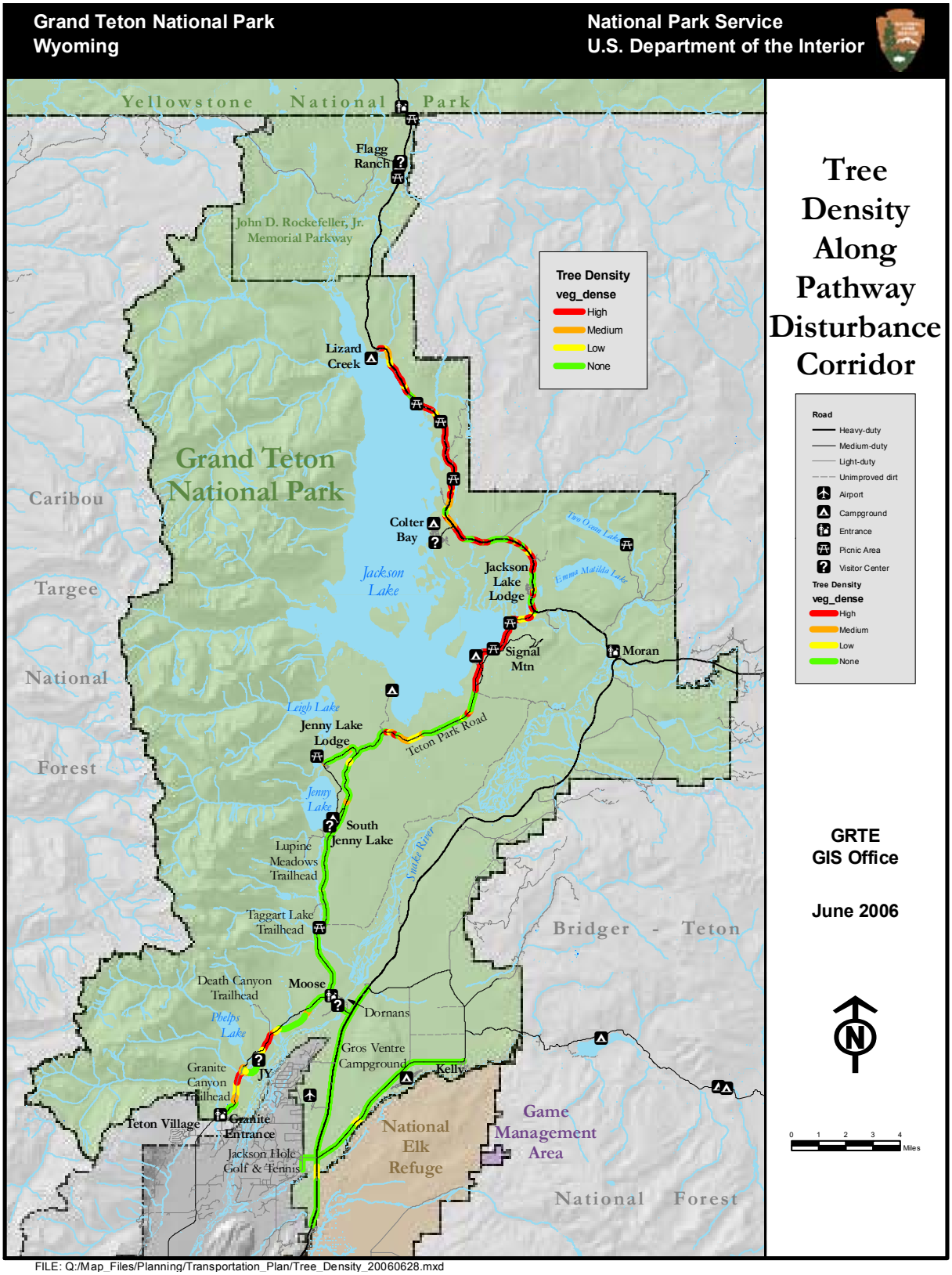
FIGURE 14
TREE DENSITY IN THE VICINITY OF THE PROJECT AREA



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Invasive Species / Noxious Weeds

Invasive species are those that are introduced into an area in which they did not evolve and that can cause economic and/or ecological impacts. Exotic plant invaders possess unique characteristics for out-competing other plants and they quickly establish thick stands that threaten native habitats. A noxious weed typically is an official designation of a particular weed within a state. The Wyoming Weed and Pest Control Act of 1973 defines noxious weeds as "the weeds, seeds or other plant parts that are considered detrimental, destructive, injurious or poisonous, either by virtue of their direct effect or as carriers of diseases or parasites that exist within this state, and are on the designated list" (State of Wyoming 1973).

Invasive species and noxious weeds have become an increasing concern in the Park in recent years, and weed control is viewed as a long-term management issue. Noxious weeds primarily occur along roadsides and trails and in other disturbed areas, including construction sites, gravel pits, and recently burned areas within the Park. Roadsides are uniquely vulnerable to invasions by non-native species because of continual disturbance resulting from maintenance activities, vehicular traffic, and runoff. The primary means of noxious weed spread include vehicles, pets, horses, wildlife, and humans (S. Haynes 2002, pers. comm.). Trails are also susceptible to weed infestations since seeds are easily carried and dispersed on shoes, socks, clothing, and pets. Bicycle spokes, tires, and chains can also provide a vector for seed dispersal.

Weeds such as spotted knapweed (*Centaurea stoebe* ssp. *micranthos*), Russian knapweed (*Acroptilon repens*), Dyer's woad (*Isatis tinctoria*), Dalmatian toadflax (*Linaria dalmatica*), yellow toadflax (*Linaria vulgaris*), marsh sowthistle (*Sonchus arvensis* ssp. *uliginosus*), sulfur cinquefoil (*Potentilla recta*), perennial pepperweed (*Lepidium latifolium*), and leafy spurge (*Euphorbia esula*) are considered the Park's most invasive and difficult to control. All are adept at colonizing disturbed dry sites, often out-competing native vegetation and, in some cases, spreading into undisturbed areas. Other invasive species common within the Park include musk thistle (*Carduus nutans*), bull thistle (*Cirsium vulgare*), Canada thistle (*Cirsium arvense*), oxeye daisy (*Leucanthemum vulgare*), orange hawkweed (*Hieracium aurantiacum*), common tansy (*Tanacetum vulgare*), St. Johnswort (*Hypericum perforatum*), houndstongue (*Cynoglossum officinale*), woolly mullein (*Verbascum thapsus*), and cheatgrass (*Bromus tectorum*).

Park personnel inventory, monitor, collect test plot data, and control weeds each summer. The most effective method of weed control is to prevent establishment by maintaining optimum biodiversity and cover within native plant communities (Grand Teton National Park 2000). Where noxious weeds have become established, eradication and revegetation with native species is the ultimate goal, although managers never expect to eliminate weeds from the Park completely (S. Haynes 2002, pers. comm.). Various methods to control or reduce the spread of invasive species include herbicide application, hand pulling, biological controls (insect introductions), and mechanical treatments. In 2003, park staff and/or contractors spent 2,242 person hours treating 1,054 acres of weed infestations (NPS 2005). Similar effort has occurred in subsequent years.

Hydrology and Water Quality

The area that would be directly affected by proposed actions includes selected surface water features within the Park, including the Snake River and its tributaries that are adjacent to, crossed by or downstream from proposed actions. The area indirectly affected includes the Snake River Valley aquifer, which is recharged by infiltration of precipitation, streamflow leakage, irrigation water, and inflow from other aquifers. Much of the aquifer exhibits high permeability and interconnection to the rivers and lakes, making it vulnerable to contamination from the facilities, visitor use, and transportation corridors that exist in the recharge areas.

Surface Water

The Snake River, Jackson Lake, and the Leigh/String/Jenny Lake complex are the dominant surface water features within the project area. Several large lakes, fed by mountain drainage, exist outside the project area, but all eventually drain into one of these three main water bodies. The Wyoming Department of Environmental Quality (DEQ) has designated these waters as Class 1 — Outstanding Resource Waters. No further degradation of these waters is allowed and there are restrictions for avoiding all point source discharges.

Jackson Lake is located in the northern half of the Park. It is fed primarily by the Snake River, flowing south from YNP. Numerous other small creeks drain from the surrounding mountains and wilderness areas, including Pilgrim Creek, which enters the lake in the Willow Flats area and is crossed by North Park Road. The natural Jackson Lake was enlarged into a reservoir when the

Jackson Lake Dam was constructed by the BOR in 1907 and again in 1916. The maximum designed water surface elevation is 6,769 ft (2,063 m). Jackson Lake Reservoir provides storage space for 100- and 500-year floodwaters within the BOR's Minidoka Project (a series of six major reservoirs in the upper Snake River Basin). Recreational boating is allowed on Jackson Lake, with active marinas and boat put-ins at Leeks Marina, Colter Bay, and Signal Mountain Lodge. Since 2004, collaboration between the BOR and the NPS has resulted in reservoir releases being managed to, when possible, simulate the natural peak and decline demonstrated by undammed rivers in the Rocky Mountain region; these efforts are intended to benefit native fish, plant, and wildlife habitat along the Snake River downstream from Jackson Lake.

The Snake River reemerges from the southeast end of Jackson Lake at the dam and flows east for approximately 5.0 miles (8.0 km) before turning south and west. For most of its length, the river follows the pattern of a classic braided stream. However, in the area adjacent to Moose, flow is contained within a single channel (Grand Teton National Park 2001b). Farther south, the river returns to a braided form, but its western boundary is contained by a levee maintained by the ACOE. Several intermittent and perennial streams cross the project area and are tributary to the Snake River, including Pacific Creek, Spread Creek, Ditch Creek, Granite Creek, Taggart Creek, Christian Creek, Pilgrim Creek, and Cottonwood Creek. Pacific and Spread Creeks are located east of any proposed improvements under the alternatives considered in this Final Plan/EIS. Recreational raft and float trips occur along the length of the Snake River within the Park with numerous access points provided.

A levee system is located along Pilgrim Creek, just east of Jackson Lake Dam. Following construction of the dam, Pilgrim Creek changed course and flowed below the dam to its confluence with the Snake River. The BOR subsequently built a series of levees to push Pilgrim Creek north into Jackson Lake and alleviate the local flooding problem to the historic town of Moran. Presently there is no maintenance plan for these levees and, left to its own devices, Pilgrim Creek could eventually put the stream in the vicinity of the Teton Park Road; the Willow Flats area could be dissected by an active stream channel and sediments brought in below the dam by Pilgrim Creek could fill-in or destabilize the Oxbow Bend area.

The Leigh/String/Jenny Lake complex is a series of water bodies formed by glacial activity and fed primarily by mountain drainage. These bodies drain from north to south, flowing from Leigh Lake to String Lake to Jenny Lake. Cottonwood Creek emerges from the southeast end of Jenny Lake and eventually drains into the Snake River. Leigh Lake is outside the scope of the Final Plan/EIS, but String and Jenny Lakes are both included.

Recreational, non-motorized boating is allowed on String Lake with a boat put-in on the south end. Recreational, low horsepower boating is allowed on Jenny Lake with a boat put-in south of the Jenny Lake Visitor area. In addition, a concessioner provides regularly scheduled shuttle trips across the lake between South Jenny Lake and the Hidden Falls Trailhead.

Ground Water

Ground water recharge occurs by infiltration of precipitation, streamflow leakage, irrigation water, and inflow from other aquifers. Water level contours indicate that ground water flows topographically from high areas toward the Snake River and southwest through the valley in the general direction of the river. The data indicate that the water quality of the alluvial valley aquifer is excellent; it supports utilization for drinking water, recreation, and other commercial uses. Much of the aquifer exhibits high permeability and interconnection to the rivers and lakes, making it vulnerable to contamination from the facilities, visitor use, and transportation corridors that exist in the recharge areas.

Wetlands

The ACOE and EPA have defined wetlands as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (Environmental Laboratory 1987).

Section 404 of the Clean Water Act addresses activities involving the discharge of pollutants into wetlands. The ACOE and EPA regulate activities involving the discharge of dredged or fill material into wetlands and other waters of the United States using the Section 404 guidelines and permitting process. The NPS has issued Director's Order #77-1 (issued 10/22/98, reissued 10/30/02) based on wetland protection measures described in EO 11990. It states that actions that may alter NPS lands are required "to avoid to the extent possible the long- and short-term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect

support of new construction in wetlands wherever there is a practicable alternative." Open water habitats are also regulated by Section 404 of the Clean Water Act, and, for the purposes of this analysis, are addressed as if they were wetlands.

Ecological processes associated with wetlands and open water habitats provide a variety of environmental maintenance functions on global, regional, and local scales. Disruption of wetland function can alter these processes and ultimately curtail many of these important services. Little research has been conducted on the overall ecological value of wetlands in the Rocky Mountains. However, wetland functions identified in other regions of North America can be applied to park wetlands with some reliability until more specific information is gathered. Ecological benefits believed to be associated with wetlands were compiled by Minta and Campbell (1991) and include: (1) atmospheric, climatological, and meteorological stabilization; (2) groundwater recharge or discharge; (3) flood control; (4) erosion control; (5) water purification; (6) nutrient cycling; (7) primary production; and (8) biotic community support.

Three wetland types, described below, are expected to be present within the project area (Figure 15).

Palustrine Emergent Wetlands

These wetlands are characterized by erect, rooted, herbaceous hydrophytic plants, excluding mosses and lichens. Plant species that dominate emergent wetlands in the Park include sedges, rushes (*Juncus* spp.), spikerush (*Eleocharis* spp.), and various hydrophytic grasses. Palustrine emergent wetlands provide valuable forage for ungulates and avian species, especially during the early growing season when other forages have not yet greened up (Hansen et al. 1996). These wetlands also provide cover for nesting, resting, and foraging waterfowl and upland birds, habitat for small mammals and reptiles, and reproductive habitat for amphibians.

Palustrine Scrub-Shrub Wetlands

These wetlands are dominated by woody vegetation less than 20.0 ft (6.1 m) tall. Plant species may include true shrubs. Scrub-shrub wetlands may represent a seral stage leading to a forested wetland or they may be stable, self-perpetuating plant communities. Palustrine scrub-shrub wetlands in the Park are usually dominated by willows but may also be dominated by alders (*Alnus* spp.), birches (*Betula* spp.), or other shrubs. Scrub-shrub wetlands provide important cover and breeding and foraging habitat for a variety of wildlife species, including moose, neotropical songbirds, and small mammals.

Lacustrine Wetlands

These wetland areas include shallow water, lakes and ponds, and stream channels within which water is present on an annual, but not necessarily permanent, basis. Macrophytic plants are usually present and include a variety of rooted and floating species. Shallow areas of open water habitat provide nesting, cover, and foraging opportunities for a variety of avian species, small mammals, and fish.

Several site-specific wetland assessments and delineations have been conducted for infrastructure-related projects in the Park. However, detailed wetland mapping of the proposed transportation corridors is currently limited. National Wetlands Inventory (NWI) mapping was completed in 1990 by the USFWS and is available for the entire project area (USFWS 1990). The Teton County Soil Survey (Young 1982) and corresponding hydric soils list (USDA 1991) were also used to determine the potential presence of wetlands within the project area. Additionally, the most recent Grand Teton land-cover type classification (Cogan et al. 2005), which includes locations of vegetative cover types typical of wetlands in the project area, contributed to a preliminary assessment of wetland impacts. The primary wetland and open water features found along each major roadway within the project area are presented in Table 10 and depicted on Figure 15.

FIGURE 15
WETLANDS IN THE PROJECT AREA

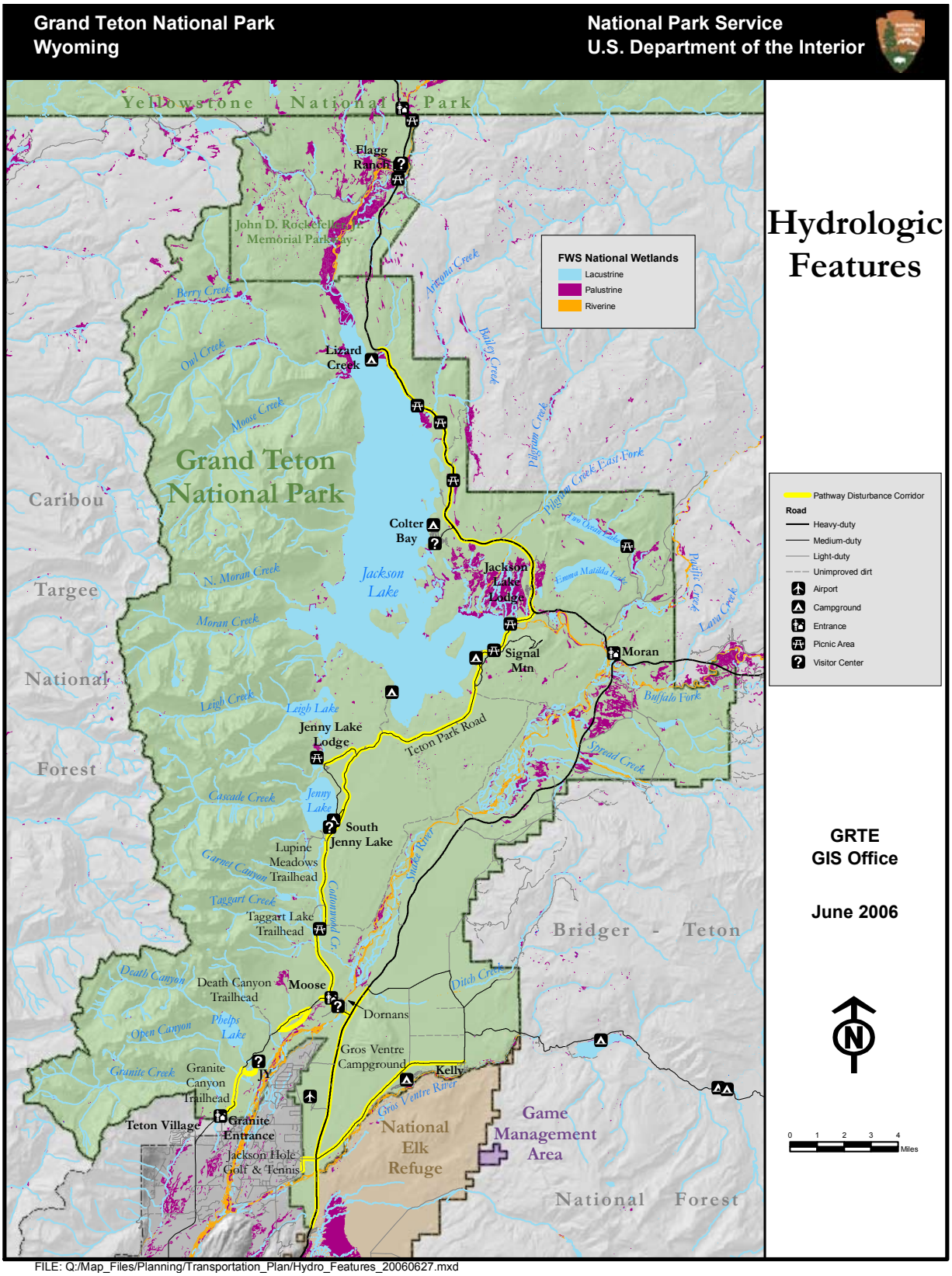

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TABLE 10 DOMINANT WETLAND AND OPEN WATER FEATURES BY PROJECT AREA ROADWAY	
Road	**Cover Type Description**
U.S. Highway 26/89/191	The road is located primarily in uplands, except where it crosses the Gros Ventre River. Substantial portions of the Gros Ventre River annual flow are appropriated and diverted for irrigation practices, causing river flows to vary greatly. Although NWI mapping does not indicate the presence of wetlands, irrigation practices may provide the hydrological support for palustrine emergent wetlands adjacent to portions of this roadway. From Moose Junction, the road parallels the Snake River on alluvial terraces above the river and is located in uplands until it descends into an extensive wetland mosaic dominated by palustrine emergent and scrub-shrub wetlands northeast of Deadman's Bar Road. As the road continues north, it crosses Spread Creek and the Buffalo Fork River and bisects extensive palustrine scrub-shrub and palustrine emergent wetland mosaics interspersed with uplands.
Teton Park Road	The road is primarily located in and adjacent to uplands. However, it crosses the Snake River near Moose, as well as Cottonwood, Taggart and Beaver Creeks, where palustrine scrub-shrub and palustrine emergent wetlands are present. The Teton Park Road parallels Cottonwood Creek north to the Lupine Meadows turn-off. In the Jenny Lake area, the road is located entirely in uplands, even though portions of Jenny Lake Loop Road lie immediately adjacent to Jenny Lake. From North Jenny Lake Junction, the road is located primarily in uplands, except to the northeast of Jackson Lake Dam, where it bisects large expanses of palustrine scrub-shrub wetlands known as Willow Flats. Palustrine emergent wetlands may also be present in this area but were not mapped by the NWI.
North Park Road	From Moran Junction north, the road crosses Pacific Creek and associated palustrine scrub-shrub wetlands and continues west through an extensive mosaic of palustrine emergent and palustrine scrub-shrub wetlands associated with the Oxbow Bend reach of the Snake River. At Jackson Lake Junction, the road bisects palustrine scrub-shrub and palustrine emergent wetlands associated with Willow Flats and Christian Pond. The road crosses Christian and Pilgrim Creeks before reaching Colter Bay Village and Leeks Marina. Various small, named, and unnamed ponds are located near the road. The section from the dam to Lizard Creek crosses Arizona Creek and Lizard Creek and the adjacent riparian zones.
Moose-Wilson Road	From Moose to the Death Canyon Trailhead, the road is located adjacent to extensive palustrine scrub-shrub and palustrine emergent wetlands associated with Sawmill Pond, a spring discharge at the toe of Beaver Creek Bench, and the Snake River. South of the Death Canyon Trailhead, the road lies entirely in forested uplands, except where it crosses Lake and Granite Creeks.

Once an alternative has been selected, a complete wetland delineation of the project area would be performed that provides more accurate locations of wetlands and open water habitats within the project area that could be affected by project implementation. Wetlands would be delineated by qualified NPS staff or certified wetland specialists and marked before any construction begins. All proposed separated, multi-use pathways and infrastructure improvements (regardless of alternative) would be designed taking into consideration wetland resources, such as constructing cantilevered bridge crossings to avoid wetland impacts.

If potential adverse impacts are identified when project locations and design are finalized, a Wetland Statement of Findings would be prepared. The purpose of a Wetland Statement of Findings is to review the proposed plan in sufficient detail to ensure avoidance, to the extent possible, of short-and long-term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative. The statement would describe the effects on wetland values associated with the selected alternative and provide a thorough description and evaluation of mitigation measures developed to achieve compliance with EO 11990 and NPS Director's Order #77-1. The overall purpose of the statement is to ensure "no net loss" of wetland functions or values.

Threatened and Endangered Species / Bird Species of Special Concern and Neotropical Migratory Birds / Wildlife

Threatened and Endangered Species

The Park contains five vertebrate species and no plant species listed under the ESA as threatened, endangered, experimental, or candidate species (Table 11).

Bald Eagle (Haliaeetus leucocephalus)

The bald eagle was federally listed as an endangered species in Wyoming in March 1967 under the Endangered Species Preservation Act of 1966 (32 FR 4001) and was re-listed in 1978 under the ESA of 1973 (43 FR 6233). The Pacific States Bald Eagle Recovery Team was formed as a result of the 1978 listing, and a recovery plan was completed in 1986 (USFWS 1986). Grand Teton National Park lies within the Greater Yellowstone Recovery Area (Zone 18 in the Recovery Plan). As a result of the implementation of recovery plans, bald eagles began to increase by the mid-1980s. Consequently, the status of the bald eagle in Wyoming was changed to threatened on July 12, 1995 (64 FR 35999-36010). Recovery goals were subsequently met, and in July 1999, the USFWS announced a proposal to remove the bald eagle from the endangered species list. The public comment period for the proposed delisting of the bald eagle was reopened in 2006. No final action on this proposal has occurred to date. The bald eagle, besides being a "species of special concern" in the Park, is also afforded protection under the 1918 Migratory Bird Treaty Act (16 U.S. Code 703) and 1940 Bald Eagle Protection Act (16 U.S. Code 668).

Between 1970 and 1995, the bald eagle population in the GYA increased exponentially. This growth was attributed to a reduction in the level of environmental contaminants (i.e., DDT) and the protection of nesting habitat (Stangl 1999).

Grand Teton National Park contained 14 known nesting territories and pairs in 2005; however, not all pairs breed in the Park each year (Table 12). Known territories are located along the shorelines of the Snake River, Jackson Lake, and adjacent riparian areas. Bald eagles that nest along the Snake River may remain on their nest territories throughout the year, occasionally leaving for short periods during the non-breeding season to exploit abundant or

TABLE 11
FEDERALLY LISTED THREATENED, ENDANGERED, AND EXPERIMENTAL WILDLIFE SPECIES OCCURRING OR POTENTIALLY OCCURRING IN THE PROJECT AREA

Wildlife Species	Common Name	Status
Haliaeetus leucocephalus	Bald eagle	Threatened
Lynx canadensis	Canada lynx	Threatened
Ursus arctos horribilis	Grizzly bear	Threatened
Canis lupus	Gray wolf	Threatened
Coccyzus erythropthalmus	Yellow-billed cuckoo	Candidate

Data source: USFWS 2002.

ephemeral food sources elsewhere. Eagles feed primarily on fish, waterfowl, and carrion.

Bald eagle management in the Park involves conducting annual nest surveys, establishing seasonal area closures around bald eagle nest sites to protect them from human disturbance, and monitoring of annual nest territory occupancy and productivity. Seasonal area closures usually occur from February 15 until August 15 and involve a one-half-mile (0.8-km) buffer zone around active bald eagle nests to provide protection from human disturbance.

Nest building or repair intensifies in early February, and egg laying occurs in late March or early April, followed by a 35-day incubation period (Stangl 1994; Swensen et al. 1986). Most nesting territories are located along major rivers or lakes within approximately 3.0 miles (4.8 km) of their inlets or outlets or along thermally influenced streams or lakes (Alt 1980). Nests and roosts commonly occur in mature and old growth trees in multi-layered stands of Douglas-fir, cottonwood, and spruce. Nearby food, suitable perches, and security from human activities are important habitat components for both nest and roost sites.

TABLE 12
BALD EAGLE TERRITORIES AND PRODUCTIVITY IN GRAND TETON NATIONAL PARK 1987-2005

Year	Occupied Territories	Breeding Pairs	Productive Pairs	Young Fledged	Young / Occupied Territory	Young / Productive Nest
1987	8	8	6	10	1.25	1.67
1988	6	6	5	8	1.33	1.60
1989	8	6	3	3	0.38	1.00
1990	8	7	4	6	0.75	1.50
1991	9	8	5	5	0.55	1.00
1992	9	7	5	10	1.10	2.00
1993	10	8	6	9	0.90	1.50
1994	11	9	8	13	1.18	1.63
1995	11	9	4	5	0.45	1.25
1996	9	7	4	7	0.78	1.75
1997	7	6	3	4	0.57	1.33
1998	8	6	6	9	1.13	1.50
1999	8	6	5	6	0.75	1.20
2000	7	7	4	6	0.86	1.5
2001	11	10	5	5	0.46	1.0
2002	12	12	5	8	0.67	1.6
2003	12	12	7	10	0.83	1.43
2004	11	11	5	6	0.54	1.20
2005	14	14	7	10	0.71	1.42

The nearest bald eagle nests, located approximately 1.25 and 1.75 miles (2.0 and 2.8 km) from the proposed project area, are located along the Snake River. The project area does contain suitable nesting habitat in areas along the Snake River near the Moose Bridge and Jackson Lake Dam. These areas and areas near Cottonwood Creek also contain foraging habitat for bald eagles.

Canada Lynx (Lynx canadensis)

The Canada lynx is a federally threatened species under the ESA as of 2000. Lynx are considered rare in Wyoming (Nordstrom 2003) and are classified as a Species of Special Concern–Native Species Status 1 by the WGFD, indicating that habitat is limited and populations are restricted or declining (WGFD 2005). Historical information suggests that lynx were present but uncommon in YNP from 1880 to 1980. Records of lynx in Wyoming show the highest concentrations of confirmed observations in the northwest corner of the state, including YNP, Grand Teton National Park, and the Teton, Gros Ventre, Absaroka, Beartooth, Wind River, and Wyoming Mountain Ranges (Reeve et al. 1986).

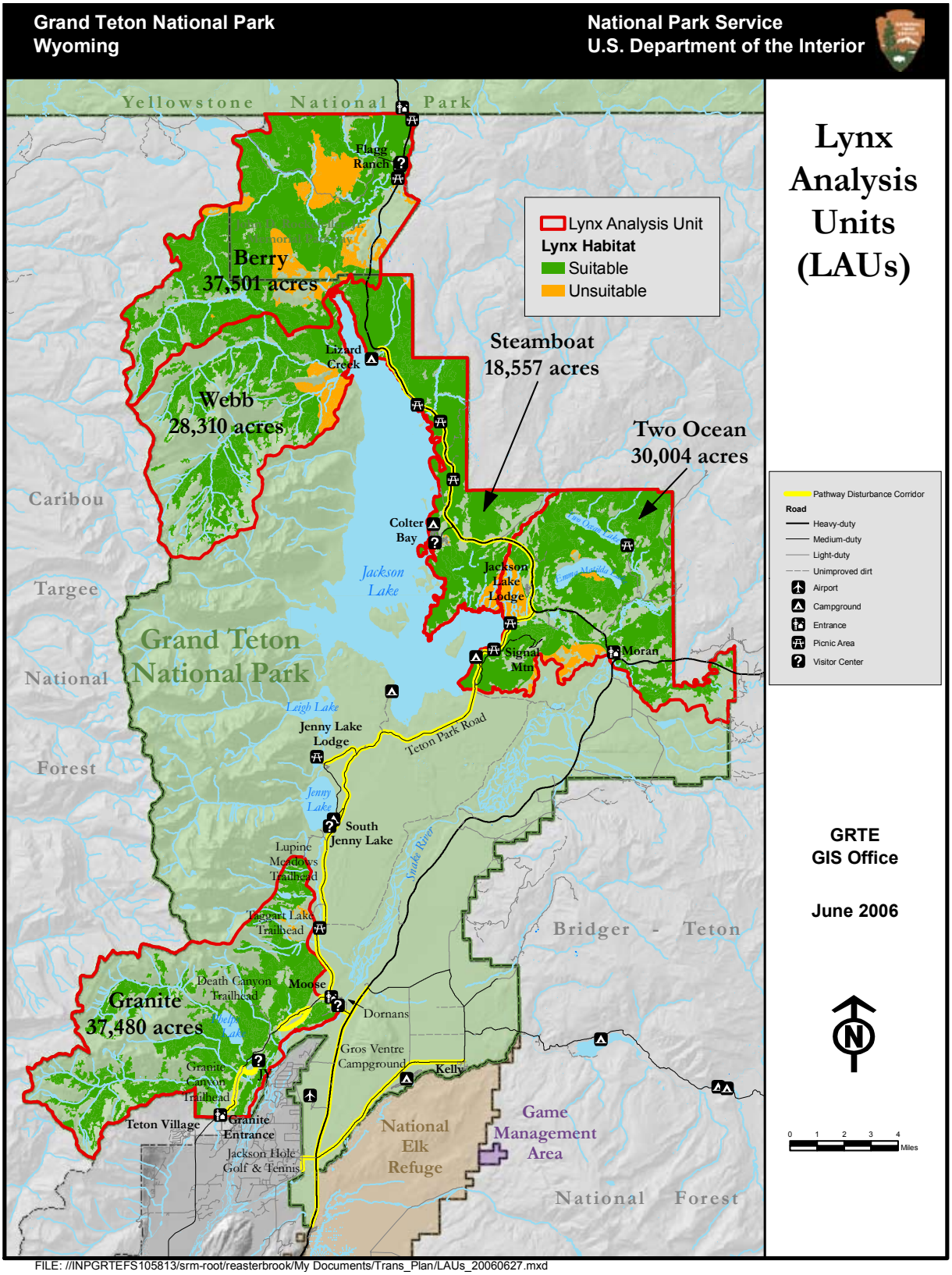
Lynx are solitary carnivores generally occurring at low densities in boreal forests. Distribution and abundance of this species is closely tied to the snowshoe hare (*Lepus americanus*), their primary prey. In Wyoming, lynx occur primarily in spruce/fir and lodgepole pine forests with slopes of 8 to 12 degrees and at elevations from 7,995 to 9,636 ft (2,437 to 2,937 m) (Ruediger et al. 2000). Densely regenerating coniferous forests and regenerating burned areas in mixed species forests provide excellent habitat for snowshoe hares and, therefore, are also important habitat for lynx. Aspen intermixed with spruce, fir, or lodgepole pine (with extensive shrub growth and woody debris) also provides high quality habitat for hares. Sagebrush-grassland cover types support alternative prey for lynx, such as white-tailed jackrabbits, mountain cottontails, and ground squirrels. Dense willow thickets and beaver pond complexes may provide some foraging opportunities. Lynx denning habitat consists of late successional spruce/fir forests on north-facing slopes with relatively high densities of large diameter woody debris. Dispersal corridors, principally continuous conifer forests several miles in width, are critical for lynx travel and dispersal (Tanimoto 1998). Lynx travel corridors may be found in any conifer-covered landscape.

Little information exists on lynx abundance and distribution within Grand Teton National Park. Park records include 12 reports of lynx (Grand Teton National Park, unpublished data), some of which may not be credible because lynx are easily confused with bobcat (*Lynx rufus*). Two lynx sightings have been reported in the Park in the past 10 years, one at the Murie Ranch in 1992 and one in Moran Canyon in 1998 (D. Cunningham 2002, pers. comm.). McKelvey et al. (2000) documented 22 reports of lynx in the Park between 1917 and 1997, with the majority of sightings occurring in the mid-1970s and early 1980s. Recent efforts to document lynx in Grand Teton National Park and YNP have had limited success. A 105-mile (169-kilometer) snow-track transect survey in the northern Grand Teton National Park and vicinity in 1998 found no evidence of lynx (S. Patla 2000, pers. comm.). Pyare (2002) located possible lynx tracks and a day-bed along Arizona Creek (Steamboat Lynx Analysis Unit [LAU]) and productive snowshoe hare habitat near Grassy Lake Reservoir and Glade Creek (Berry LAU) in Grand Teton National Park during lynx surveys. However, no evidence of lynx was found in 3 years (2000-2002) of systematic hair snaring surveys in the Park's best lynx habitat. In YNP, at least four individual lynx, including two kittens born in different years, have been documented between 2001 and 2004 (Murphy et al. 2004). These researchers concluded that the presence of offspring indicates that resident breeding individuals are present within YNP. During the summer of 2004, a male lynx translocated to Colorado traveled through YNP and Grand Teton National Park (K. Murphy 2003, pers. comm.).

Whether or not lynx currently reside in the Park is unknown. Forest cover types located in the northern, northeastern, and southwestern portions of the Park are within the elevational range and appear to be generally suitable habitat for lynx. Based upon general habitat preferences and existing vegetative cover types, potential habitat for lynx is believed to be present in Grand Teton National Park. Low densities of snowshoe hares, may mean that lynx, if present, would occur at low densities, perhaps only as transients (S. Cain 2002, pers. comm.).

LAUs and potential lynx habitat within Grand Teton National Park are depicted in Figure 16. The five LAUs cover 149,827 acres (60,633 ha) and include approximately 96,000 acres (38,850 ha) of mapped lynx habitat. In addition, important linkage areas connecting larger contiguous blocks of habitat occur within the Park at the base of the Teton Range, connecting the Granite LAU with the Webb LAU on the west side of Jackson Lake, and the Granite LAU to the Two Ocean LAU on the east side of Jackson Lake and along the Snake River corridor.

FIGURE 16
LYNX ANALYSIS UNITS (LAUs)



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Other regionally important linkage zones occur around Togwotee Pass and the Teton Wilderness, linking areas in the southern GYA to YNP, at Teton Pass connecting the southern GYA to the Teton Range, and at the head of Granite Canyon connecting the east and west sides of the Teton Range (Claar et al. 2003).

Project area roads traverse three of the five LAUs. The southern portion of North Park Road, which is part of proposed improvements under Alternatives 3, 3a, and 4, occurs within the Steamboat and Two Ocean LAUs, and the Teton Park Road near Jackson Lake Dam occurs within the Two Ocean LAU. The Moose-Wilson Road passes through the low elevation portion of the Granite LAU. Although most of the Teton Park Road from Moose to North Jenny Lake Junction is not within an LAU, it falls within a linkage area.

Grizzly Bear (Ursus arctos horribilis)

Grizzly bears once ranged over most of western North America, from the Arctic Ocean to central Mexico. Although still abundant throughout much of Canada and Alaska, the range of grizzly bears in the lower 48 states is confined to six separate areas in Wyoming, Montana, Idaho, and Washington, covering less than 1 percent of its historic range in the lower 48 states (USFWS 1993). Grizzly bears currently inhabit much of the GYA, including portions of YNP, Grand Teton National Park, and the Bridger-Teton, Shoshone, Caribou-Targhee, Gallatin, and Custer National Forests.

Between 1800 and 1975, the grizzly population in the contiguous United States was reduced from an estimated 100,000 animals to less than 1,000 because of habitat destruction and intensive persecution from livestock interests (USFWS 1982). By 1974, some scientists estimated that fewer than 200 grizzly bears remained in the GYA (Craighead et al. 1995). In 1975, grizzly bears were listed as threatened under the ESA in the lower 48 states. In 1982, a recovery plan for grizzly bear populations in the contiguous United States was completed and implemented (USFWS 1982). Guidelines for grizzly bear recovery were developed in 1983 by the Interagency Grizzly Bear Committee (IGBC [USFS 1986]). The IGBC is comprised of representatives from the NPS, USFWS, USFS, BLM, and the state wildlife agencies of Idaho, Montana, and Wyoming. Recovery zones and population goals were established in the Grizzly Bear Recovery Plan (USFWS 1982) and the Revised Grizzly Bear Recovery Plan (USFWS 1993). These plans established six grizzly bear recovery zones in the contiguous United States, one of which encompasses a portion of the GYA, including much of Grand Teton National Park (Figure 17).

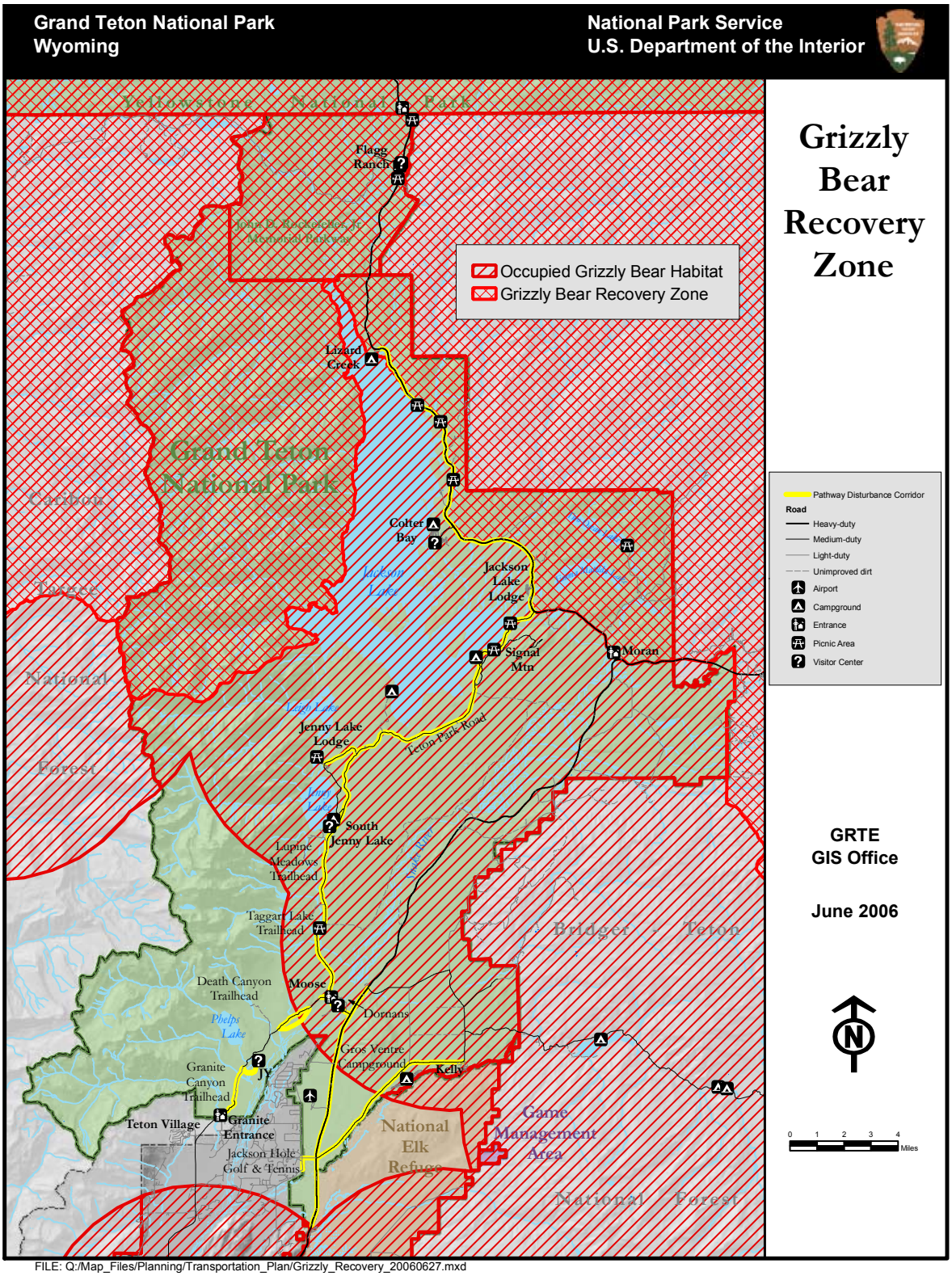
The Revised Grizzly Bear Recovery Plan established measurable population parameters as indicators of population status for the GYA (USFWS 1993). The USFWS would consider removing the GYA population of grizzly bears from threatened species status when these demographic recovery goals are met. The Revised Grizzly Bear Recovery Plan (USFWS 1993) recovery parameters for the GYA are:

- An average of 15 adult females with cubs-of-the-year over 6 years inside the recovery zone and within a 10.0-mile (16.1-kilometer) area.
- Sixteen of 18 Bear Management Units (BMUs) occupied by females with young for 6 years; no two adjacent BMUs shall be unoccupied.
- Known human-caused mortality not to exceed 4 percent of the minimum population estimate based on the most recent 3-year sum of females with cubs.
- No more than 30 percent of this 4 percent mortality limit shall be females. These mortality limits cannot be exceeded during any 2 consecutive years for recovery to be achieved.

After grizzly bears were listed as a threatened species in 1975, population estimates in the GYA continued to decline through the early 1980s (Eberhardt and Knight 1996). Starting in the mid-1980s, annual minimum population estimates have increased approximately 2 to 5 percent (Haroldson et al. 1998, Haroldson et al. 2004), largely due to lower numbers of human-caused grizzly bear mortality, especially of adult female grizzly bears. In 2003, 53 unduplicated females with young were estimated in the GYA (Haroldson et al. 2004), 49 were observed in 2004 (IGBST 2004) and 31 in 2005 (IGBST 2006).

Absolute minimum population estimates for grizzly bears in the GYA, based on counts of adult females with cubs-of-the year, have increased from a low of 99 in 1979 (Haroldson et al. 1998) to a high of 431 in 2004 (M. Haroldson 2006, pers. comm.). Eberhardt et al. (1994) evaluated population trends based on reproductive and survival rates and estimated a rate of increase of 4.6 percent annually since the mid- to late-1980s. Prior to delisting, habitat-based recovery criteria, a conservation strategy that demonstrates that adequate regulatory mechanisms are in place to ensure long-term protection of grizzly bears in a primary conservation area (PCA), and state plans that outline management strategies outside of the PCA must be developed and approved by the USFWS.

FIGURE 17
GRIZZLY BEAR RECOVERY ZONE IN THE GRAND TETON NATIONAL PARK AREA



Source: Schwartz et al. 2002

All grizzly bear population recovery parameters were achieved for the first time in 1994, but grizzly bear mortality limits were exceeded during the next 3 years (1995-1997). Population recovery parameters were again achieved from 1998-2003 and habitat-based recovery criteria, a conservation strategy (USFWS 2003), and state plans were developed. However, recovery mortality limits were exceeded again in 2004 and in 2005 (Haroldson and Frey 2006). Scientists reviewing the data believe that the mortality thresholds are sufficiently conservative such that even though the previously set objectives have been exceeded, the ecosystem's grizzly bear population continues to be stable or slightly increasing.

On November 15, 2005, the USFWS proposed delisting the Yellowstone Distinct Population Segment (DPS), announcing that based on the best scientific and commercial information available, the recovered population no longer meets the ESA's definition of being threatened or endangered. The state and federal agencies' agreement to implement the extensive conservation strategy and state management plans will ensure that adequate regulatory mechanisms remain in place and that the Yellowstone grizzly bear population will not become an endangered species within the foreseeable future throughout all or a portion of its range. The public comment period for this proposal has ended, and the USFWS will likely issue a final delisting rule in the near future.

Approximately 125,000 acres (50,586 ha) of Grand Teton National Park are within the PCA identified in the Conservation Strategy for the Grizzly Bears in the Yellowstone Ecosystem (USFWS 2003). Development within the PCA is restricted as the strategy requires a no-net-loss of secure grizzly bear habitat based on secure habitat that existed in 1998.

Background

The life history of the grizzly bear is well documented, and ongoing research continues to add substantive details and knowledge to this large dataset. Craighead and Mitchell (1982) characterized essential grizzly bear habitat as space, isolation, sanitation, food, denning sites, vegetation types, and safety. Grizzly bears require large home ranges (50 to 300 square miles for females; 200 to 500 square miles or more for males), encompassing diverse forests interspersed with moist meadows and grasslands in or near mountains. In the spring, bears usually range at lower elevations but can be found at a wide elevational range throughout the non-denning period. Typical den sites are situated on high, remote mountain slopes where deep snow functions as insulation and persists until spring (Podruzny et al. 2002). Grizzly bears often dig beneath the roots of large trees to create hibernacula.

Food habits of grizzly bears in the GYA have been described by Knight and Knight (1984) and are strongly influenced by seasonal variation in food availability. In general, whitebark pine nuts, graminoids, and ungulates are the most important foods in the grizzly bear's diet, but fish, small mammals, herbaceous vegetation, tubers, fruit, and insects also comprise a portion of their diet (Mattson and Knight 1991). Ungulate carcasses are an important high quality food source for bears (Mattson 1997) and will often attract and hold bears in localized areas for periods of several days to a week or more.

The greatest threat to grizzly bears is human-caused mortality. Grizzly bears can become habituated to humans because of attractants such as garbage, pet foods, livestock carcasses, and improper camping practices. These attractants usually lead to conflicts between people and bears, and the most common outcome is that the bear is ultimately killed. More recently, however, the number of bears killed in conflicts with hunters throughout the ecosystem has increased, adding to numbers associated with unsecured food (Gunther et al. 2004).

Occurrence Within the Project Area

Grizzly bear occurrence in Grand Teton National Park has increased during the past 20 years, most likely in response to increases in bear densities throughout the GYA (Pyare et al. 2004; Schwartz et al. 2002). Grizzly bears are now relatively common in the southern GYA, including the Gros Ventre Mountains southeast of Grand Teton National Park, and are regularly observed in the Teton Mountain Range north of Paintbrush Canyon and the Badger Creek drainage (Grand Teton National Park, unpublished data). Grizzly bears have been observed on the valley floor south of Triangle X Ranch, at Jackson Lake, in Death Canyon, and south of Grand Teton National Park in the vicinity of Teton Village and along the Snake River south of Jackson (Schwartz et al. 2002). In addition, a young male radio-collared grizzly bear used the Bradley-Taggart Lakes and White Grass areas for several weeks in 2005 (IGBST, unpublished data), providing empirical evidence for the continued southward movement of grizzly bears in the Teton Range.

Management of grizzly bears and their habitat in Grand Teton National Park follows IGBC guidelines (USFS 1986) and the Park's Human-Bear Management Plan

(NPS 1989). These guidelines were developed to provide effective direction for the conservation of grizzly bears and their habitat to federal agencies responsible for managing land within the recovery zone. The objectives for managing grizzly bears in Grand Teton National Park (NPS 1989) are to:

- Restore and maintain the natural integrity, distribution, and behavior of grizzly bears.
- Provide opportunities for visitors to understand, observe, and appreciate grizzly bears.
- Provide for visitor safety by minimizing bear/human conflicts, by reducing human-generated food sources, and by regulating visitor distribution.

In order to achieve grizzly bear management objectives in Grand Teton National Park, the Human-Bear Management Plan (NPS 1989) calls for educating the public and providing information on grizzly bear occurrence and how to avoid bear encounters by removing artificial food sources, enforcing regulations, managing and controlling nuisance bears, and continuing to conduct grizzly bear research.

Management of grizzly bears in both the GYA and Grand Teton National Park has been highly successful in promoting grizzly bear recovery and reducing bear-human conflicts (e.g., property damages, incidents of bears obtaining human food, bear-inflicted human injuries) and human-caused bear mortalities in the Park. Recreational and administrative facilities, human activities, and human waste (garbage and sewage) in Grand Teton National Park are managed in a manner that minimizes the potential for human-caused grizzly bear mortalities. Bears that are typically wary of humans will often tolerate people at close distances when carcasses are available due to the high quality of this bear food. Carcasses on or within 330 ft (100 m) of roads may create large "bear-jams" and potentially pose a hazard to bears that could be hit by vehicles while approaching carcasses to scavenge. To reduce these risks, road-killed carcasses of large animals located on and within approximately 330 ft (100 m) of roads are dragged away from roads or are loaded into trucks and hauled to areas away from visitor activity.

Eighteen grizzly bears have been road-killed within the GYA since 1977 (M. Haroldson 2006, pers. comm.), including two within Grand Teton National Park. Additionally, a young male grizzly bear found dead within 330 ft (100 m) of Teton Park Road near Jackson Lake Junction in May 2003 may have been struck by a vehicle. Although the cause of death was undetermined, injuries sustained by the bear and believed to contribute to its death were, in part, consistent with expected trauma associated with a vehicle collision.

Gray Wolf (Canis lupus)

The northern Rocky Mountain wolf (*Canis lupus irremotus*) was initially listed as an endangered species in 1973 (38 FR 14678). Due to a lack of consensus on taxonomic classification, the entire species (*Canis lupus*) was listed as endangered in the contiguous United States outside of Minnesota, where it was listed as threatened in 1978 (43 FR 9607). Although gray wolves are native to the GYA (Young and Goldman 1944), human persecution resulted in their extirpation by the 1930s (Phillips and Smith 1996).

Fourteen wolves, representing three packs from Alberta, were released into YNP in March 1995, and an additional 17 wolves from British Columbia were released into more widespread locations throughout YNP in 1996. At the same time, additional wolves were released into the central Idaho wilderness. Wolves reintroduced into YNP and central Idaho are classified as "nonessential experimental" according to Section 10(j) of the ESA. However, in national parks and wildlife refuges, nonessential experimental populations are treated as threatened species and all provisions of the ESA apply (50 CFR 17.83(b)). All wolves occurring elsewhere in the State of Wyoming are classified as nonessential experimental (59 FR 60256).

The recovery criterion for wolf restoration is to maintain at least 30 breeding pairs in three northern Rocky Mountain recovery areas (i.e., GYA, central Idaho, and northwest Montana). Once 30 pairs are established and reproducing across the three recovery areas for 3 successive years in an equitable spatial distribution, as defined by the USFWS, the gray wolf would be biologically eligible for removal from the endangered species list in Idaho, Montana, and Wyoming. Recovery criteria were met in 2002 (Smith et al. 2003) and have been retained each successive year. Idaho and Montana have produced State Wolf Management Plans, and these plans have been accepted by the USFWS. As of July 2006, the State of Wyoming was involved in continued litigation with the USFWS over the latter agency's rejection of the Wyoming Plan. Delisting cannot occur until Wyoming's plan is approved.

Background

Wolf distribution varies depending upon prey abundance and includes a variety of habitats (e.g., grasslands, sagebrush steppes, coniferous and mixed forests, and riparian and alpine areas). Wolves tend to be flexible in

their habitat needs and are considered habitat generalists. Key components of wolf habitat include the following: (1) a sufficient, year-round prey base of ungulates and alternate prey; (2) suitable and somewhat secluded denning and rendezvous sites; and (3) sufficient space with minimal exposure to humans (USFWS 1987).

Low-elevation river bottoms that are relatively free from human influence provide important winter range for ungulates and wolves. Wolves are especially sensitive to disturbance from humans at den and rendezvous sites during the breeding period. Human activity near den sites can lead to pack displacement or physiological stress, perhaps resulting in reproductive failure or pup mortality (Mech et al. 1991). Indirectly, wolves support a wide variety of other species; common ravens, coyotes, wolverines, mountain lion (*Puma concolor concolor*), and bears feed on the remains of animals killed by wolves. Bald and golden eagles routinely feed on the carcasses of animals killed by wolves during the winter. As apex predators, wolves also help regulate the populations of their prey, ensuring healthy ecosystems and greater biodiversity (Terborgh 1988).

Occurrence within the Project Area

At the end of 2005, at least 325 wolves occupied the GYA (Sime et al. 2006). From 1999 to 2005, the Teton Pack was the only wolf pack using Grand Teton National Park consistently, although observations of other wolves with unknown pack affiliations were regularly reported in the Park. In 2006 there were 10 adult individuals that made up the Teton Pack. The traditional home range of the Teton Pack includes a small portion of Grand Teton National Park, with the remainder of its territory within the Gros Ventre River drainage. However, in 2006 wolf dynamics in the Park changed considerably. The Teton Pack's territory was usurped by a new pack, now known as the Buffalo Pack (consisting of 10-11 adult individuals), which denned in an area traditionally used by the Teton Pack. Two other new packs also denned in the Park in 2006, one in the Pacific Creek area (Pacific Creek Pack made up of 9-10 adult individuals) and another in the south end of the Park (Sage Pack made up of 5 adult individuals). In 2006, the Teton Pack used areas mostly south and east of the Park and is not believed to have denned. Other packs in the area include the Gros Ventre, Flat Creek, and Victor-Driggs Packs.

The Gros Ventre Pack resided in the vicinity of Grand Teton National Park from 1999-2001 and may have ventured into the Park from time to time. However, the pack stopped producing pups after two adult Gros Ventre wolves were killed in control actions in summer 2000. Based on the lack of visual observations, winter track counts, and reported sightings, the Gros Ventre Pack is believed to have been defunct until 2006.

Wolf activity in Jackson Hole is concentrated in areas with dense populations of big game, and in the winter, wolves frequent elk feed grounds on the National Elk Refuge and in the Gros Ventre River drainage, Elk Ranch, and Buffalo Valley areas, and some parts of the south end of Grand Teton National Park. Thus, wolves are considered present in small numbers throughout the project area.

Wolf management in the Park consists of monitoring wolf population dynamics and gathering ecological data relevant to the species' return to the GYA. To determine territory sizes and locate dens, collared wolves are monitored using both ground-based and aerial telemetry. By observing dens, birthing dates are estimated and the number of pups counted. In addition, wolf deaths are investigated and wolf-prey relationships are documented by observing wolf predation directly and by recording characteristics of wolf prey at kill sites. Collaborative research is ongoing and represents pioneering work on wolf ecology. All management and monitoring activities are closely coordinated with the USFWS.

Roads represent a source of mortality to wolves in the GYA. One wolf, the alpha male of the Teton Pack, was struck and killed by a vehicle on U.S. 287 near the east boundary of Grand Teton National Park in 1999 (Grand Teton National Park, unpublished data). Three other wolves were killed on park roads in 2005 and 2006 near Moran, Spread Creek, and the Park's south boundary. Twelve wolves were killed by vehicles in YNP between 1995 and 2001. Although road-related wolf mortality has not yet led to the demise of an entire pack, road mortality has led to the loss of a breeding wolf, and therefore, a breeding pair in the GYA (i.e., Teton Pack in 1999 and Chief Joseph Pack in 2001). It is reasonable to expect that additional wolves will be struck and killed by vehicles in the Park in the future.

Yellow-billed Cuckoo (Coccyzus erythropthalmus)

The yellow-billed cuckoo has declined precipitously throughout its range in southern Canada, the United States, and northern Mexico due to habitat loss. It is nearly extinct west of the Continental Divide and is rare in the interior west. Cuckoos are closely associated with broadleaf riparian (i.e., tall cottonwood and willow) forest habitats, which are in decline in most western states.

Yellow-billed cuckoos may occur in the Park but little is known about their status and occupancy in this area.

Suitable cuckoo habitats within the project area include areas along the Snake River, Cottonwood Creek, and Christian Creek. The only sighting of this species reported to the Park was documented in 2001 at Teton Science School's Monitoring Avian Productivity and Survivorship station.

In 1998, an updated ESA petition was filed with USFWS. This petition called for listing cuckoos west of the Continental Divide as either a subspecies (i.e., the western yellow-billed cuckoo) or as a population, which is geographically, morphologically, behaviorally, and ecologically distinct from cuckoo's east of the divide. In addition, the petition asked the USFWS to list the entire species in North American because of ongoing declines east of the continental divide. When the USFWS refused to process the petition, a lawsuit was filed to obtain a review and decision. In February 2000, the USFWS published an initial finding that ESA protection may be needed for western cuckoos, either as subspecies or as a unique population.

Neotropical Migratory Birds and Bird Species of Special Concern

Neotropical Migratory Birds

Neotropical migratory birds that occur in Grand Teton National Park include raptors, passerines, and shorebirds that breed in North America but migrate to Mexico and Central and South America for the winter. In Wyoming, 162 bird species are considered neotropical migrants (Cerovski et al. 2000). Some of these species are also considered species of concern (see following section). Examples of neotropical migratory bird species that are not designated as sensitive and that occur and breed in Grand Teton National Park include, but are not limited to, osprey (*Pandion haliaetus*), chipping sparrow (*Spizella passerine*), ruby-crowned kinglet (*Regulus calendula*), yellow warbler (*Dendroica petechia*), yellow-rumped warbler (*Dendroica coronata*), white-crowned sparrow (*Zonotrichia leucophrys*), western tanager (*Piranga ludoviciana*), western meadowlark (*Strunella neglecta*), green-tailed towhee (*Pipilo erythrophthalmus*), Lincoln's sparrow (*Melospiza lincolnii*), and savannah sparrow (*Passerculus sandwichensis*). Neotropical migratory birds migrate from their wintering grounds to Grand Teton National Park or further north between April and early June and then return to their winter habitat from September through early October. Those species that nest in the Park begin breeding between early May and mid-June and may brood young into August.

Neotropical migratory birds are of particular interest to wildlife managers for several reasons. First, neotropical migratory birds play a major role in the health and functioning of ecosystems, as consumers of insects, dispersers of seeds, and pollinators of flowers (Robinson 1997). Second, neotropical migratory bird populations have experienced declines throughout the last several decades. Many reasons are responsible for these declines including habitat fragmentation and loss, land-use changes in both breeding and wintering habitats (Nicholoff 2003), a reduction in migratory stop-over habitat (Robinson 1997), pollution, and increases in predators and nest parasitism (e.g., domestic cats, brown-headed cowbirds). Lastly, neotropical migratory birds can be used by managers as a tool to monitor effects of land-use practices and landscape changes, as well as the health of a particular habitat or system (Hutto and Young 2002).

All migratory birds in the Park are protected under the Migratory Bird Treaty Act (16 USC 703), enacted in 1918. This Act prohibits the taking of any migratory birds, their parts, nests, or eggs. Removal of nests or nest trees is prohibited but may be allowed once young have fledged and/or a permit from USFWS has been issued.

Bird Species of Special Concern

In conjunction with species classification systems generated by the WGFD, Wyoming Natural Diversity Database (WYNDD), and USFWS, Grand Teton National Park maintains a sensitive bird species list that is used for establishing monitoring priorities and for evaluating project impacts. The WGFD classifies certain non-game bird species as "species of special concern" and categorizes these species into a range of priority groups according to their need for special management. This classification system evaluates species' distributions, population status and trend, habitat stability, and tolerance to human disturbance (WGFD 1996). Birds are also considered species of special concern by the WYNDD if they are "vulnerable to extirpation at the global or state level due to inherent rarity, loss of habitat, or sensitivity to human-caused mortality or habitat disturbances" (WYNDD 2002; Fertig and Beauvais 1999). Migratory Bird Species of Management Concern in Wyoming are designated as such by the USFWS (Cerovski et al. 2000). The Wyoming Field Office of the USFWS has developed this list from the Wyoming Bird Conservation Plan compiled by state and federal agencies, non-governmental organizations, and the public. The Wyoming Bird Conservation Plan identifies "priority species" based on a number of criteria, using the best information available. In many cases, this list reflects identified threats to habitat because no information is available on species population trends.

Two priority groups are designated by the USFWS: Level 1 and Level 2. Level 1 species are those that are clearly in need of conservation action. They include species of which Wyoming has a high percentage of and responsibility for the breeding population, and the need for additional knowledge through monitoring and research. The action and focus on Level 2 species is on monitoring rather than conservation action. Level 2 species include those in Wyoming with a high percentage of and responsibility for the breeding population, species whose population trend is unknown, species that are peripheral for breeding in the habitat or state, or species for which additional knowledge is needed. Bird species of special concern that occur in Grand Teton National Park and in the project area are listed in Table 13.

TABLE 13
BIRD SPECIES OF SPECIAL CONCERN IN GRAND TETON NATIONAL PARK AND THE PROJECT AREA

Common Name	WGFD Status[1]	USFWS Status[2]	Habitat type
Northern pygmy-owl	NSS4	none	Forests
Northern goshawk	NSS4	Level 1	Forests
Greater sage-grouse	none	Level 1	Sagebrush
Brewer's sparrow	none	Level 1	Sagebrush
Swainson's hawk	none	Level 1	Sagebrush/open fields
Long-billed curlew	NSS3	Level 1	Sagebrush/open fields
Short-eared owl	none	Level 1	Sagebrush
Bald eagle	NSS2	Level 1	Riparian/lakes/rivers
Great gray owl	NSS4	Level 2	Forests
Calliope hummingbird	none	Level 2	Forests
Lewis' woodpecker	NSS3	Level 2	Forests
Williamson's sapsucker	none	Level 2	Forests
Gray flycatcher	none	Level 2	Forests
Rufous hummingbird	none	Level 2	Forests/meadows
Hammond flycatcher	none	Level 2	Forests
American dipper	none	Level 2	Riparian
Sage thrasher	none	Level 2	Sagebrush
Bobolink	NSS4	Level 2	Sagebrush
Western screech-owl	none	Level 2	Forests
Broad-tailed hummingbird	none	Level 2	Forests/meadows
Vesper sparrow	none	Level 2	Sagebrush
Golden-crowned kinglet	none	Level 2	Forests
Brown creeper	none	Level 2	Forests

[1] ***WGFD Status***:
NSS2 = Populations restricted or declining in numbers and/or distribution; extirpation in Wyoming is not imminent AND ongoing loss of habitat.
NSS3 = Populations restricted or declining in numbers and/or distribution; extirpation in Wyoming is not imminent AND habitat is restricted or vulnerable but no recent or on-going loss; species is sensitive to human disturbance.
NSS4 = Species is widely distributed; population status and trends within Wyoming are assumed stable AND habitat is restricted or vulnerable but no recent or on-going loss; species is sensitive to human disturbance.

[2] ***USFWS Status***:
Level 1 = Conservation Species.
Level 2 = Monitoring Species.

Bird Monitoring in Grand Teton National Park

Songbirds are monitored each summer in Grand Teton National Park using several techniques. For example, Breeding Bird Surveys are conducted to sample birds that breed and nest in a variety of habitats in the Park. A subsample of 30 sites set up by Dr. Cody, UCLA, located throughout the frontcountry and backcountry are also surveyed annually by park personnel and Dr. Cody. Lastly, a long-term landbird monitoring program, initiated in 2005, surveys landbirds that occur in five different habitat types within the Park: sagebrush, aspen, willow, cottonwood, and high elevation.

Results from these surveys indicate that many bird species of special concern and other neotropical migratory bird species are likely present and breed in and adjacent to the project area including many willow and sagebrush obligate birds (S. Wolff 2004, pers. com). These surveys also show that riparian and wetland habitats generally contain the highest density of bird species in the Park.

Specific surveys were conducted in summer 2005 to document the presence of sensitive bird species along the proposed pathway from Moose to South Jenny Lake Junction. The following three areas were surveyed: (1) Windy Point to Beaver Creek, (2) Cottonwood Creek, and (3) Lupine Meadows Junction. Surveys took place during the breeding season and occurred early in the morning when most songbirds are actively singing. Twenty bird species were observed in and along the proposed pathway, most of which are considered common in the Park. Sensitive bird species that were documented include brewer's sparrow, vesper sparrow, greater sage-grouse, and sage thrasher. Also, numerous bird species were seen and heard along the bridge at Cottonwood Creek. This area contains numerous old and decadent cottonwood trees, and the understory is thick with woody vegetation. Because of these characteristics, this area provides excellent nesting habitat for several songbird species (Wolff 2005). Additional surveys in areas not visited in 2005 may be conducted in subsequent years.

Greater Sage-Grouse (Centrocercus urophasianus)

Greater sage-grouse have declined in number and distribution throughout their range. In the west, reductions of up to 51 percent have been recorded, resulting in numerous petitions for listing sage-grouse under the ESA, including in Wyoming. In January 2005, the USFWS completed its status review of the greater sage-grouse and determined that the species did not warrant protection under the ESA at that time (FR/50 CFR Part 17/Vol. 70, No. 8, Wednesday, January 12, 2005, Proposed Rules). The exact cause of sage-grouse decline has not been conclusively identified but is thought to be related to permanent loss, degradation, and fragmentation of key habitat, as well as low nest productivity. State and local working groups have initiated conservation planning efforts that focus on providing guidelines for sustaining and/or perpetuating sage-grouse populations through consistent and current management strategies. In Wyoming, the Wyoming Greater Sage-Grouse Conservation Plan (WGFD 2002) outlines these guidelines.

In Grand Teton National Park, survey results show evidence of even greater local declines than those noted in other areas. For example, since the late 1940s, surveys have indicated a 70 percent decline in the number of grouse observed at the Park's lek sites. (Lek sites are mating grounds generally located in open areas such as meadows, low sagebrush zones, ridge tops, and old lakebeds surrounded by denser sagebrush cover.) In addition, over the last 10 years, the number of active leks in the Park has dropped from eight to three. The reasons for these declines are unknown.

Breeding habitat critical for the survival of sage-grouse populations is characterized by sagebrush-dominated rangelands with a healthy herbaceous understory. Lek attendance, nesting, and early brood rearing all occur within breeding habitats; however, vegetation characteristics differ between each of these areas. Breeding activity begins in mid-March when grouse gather on their leks (Connelly et al. 1981). Three leks are active in the Park and are located near Antelope Flats, the Jackson Hole Airport, and east of Timbered Island.

Soon after breeding, females disperse to nesting areas characterized by relatively dense, tall, mature sagebrush stands (Holloran and Anderson 2004; Connelly et al. 2000). Nests are usually shallow depressions lined with grass, twigs, and feathers and generally are constructed under the tallest shrub in the stand (Keister and Willis 1986). Typically, nests are within 2.0 to 4.0 miles (3.2 to 6.4 km) of the lek, but some nests may be more than 12.0 miles (19.3 km) away (Wakkinen et al. 1992; Autenrieth 1981). In Grand Teton National Park, known nests average 2.0 miles (3.2 km) and range from 1.5 to 6.0 miles (2.4 to 9.6 km) from active leks (Holloran and Anderson 2004) and are located throughout Antelope Flats, Ditch Creek, Baseline Flats, Potholes, east of Timbered Island, east of the Jackson Hole Airport, and along U.S. Highway 26/89/191. During the 2005 surveys, a female sage-grouse was documented

nesting approximately 100 m (330 ft) from the project area just east of Lupine Meadows. This nest was monitored several times throughout the summer and appeared to produce young successfully (Wolff 2005).

Female grouse typically return to the same area each year for nesting and brood rearing. In the event that this nesting territory is occupied in the future by sage-grouse, it is recommended that construction activities be avoided during the nesting period (May-July) to prevent disturbance. Additionally, no egg or nest of any migratory, sensitive, or protected bird species should be removed or destroyed at any time; therefore, it is recommended that the project area be surveyed for nests if construction takes place during the breeding season (Wolff 2005).

Early brood-rearing habitat is typically close to nesting sites (Gates 1985) in dense, mature sagebrush stands (Holloran and Anderson 2004). Brood-rearing occurs from June to mid-July. As the summer progresses, hens and their young will also use relatively open sagebrush stands that have good grass and forb cover (Lyon 2000). Adult and young grouse depend not only on forbs for food during the brood-rearing period but also on insects. As sagebrush habitats desiccate, grouse usually move to more mesic sites (Connelly et al. 1988; Gates 1985). Known brood-rearing locations in Grand Teton National Park include Antelope Flats, Baseline Flats, northeast of the Jackson Hole Airport, north of the Gros Ventre Junction, and southwest of Lost Creek Ranch.

Sage-grouse use dense, tall stands of mature sagebrush during the winter for both food and cover. Low sagebrush stands on open windswept knolls are also used as feeding sites. Sage-grouse widely disperse over wintering areas during mild weather but concentrate in areas with exposed sagebrush as snow depth increases. In Grand Teton National Park, major wintering concentration areas include relatively flat south to west facing slopes, such as south of Blacktail Butte. Other areas in the Park used by sage-grouse in the winter include exposed sagebrush along U.S. Highway 26/89/191, the Jackson Hole Airport, Lost Creek Ranch, Potholes, Wolff Ridge, and areas near the Town of Kelly and the Teton Science School (Holloran and Anderson 2004; Holloran 2001).

While vehicle-sage-grouse mortalities occur in Grand Teton National Park, they are infrequently reported to park biologists. Known vehicle-caused sage-grouse mortalities have occurred along U.S. Highway 26/89/191, especially near Jackson Hole Airport Junction, north of the Moose Entrance Station along the Teton Park Road, and near Windy Point. The number and frequency of grouse-vehicle accidents is unknown but appears to be highest in the spring and summer when birds are traveling from breeding sites to nesting areas.

Portions of the project area contain suitable year-round sage-grouse habitat, particularly areas from Gros Ventre Junction to Moose Junction and from the Moose Entrance Station to Potholes. No leks are directly within the project area but two, the Airport lek and the Timbered Island lek, are one-half and 1.1 miles (0.8 and 1.8 km) from U.S. Highway 26/89/191 and the Teton Park Road, respectively. Radio telemetry data indicate grouse use sagebrush habitats adjacent to U.S. Highway 26/89/191 for nesting, brood-rearing, summering, and wintering (Holloran and Anderson 2004). Other known nesting, brood-rearing, and wintering areas include sagebrush habitats along the east side of the Teton Park Road from the Moose Entrance Station to Potholes. No breeding, nesting, brood-rearing, or wintering habitat is known or likely to occur within the project area north of Potholes.

Wildlife

Grand Teton National Park provides habitat for a variety of wildlife species, including at least 61 mammals, four reptiles, six amphibians, 19 fish, and 299 birds (NPS 2005; NPS 2000). Many of these species are likely to occur in at least some portion of the project area due to the diverse habitat mixture of woodland, riparian-wetland, and sagebrush steppe communities present on the valley floor. Several ungulate species are common in the Park. Information about each of these is provided below.

Rocky Mountain Elk (Cervus elaphus)

Jackson Hole and its vicinity support one of the largest herds of Rocky Mountain Elk in North America. The most recent modeled population estimate for the Jackson elk herd was 12,855 for the biological year ending in May 2006 (WGFD 2006). Summer ranges for Jackson Hole elk are extensive (over 1,000 square miles), with virtually unlimited supplies of forage (Boyce 1989). The availability, abundance, and quality of winter range constrain elk population size in Jackson Hole. Heavy snow accumulation in the mountains and foothills reduces food availability and forces elk to migrate to lower elevations during the winter. Supplemental feeding of large numbers of elk occurs on the National Elk Refuge and WGFD feedgrounds during the winter.

Elk are the most numerous ungulate in Grand Teton National Park. They are highly visible to park visitors and occur at relatively high densities throughout the project area in the summer. Elk reside in both lower and higher elevation habitats throughout the Park, although their distribution and group sizes vary seasonally. Mid- to lower-elevation forested areas and portions of the Snake River riparian zone represent spring calving areas. Within the project area, areas along the Moose-Wilson Road, the Teton Park Road, and Willow Flats are important for elk calving, which peaks around June 1. During calving, cows are often found alone or in small groups. Once calves are capable of staying with their mothers, they join larger nursery bands of other cows, calves, and young bulls. Older bulls usually occur alone or in small groups throughout the summer. Elk are especially visible within the project area in the fall during the rut, which generally begins in late August and extends through November with a peak in breeding behavior from mid-September to mid-October. During evening and early morning hours, elk use the large sagebrush meadows on both sides of the Teton Park Road, especially in the vicinity of Windy Point/Beaver Creek, Timbered Island, Lupine Meadows, and Jenny Lake Junction.

A substantial portion of the Jackson elk herd migrates through the project area during spring and fall movements between summer range (in Grand Teton National Park, on Bridger Teton National Forest lands, and in YNP) and winter range (predominantly on the National Elk Refuge near Jackson). Large numbers of elk move through the Mormon Row hayfields, Antelope Flats, Blacktail Butte, and the Moose-Wilson Road areas of the Park each spring and fall. During migrations, it is not uncommon to observe several hundred elk at one time bedding down, foraging, and/or moving. The migration from winter range to summer range is generally complete by the end of May, and elk are largely absent from the southeastern portion of the project area until the fall migration begins in October and November. Important east-west elk migration routes exist between Moose and the Gros Ventre River, facilitating elk movements from the west side of the Snake River corridor to winter range on the National Elk Refuge. Wacob and Smith (2002) documented two general areas of movement: (1) from the Snake River corridor south of Moose northeast and east towards Blacktail Butte, and (2) from the Snake River corridor south of the airport east towards the Gros Ventre River. Large numbers of elk cross U.S. Highway 26/89/191 between the Snake River overlook (north of Moose) and Gros Ventre Junction. Migration from summer to winter ranges may occur during a few days or span several weeks depending upon weather, snow accumulations, hunting seasons, and distance traveled.

Roads are a major source of mortality for elk, with elk being the second most commonly road-killed large animal within the Park. Between 1992 and 2005, 323 road-killed elk were documented on park roads (Table 14). Most elk road-kills occur during the summer months. Within the project area, elk mortality hotspots included U.S. Highway 89/191 between Moose and Moran, especially near Blacktail Butte and Triangle X Ranch, the Teton Park Road near Windy point, and North Park Road near Pacific Creek (Biota 2003).

Shiras Moose (Alces alces shirasi)

Shiras Moose are widely distributed throughout Jackson Hole and can be found within the project area anytime of the year. Recent estimates suggest that the moose population in Jackson Hole has declined from a high in excess of 3,500 animals to approximately 1,700 individuals (D. Brimeyer 2003, pers. comm.).

Moose are generally found at higher elevations in the summer and in riparian areas throughout the year. In the Jackson area, they are also frequently observed in sagebrush-steppe habitats during the winter and early spring where they browse on bitterbrush, especially near Airport Junction, Moose Junction, and Antelope Flats near Ditch Creek. The entire Snake River drainage and low elevation portions of the Gros Ventre River drainage within the project area represent either “winter-yearlong” or “crucial moose winter range” (WGFD, unpublished data). Moose densities along the Snake River north of the Gros Ventre River confluence average about five moose per mile (Fralick 1989) but vary both seasonally and annually. Increases may occur during the autumn as the rutting season progresses, during winter when moose move to lower elevations, and during harsh winters. In contrast, moose densities at lower elevations may decrease when winters are mild or where there are high levels of human activity (Minta and Campbell 1991). As with many ungulates, severe winters appear to be a key factor causing population declines. Although willow and spruce forest vegetation types are preferred during winter, moose will select and use other habitat types based on snow depth (Matchett 1985). As winter progresses and snow accumulations become greater, moose make use of older, denser stands of trees with a high conifer component and relatively shallow snow depths (Saether et al. 1989).

The Snake River drainage and the lower elevations of the surrounding mountains are also considered critically important reproductive and maintenance habitat to the Jackson Hole moose population (WGFD, unpublished data). Within the project area, riparian areas along the Gros Ventre River, the Snake River, and Willow Flats are important calving areas for moose. Moose thrive in seral stages of shrub and tree communities (Coady 1982), and environmental disturbances that disrupt existing vegetative patterns and promote the formation of ecotones are generally beneficial to moose (Tefler 1978). Shrub communities interspersed with forest cover and riparian willow stands provide winter range to moose in Wyoming (Houston 1968). Both lowland and upland climax-shrub habitats are heavily used during summer and fall (Van Ballenberghe and Miquelle 1990). Aquatic vegetation is used extensively where available, particularly in early summer.

Roads are a source of moose mortalities, with 115 road-killed moose documented on park roads between 1992 and 2005 (Table 14). Moose-vehicle collisions most commonly occur in the winter. Within the project area, mortality hotspots for moose occur between the Park south boundary and Moose on U.S. Highway 89/191 and in the vicinity of Willow Flats (Biota 2003).

Mule Deer (Odocoileus hemionus hemionus)

Jackson Hole provides year-round habitat for mule deer, and this species is abundant in the Park during non-winter months. The project area and its vicinity are classified as spring-summer-fall mule deer habitat. Primary mule deer summer range is on mountain slopes surrounding the valley, but mule deer can also be found summering within the Snake River floodplain. Mule deer use of lower elevations (e.g., along the Snake River and on the slopes of buttes and foothills) increases dramatically during the spring and fall months as mule deer migrate to and from winter range. Use of specific migration routes by mule deer in Jackson Hole is not common, and migrating deer apparently use whatever routes are available to them in order to get where they want to go (Campbell 1990). General mule deer movement routes are present within the Park (e.g., along the Snake and Gros Ventre Rivers)

TABLE 14
WILDLIFE SPECIES INVOLVED IN DOCUMENTED VEHICLE COLLISIONS ON GRAND TETON NATIONAL PARK ROADS FROM 1992-2005

Ungulate			Non-ungulate		
Species	**Number**	**Percent of Total**	**Species**	**Number**	**Percent of Total**
Deer	396	37.6	Coyote	43	4.1
Elk	323	30.7	Black bear	27	2.6
Moose	115	10.9	Owl	12	1.1
Bison	70	6.6	Porcupine	11	1.0
Pronghorn antelope	23	2.2	Beaver	8	0.8
			Badger	4	0.4
			Raccoon	4	0.4
			Pine marten	3	0.3
			Sage-grouse	3	0.3
			Wolf	2	0.2
			Mountain lion	2	0.2
			Otter	2	0.2
			Mallard duck	2	0.2
			Fox	1	0.1
			Raven	1	0.1
Total	**927**	**88.0**	**Total**	**125**	**12.0**

and are used by mule deer en route to and from crucial winter range located to the south on the East and West Gros Ventre Buttes. Mule deer winter range is limited in Jackson Hole, and these ranges are generally confined to east-, west-, and south-facing slopes and bottomlands at low elevations in the southern portion of Jackson Hole. Some deer are known to irregularly winter along the Snake River depending upon the severity of the winter and/or the availability of artificial foods intentionally or unintentionally provided by humans outside the Park. The number of deer wintering along the Snake River is unknown but appears to be increasing in response to intentional feeding efforts and recent mild winters.

Roads are a source of mule deer mortalities, with 396 road-killed deer documented on park roads between 1992 and 2005 (Table 14). The majority of deer road kills within the Park occur during the summer. Mortality hotspots occur between the south boundary of the Park and Moose, along North Park Road between Moran and Pilgrim Creek, and in the vicinity of Willow Flats (Biota 2003).

Bison (Bison bison)

A population of bison resides in Jackson Hole and uses portions of the project area. Bison use of the Park usually occurs from spring through fall, and animals typically winter on the National Elk Refuge where they exploit supplemental feed provided to the elk. The Jackson population, including calves, was estimated to be approximately 950 to 1,000 animals in early 2006 (S. Cain 2006, pers. comm.). Because of the availability of supplemental feed on the National Elk Refuge and few sources of mortality, the bison herd will likely continue to increase unless controlled.

Within the project area, bison are frequently found south of Blacktail Butte and east of U.S. Highway 26/89/191. They are also occasionally found east of the Teton Park Road between North Jenny Lake Junction and the Signal Mountain area.

Roads are a source of bison mortalities, with 70 road-killed bison documented on park roads between 1992 and 2005 (Table 14). Most bison mortalities have occurred between North Antelope Flats and Moran.

Pronghorn Antelope (Antilocapra americana americana)

Pronghorn antelope are seasonal residents of the project area. Approximately 150 to 250 pronghorn antelope summer in the Park and Gros Ventre River drainage and generally migrate out of Jackson Hole to winter range in the Green River Basin, approximately 100 miles (160 km) to the south (Sawyer and Lindzey 2000). Historic records and recent research indicate that pronghorn antelope summering in Jackson Hole have migrated as far south as Rock Springs, Wyoming. Pronghorn antelope have been described as opportunistic migrants, because herds may not migrate to specific wintering areas each year (Minta and Campbell 1991). In fact, not all pronghorn antelope leave Jackson Hole every winter, as evidenced by individuals wintering on the National Elk Refuge and East Gros Ventre Butte during the winters of 1976/77, 1986/87, 1992/93 through 1997/98 and 2005/2006 (E. Cole 2006, pers. comm.; Sawyer and Lindzey 2000; Segerstrom 1997). During most years, however, the majority of any pronghorn antelope that attempt to winter in Jackson Hole do not survive because of deep snow. Pronghorn antelope that do migrate into and out of Jackson Hole generally follow a route along the Gros Ventre River, arrive in Grand Teton National Park in May, and depart by late November (Sawyer and Lindzey 2000; Segerstrom 1997). Pronghorn antelope that summer in the Park do not necessarily return year after year, although these particular animals do exhibit high fidelity to winter ranges (Sawyer and Lindzey 2000).

The highest concentrations of pronghorn antelope summering in Jackson Hole occur within the low-lying sagebrush communities on the east and west sides of the Snake River floodplain (Segerstrom 1997), including Baseline Flats, Potholes, Antelope Flats, and Kelly hayfields (Sawyer and Lindzey 2000). Some of these antelope also spend portions of the summer on the National Elk Refuge (Sawyer and Lindzey 2000). Key fawning areas for pronghorns in the Park include the Kelly hayfields, Antelope Flats area, Potholes, Lupine Meadows, and Elk Ranch. Fawning occurs mid-May to mid-July and represents the time of year when this species is most sensitive to human disturbance (J. Berger 2002, pers. comm.). Breeding territories, which are defended by bucks, are also concentrated in Grand Teton National Park. Reproductive rates for pronghorn antelope in Jackson Hole and the upper Gros Ventre River drainage tend to be lower than the rest of the Sublette pronghorn herd to which they belong. This may be because of stress related to a lengthy migration or because there is a higher percentage of barren females that migrate to the Park (Sawyer and Lindzey 2000). It could also be that pronghorn fawns are more susceptible to predation by coyotes (J. Berger 2002, pers. comm.).

Since 1992, 23 road-killed pronghorn have been documented on park roads (Table 14); however, no mortality hotspots have been identified for this species.

Common Mammals

Mammalian predators inhabiting the project area include coyote, bobcat, mountain lion, black bear, badger (*Taxidea taxus*), long-tailed weasel (*Mustela frenata*), short-tailed weasel (*Mustela ermine*), mink (*Mustela vison*), river otter (*Lutra canadensis*), red fox (*Vulpes vulpes*), pine marten (*Martes americana*), skunk (*Mephitis mephitis*), and bats. Small mammals are abundant within the project area and include Uinta ground squirrel, mice, vole, shrew, chipmunk, tree squirrel, raccoon (*Procyon lotor*), marmot (*Marmota* spp.), porcupine (*Erethizon dorsatum*), beaver, muskrat, northern pocket gopher (*Thomomys talpoides*), and snowshoe hare.

Wildlife-Vehicle Collisions

According to Wildlife Incident Reports compiled by the Park, 927 ungulate and 125 non-ungulate species have been involved in documented vehicle collisions between 1992 and 2005 (Grand Teton National Park, unpublished data; Table 14). Nearly 88 percent of animals involved in wildlife-vehicle collisions on park roads during that time were ungulates and included deer (38 percent), elk (31 percent), moose (11 percent), bison (7 percent), and pronghorn antelope (2 percent). Non-ungulate species involved in reported wildlife-vehicle collisions included coyote, porcupine, grizzly bear, black bear, sage-grouse, owl, mountain lion, badger, raccoon, wolf, otter, fox, pine marten, and beaver. One wolf mortality occurred along the road segment between the south boundary and Moose. The other wolf mortality occurred on sections of park roadway outside of the project area. Two grizzly bears have also been killed on park roads. No other threatened or endangered species are known to have been killed by vehicles along any road sections in the Park.

Biota (2003) identified wildlife-vehicle collision "hotspots" throughout Teton County as part of a Jackson area roadway and wildlife crossing study. Within the project area, ungulate "hotspot" collision areas occur near Gros Ventre Junction, Moose Junction, Windy Point, and in the vicinity of Willow Flats near Jackson Lake Dam (Biota 2003). Many physical, biological, and behavioral factors (e.g., sight distance, road width, vehicle speed, weather, roadside vegetation, habitat, migration routes, population size, and traffic) influence the frequency of vehicle collisions with ungulates. Most of these factors are dynamic, both temporally and spatially, making it difficult to predict ungulate-vehicle collisions accurately. However, some analysis has been completed on factors affecting ungulate-vehicle collisions in Grand Teton National Park. O'Quinn and Wengeler (1997) examined the correlation between visibility (as an artifact of vegetation and topography) and wildlife-vehicle collision location and found that wildlife-vehicle collisions occurred most often in areas with high visibility. McClellen (1997) investigated light conditions in relation to roadkill incidents in the Park and found that about 60 percent of wildlife-vehicle collisions occurred at dusk, dawn, or night. About 70 percent of ungulate-vehicle collisions occurred between June and September (Figure 18), although collisions with moose were more frequent during non-summer months. Figure 19 shows the number of wildlife-vehicle collisions in the Park between 1992 and 2005.

The rate (number per mile) of ungulate-vehicle collisions during summer months was found to vary depending upon the road. For instance, some of the highest rates of ungulate-vehicle collision in the Park occur on U.S. Highway 89 between Moose and Leeks Marina (on average 7.4 ungulate-vehicle collisions per mile); and on U.S. Highway 89 between Jackson Lake Lodge Junction and Leeks Marina (8.68 ungulate-vehicle collisions per mile).

Under existing road conditions and vehicle speeds, the number of ungulates struck and killed by vehicles on an annual basis is generally less than 1 percent of current populations. Mortalities at this level are unlikely to have a negative impact on ungulate populations.

Reptiles and Amphibians

Several species of amphibians and reptiles are present in the Jackson Hole area (Baxter and Stone 1980) and within the project area. These include the tiger salamander (*Ambystoma tigrinum melanosticum*), northern leopard frog (*Rana pipiens*), Columbia spotted frog (*Rana luteiventris*), western boreal toad (*Bufo boreas boreas*), western chorus frog (*Pseudacris triseriata maculata*), wandering garter snake (*Thamnophis elegans vagrans*), valley garter snake (*Thamnophis sirtalis fitchi*), rubber boa (*Charina bottae*), northern sagebrush lizard (*Sceloporus graciosus graciosus*), and perhaps bullsnakes (*Pituophis catenifer sayi*). The majority of these species commonly inhabit wet areas within the Snake River riparian zone and elsewhere on the valley floor and foothill regions (Koch and Peterson 1995), with the exception of rubber boas that are typically found in mesic forested areas with heavy ground cover (Baxter and

FIGURE 18
THE NUMBER OF UNGULATE-VEHICLE COLLISIONS BY MONTH ON ROADS IN GRAND TETON NATIONAL PARK

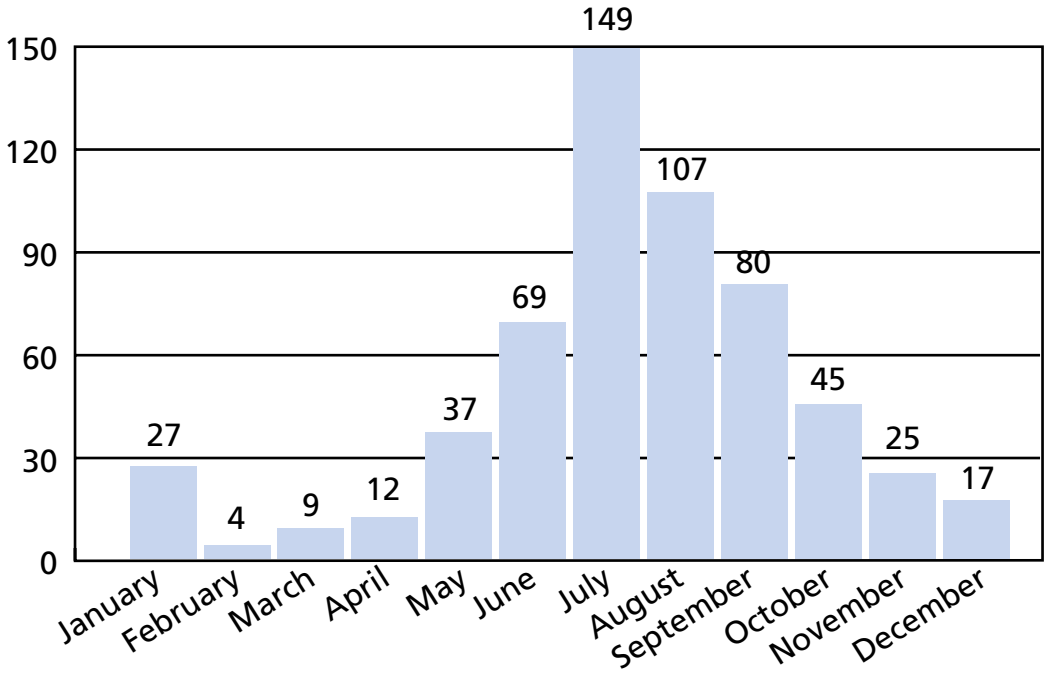
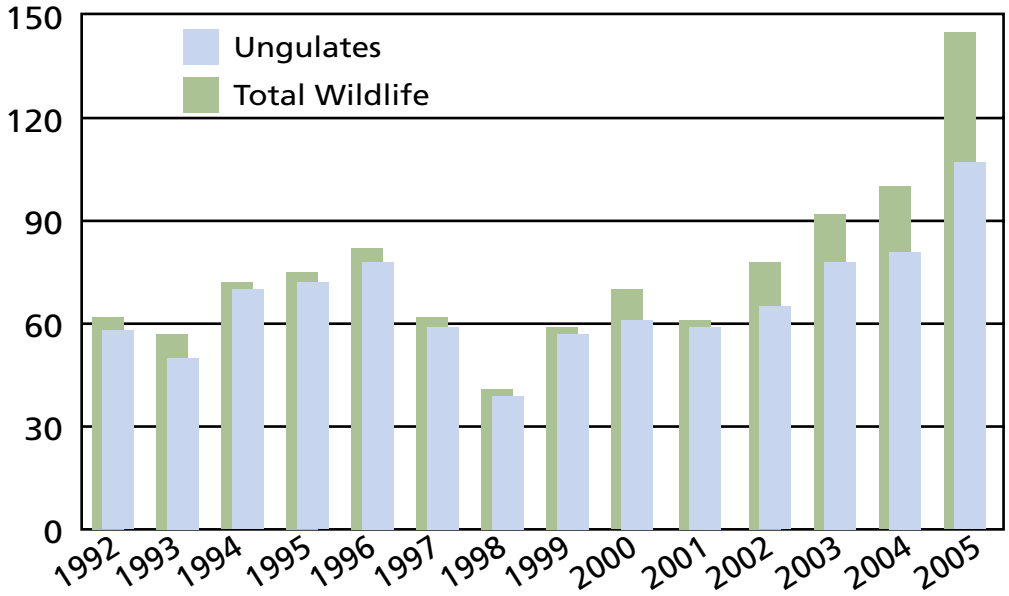


FIGURE 19
DOCUMENTED WILDLIFE/VEHICLE COLLISIONS IN GRAND TETON NATIONAL PARK BETWEEN 1992 AND 2005



Stone 1980). Populations of most of these species, with the exception of northern leopard frogs and sagebrush lizards, appear healthy and are relatively common in the area.

Western boreal toads are known to occur within both the GYA and Grand Teton National Park. The northern Rocky Mountain population within the GYA, including Jackson Hole and the Park, can be locally abundant but appears to be less widespread than it was in the 1950s (Koch and Peterson 1995). Boreal toads breed in slow moving water along the Snake River and in mesic areas in the foothills, montane and subalpine life zones, willow marshes, and aspen or spruce-fir stands (Baxter and Stone 1980). Boreal toads may move considerable distances from water while foraging and use non-riparian habitats, including forested and sagebrush dominated uplands. Boreal toads feed primarily on ants but their diet also includes adult and larval beetles, moths, and other insects (Baxter and Stone 1980).

Northern leopard frogs were historically present in the Park, but observations confirming their continued existence are lacking (Koch and Peterson 1995). In 1995, an individual leopard frog was documented near Flagg Ranch, the only verified sighting in the Park since the 1950s (Patla and Peterson 2004). It is assumed that this species is extirpated from the Park and does not occur within the project area.

The northern sagebrush lizard is the only lizard species known to occur in the GYA and, specifically, in Grand Teton National Park. Although not often found above 6,000 ft (1,828 m) in the northern Rocky Mountains (Baxter and Stone 1985), it has been documented as high as 8,300 ft (2,529 m) in YNP and Grand Teton National Park in geothermally influenced areas, and as high as 7,000 ft (2,133 m) in non-geothermal areas (Koch and Peterson 1995). Sagebrush lizards have been reported in Grand Teton National Park near the Snake River floodplain, Pilgrim Creek, Bar BC Ranch, and Colter Bay. Although not verified, this species may occur within the project area in small and localized sites. Sagebrush lizards breed in early summer and lay their eggs in loose soil sometime in June. No breeding or nesting areas have been identified in Grand Teton National Park.

Although many species of reptiles and amphibians have been documented along the valley floor and foothill regions of the Park (Koch and Peterson 1995), the project area contains little, if any, suitable breeding habitat. Three wetlands adjacent to the proposed pathway were surveyed for amphibians during the summer of 2005: (1) north of the Beaver Creek housing area, (2) where Taggart Creek crosses the Teton Park Road, and (3) where the Teton Park Road crosses over Cottonwood Creek (Wolff and Malleck 2005). No amphibians were observed at any of the three survey areas.

The wetlands near Beaver Creek are suitable breeding habitat for amphibians, but no amphibians were observed during surveys. Chorus frogs have been documented in this location in the spring and early summer, indicating that they use this area during the breeding period. Areas adjacent to Cottonwood Creek do not provide suitable breeding habitat for amphibians. The understory along the creek is dense with dead and down and vegetation. Salamanders and other dispersing amphibians and reptiles may use this area after the breeding season. The Taggart Creek area has some potential for breeding amphibians. Beaver ponds adjacent to the road provide slow moving water that is suitable for breeding toads and frogs; however, no amphibians were located during surveys.

Implementation of any projects would avoid wetlands. If avoidance is not feasible, measures would be taken to protect wetlands from damage caused by construction equipment, erosion, siltation, and other activities that potentially could affect wetlands. Because the initiation of these surveys was late in the breeding season, it is recommended that sites of potential impact from the proposed pathway be surveyed earlier in the summer to determine amphibian use during that time.

Cultural Resources

Director's Order #28, "Cultural Resource Management," recognizes the management of five categories of cultural resources: (1) archeological resources, (2) cultural landscapes, (3) ethnographic resources, (4) historic structures, and (5) museum objects. All of these categories, except archeological resources, were dismissed from detailed analysis in Chapter 1.

Archeological Resources

Although less than 10 percent of the lands within Grand Teton National Park have been surveyed, previous archeological surveys within the Park and on adjacent lands suggest a seasonal settlement pattern for the Jackson Hole area. The Park's prehistoric sites represent a wide range of plant, animal, and stone procurement locations, seasonal camps, and plant processing features that represent more than 10,000 years of human use in Jackson Hole.

To date, 194 prehistoric sites are known to exist within the project area, 150 of which have not been evaluated for the NHRP. Thirty-eight have been classified as eligible for

nomination to the National Register and are included in the Jackson Lake archeological district. Two additional sites near Jenny Lake are also eligible, and four prehistoric sites have been evaluated as not eligible for listing (Grand Teton National Park 1990).

Because archeological surveys conforming to the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation have not been completed within many portions of the proposed project areas, additional archeological surveys would be required as site-specific projects are implemented in the future.

Potential and confirmed archeological resources in the project area are as follows:

The Moose-Wilson Road

A cultural resource investigation was completed along the Moose-Wilson Road from the Granite Canyon Entrance Station to Moose in July 2006 to determine its eligibility for listing on the National Register. Documentation was submitted to the SHPO for review for determination of eligibility and the SHPO concurred that the road is eligible for listing. Because the road has been determined eligible for the National Register, the NPS will continue to consult with SHPO before taking any action. Consultation may result in additional mitigation.

Moose Area

University of Wyoming surveys located one large historic site with several rectangular concrete foundations and two prehistoric sites in this area. The archeological field crew hypothesized that the site was used only once for lithic procurement. A recent survey of the Moose Post Office area revealed one new site. The area is believed to be associated with the homestead of Leonard Altenreid. The site consists of a foundation, three depressions, and some isolated historic debris. It is not eligible for the National Register.

Southeast Snake River Location

A recent University of Wyoming archeological survey identified one historic site. The site contains several items of historic debris and is believed to be associated with the homestead of Earl Harris.

Beaver Creek to Lupine Meadows Area

During surveys in the 1970s, five prehistoric archeological sites were identified, all classified as lithic scatters. Virtually nothing is known about these sites, which have not been evaluated for eligibility (Grand Teton National Park 1990). Additional fieldwork and data recovery will be necessary before any construction occurs.

Lupine Meadows Area

Surveys of this area were conducted in the 1970s, and no archeological sites were identified (Grand Teton National Park 1990); however, additional surveys will be needed prior to any construction.

Jenny Lake Area

Three prehistoric sites were recorded in the Jenny Lake area during the 1970s. The best known of these sites is a protohistoric Shoshone site dating to ca. A.D. 1800. This site has not been evaluated for the National Register, and extensive subsurface testing would be required (Grand Teton National Park 1990).

String Lake Area

One prehistoric site has been recorded in this area.

Jackson Lake Dam Area

An archeological survey was conducted during reservoir drawdown for dam repair and the sites identified are now below the elevation of the reservoir (Conner et al. 1987).

Colter Bay Village and Jackson Lake Lodge Area

An intensive archeological survey was performed in and around the Colter Bay Village and Jackson Lake Lodge developments in 1990. No cultural materials were found (Wright 1973). A more detailed investigation will be required prior to any new construction.

Signal Mountain Area

According to a Development/Study Package Proposal, an archeological reconnaissance survey of the Signal Mountain developed area was completed in 1983 and no archeological evidence was found (Connor 1990; Grand Teton National Park 1984).

Mormon Row/Antelope Flats Area

One site has been located near the Mormon Row Historic District and additional investigations could provide insights into the material culture of Mormon Row residents.

Transportation System and Traffic

Roadway System Overview

The affected area for this analysis includes the principal paved and unpaved roadways within the Park, as described below, as well as parking areas located at pullouts, trailheads, and activity centers along these roadway corridors.

There are approximately 140 miles (225 km) of paved and 70 miles (113 km) of unpaved roadway surface within the Park. Key paved roadways include U.S. Highway 26/89/191,

North Park Road (U.S. Highway 89/191/287), and the Teton Park Road. Other paved roads include Gros Ventre Road, most of Antelope Flats Road, most of the Moose-Wilson Road, and various access roads to campgrounds, trailheads, Forest Service lands, etc. Unpaved roadways include a mix of improved (i.e., a portion of the Moose-Wilson Road, Two Ocean Lake Road, and Mormon Row) and unimproved facilities (i.e., RKO Road).

Currently, all paved roadway segments in the Park except one have two through travel lanes (one travel lane in each direction). Some roadway segments include paved shoulders. Lane widths vary from approximately 11 to 12 ft (3.3 to 3.6 m) wide on the main roads but may be somewhat less and variable on secondary roads.

Over most of U.S. Highway 26/89/191, the speed limit is 55 miles per hour (mph), slowing to 45 mph at intersections. On the Teton Park Road and North Park Road, the speed limit is mostly 45 mph. Speed limits on other roadways vary depending on the facility type and location.

The road program for Grand Teton National Park through 2009 consists of one Federal Highway 4R project from Lizard Creek Campground to the Snake River Pit (over Huckleberry Hill); this is on U.S. Highway 89/191/287 or North Park Road. The entire Teton Park Road is in the program as a 3R project, but will be programmed in the next highway/transportation bill. Descriptions of the 3R and 4R projects are provided below. Depending on the outcome of this Final Plan/EIS, the Park can choose to resubmit any of the projects as 4R, which would allow the widening of shoulders.

3R work includes resurfacing, restoration, and rehabilitation. Funds in this category may only be used for work undertaken to extend the service life of an existing road and enhance safety. Work includes the placement of additional surface materials and/or other actions necessary to return an existing roadway, including shoulders, the roadside, and appurtenances, to a condition of structural adequacy. Most 3R work occurs on the existing road bench and generally cannot involve widening beyond the existing road bench or require the construction of new retaining walls, or cuts and fills.

4R work includes road reconstruction or realignment, which consists of altering the geometry of the roadway through widening or modifying the current horizontal and/or vertical alignment. These types of projects are typically much more complex and costly than 3R projects and result in more impacts to resources along the road. The numbers of roads selected for 4R types of work is limited to only the most critical, high priority segments. Work that will not qualify as 3R work includes paving previously unpaved roads or parking areas, constructing new parking areas or pullouts, widening off the present road bench, realigning and relocating roads (vertical or horizontal realignments), and constructing new bicycling paths.

Vehicle Mix and Vehicle Restrictions

The mix of vehicles in the Park varies by roadway. U.S. Highway 26/89/191 typically experiences the most diverse mix of vehicles, with personal automobiles, motorcycles, RVs, tour buses, inter-city trucks, delivery trucks, and "official" (i.e., NPS and concessioner) vehicles being common. Traffic on the Teton Park Road and North Park Road includes a similar mix, except that the percent of trucks is less because of restrictions on through-trucking. The Moose-Wilson Road is generally open only to personal automobiles. Vehicles with trailers (except for horse trailers), RVs, large tour buses, and trucks are prohibited from using this road. Horse trailers are only allowed to travel the northern section of the Moose-Wilson Road from Moose to Death Canyon Junction and back or to the Granite Canyon Trailhead parking lot from the south and back.

Traffic Volumes

Traffic within the Park is much higher during the summer months than during the rest of the year. Summertime motor vehicle traffic in the Park varies by location, with volumes declining from south to north. For example, average daily traffic on U.S. Highway 26/89/191 in 2005 was around 14,000 vehicles per day between the south boundary and Gros Ventre Junction, 10,500 vehicles between Gros Ventre Junction and Moose, 5,900 vehicles between Moose Junction and Moran Junction, and 3,000 vehicles between Moran Junction and the Park's east boundary. Average daily traffic on the Teton Park Road is around 6,400 vehicles per day between Moose Junction and Moose, 4,800 vehicles between Moose and Lupine Meadows Junction, 4,400 vehicles between Lupine Meadows Junction and North Jenny Lake Junction, and 3,700 vehicles north of North Jenny Lake Junction.

Exceptions to this general pattern occur on North Park Road and the Moose-Wilson Road. Traffic on North Park Road averages around 5,300 to 5,500 vehicles per day everywhere except for the portion between Jackson Lake Junction and Leeks Junction, where it averages up to 7,800 vehicles per day. Daily summertime traffic on the Moose-Wilson Road averages around 1,600 vehicles on the south end and 2,400 on the north end.

Parking

Overall, there are about 2,000 parking spaces distributed throughout numerous parking areas within the Park. Lots range in size from just a few spaces to more than 400 at Colter Bay. Parking areas at some popular locations, such as South Jenny Lake, sometimes fill to capacity early in the day and stay full through the late afternoon during the peak of the summer season. The Death Canyon Trailhead parking lot also fills early in the day in the peak summer season, with additional vehicles using an overflow area on the roadway shoulders. Taggart Lake, Lupine Meadows, and Granite Canyon are also popular and parking areas fill to capacity at times in the peak summer season, but to a lesser extent than the South Jenny Lake or Death Canyon areas.

The existing roadway, parking, and pedestrian circulation infrastructure in the Moose Headquarters Complex dates back to the early 1960s, a time when park visitation was one-third what it is currently. This circulation infrastructure is used beyond design capacity during the busy summer season. The situation has been further complicated by contemporary developments such as the introduction of temporary modular office buildings for park staff, construction of the new Moose Discovery and Visitor Center, establishing a base of operations for the Western Center for Historic Preservation, and adaptive use of the Murie Ranch. It is anticipated that construction of a pathway through this area would result in even more demand for vehicle parking and increased congestion, consequently impacting visitor satisfaction and safety. In addition, much of the parking area is in a state of disrepair, storm water management is lacking, social trails in riparian habitat are expanding, and emergency response is hampered. The Park intends to correct the situation to the extent that other future project funds allow. Additional compliance may be required.

In 2006, a conceptual design and study process, intended to address all of the aforementioned issues in the Moose Headquarters Complex, was commissioned. The Park is also working with FHWA, as a subpart of proposed pathway alignment, to analyze impacts at the three existing intersections along the Teton Park Road from the Snake River Bridge to the Moose-Wilson Road. Alternative design concepts for the Moose Complex will address the level of service at these intersections, provide enjoyable and safe pedestrian circulation and road crossings, analyze vehicle parking needs, improve emergency response, improve snow and storm water management, consider potential locations for transit hubs (as may be recommended by the TBP), improve the overall experience for those accessing all the visitor use facilities in the Moose area, and mitigate the impact that the Moose development has on natural and cultural resources.

Public access to the LSR Preserve via a 12-mile network of new walking and horse trails will formally begin in June 2007. A new parking lot will be constructed with a capacity of approximately 50 cars. Traffic volumes along the Moose-Wilson Road are anticipated to increase due to public access to the LSR Preserve and the opening of this new facility, which is a Leadership in Energy and Environmental Design (LEED)-Platinum rated facility, the first such designation in the State of Wyoming and within the entire NPS. Increases in visitation (potentially resulting in parking congestion and traffic) may be reasonably anticipated at this site. It is also anticipated that bicycle rentals will increase at Dornan's after a pathway is constructed along the Teton Park Road and to their property line, adding further parking needs at that site and the nearby Moose Visitor Center parking lots on both the north and south side of the Teton Park Road within the Moose Headquarters Complex.

An observational report of parking conditions was made in July 2005 at two areas within the Park: the South Jenny Lake and String Lake parking areas. Parking congestion occassionally occurs in these areas and parking demand can exceed the number of marked parking spaces. Vehicles were observed parked in locations that did not have marked spaces; in one location, the parking of vehicles in unmarked spaces would have made it difficult for long RVs to maneuver into parking spaces designated for RVs. In addition, passenger cars were observed parked in RV parking spaces (Upchurch 2006).

Based on this observational report, it is apparent that vehicles are parking in unmarked spaces because they are available and they can park "illegally" without obstructing traffic. This suggests that the existing space is not being used efficiently and there is an opportunity to create much more parking in these lots if the space is utilized appropriately (e.g., through re-striping, re-directing traffic flow, allocating sections to compact parking, re-distributing the proportion or number of car spaces to RV spaces, etc.). The other observation that cars were parked in RV spaces because they are open and no car spaces are available is likely an indication that either the proportion of car and RV spaces is disproportionately too high or the location of the RV spaces is not in a strategically appropriate location (Upchurch 2006).

The Park's overall strategy for managing existing parking areas is to strive for no net gain on impervious surfaces and to try to make the best, most efficient use of existing paved areas through modifications. With the proposal of a new pathway system and potential future transit, the Park plans to continue to monitor the most affected and crowded parking areas such that sufficient data are available to determine the actual effects of these new components in the Park. The Park will use this information to determine whether to do larger parking lot re-designs in the future, which is not included as part of this Final Plan/EIS.

This Final Plan/EIS does include, however, minor parking area modifications. These include simple parking lot redesign, reconfiguration of traffic flow, signage, re-striping, allocating sections to compact parking, redistributing the proportion or number of car spaces to RV spaces, and other engineering techniques that could easily improve the efficiency of parking areas and somewhat increase their capacity without increasing the impervious surface in that area.

Several parking areas would be potentially affected by actions proposed in this Final Plan/EIS, including:

1. Multi-Agency Visitor Center Parking Lot (south of park boundary).
2. Dornan's Parking Lot (private property).
3. Moose Visitor Center Parking Lot (existing and new).
4. Windy Point Turnout.
5. Taggart Parking Lot.
6. Teton Glacier Turnout.
7. South Timbered Island Turnout.
8. South Jenny Lake Parking Lot.
9. String Lake Parking Lot.
10. Mountain View Turnout.

The Park's intent is to initially make the best use of the existing space already in place (as mentioned above) and monitor the changes in order to understand what specific modifications are needed to accommodate the new use patterns resulting from new visitor services. All these measures are currently being addressed with the help of FHWA.

Specifically, the portion of the parking lot at South Jenny Lake that is designed for large vehicles utilizes space inefficiently. The lot is the same size as all of the others but has only seven pull-through spaces, which seem to be utilized at least as much by passenger cars as they are by RVs and/or buses. It is evident that existing space is not being used efficiently and there is an opportunity to create much more parking in these lots if one or more of the minor modifications mentioned above are executed.

The Park plans to continue to work with FHWA on a simple engineering survey and redesign of three of the four main parking lots that would serve as pathway parking nodes: Taggart Lake, South Jenny Lake, and String Lake. Simple redesign constrained to the exiting footprint, and changes within this footprint to landscaping, curbing, traffic flow, and striping, would make more efficient use of existing paved surfaces providing more parking and better traffic flow. A comprehensive traffic flow study and efficient redesign of the Moose Headquarters Complex is proposed to start in fiscal year (FY) 2007, after the new Moose Discovery and Visitor Center opens and new traffic flow and parking patterns begin.

The TBP will analyze parking to some extent in that the introduction of a transit system could reduce the need for an unknown number of parking spaces (whether existing or needing to be built). Pathways are not likely to reduce the amount of automobile traffic from visitors to the Park; however, some people may put their bicycle on a bus to get to an area to begin riding. They may also use the bus to access a pathway instead of driving their car; thus, the reduction in need for parking spaces at trailheads, etc.

Transit Service

Transit service in Grand Teton National Park is provided by various private operators, including tour bus and shuttle services, and taxi and car shuttles. No public transit is currently offered to the Park or between points in the Park.

Tour Bus and Shuttle Services

Alltrans/National Park Tours

Alltrans, Inc. and National Park Tours are affiliated companies providing a variety of bus and shuttle services in Jackson Hole and the surrounding intermountain region. The combined bus and shuttle fleet consists of over 30 vehicles, including passenger vans, 35-ft Grumman shuttles, 40-ft regional transit system buses, and over-the-road coaches.

Alltrans, Inc. specializes in contracted winter and summer shuttle services in and around Jackson. The company also operates a year-round shuttle between Jackson and the airport. During peak travel seasons, the airport shuttle is scheduled to meet every departing and arriving plane. During the off-seasons, the shuttle runs on a more limited schedule.

National Park Tours is an affiliate of the Gray Line Network. The company specializes in day tours of YNP and Grand Teton National Park, private charters, tour destination management, and customized tours throughout the intermountain west. The tours of Grand Teton National Park and YNP originate daily from Teton Village and operate via locations in Jackson before proceeding north to the Parks.

Grand Teton Lodge Company

Grand Teton Lodge Company provides shuttle transportation for its guests, employees, and the public from May to October each year. The company operates a fleet of about 10 vehicles, ranging in size from minivans to 45-passenger buses. Summer scheduled services include a shuttle running between the Jackson Lake Lodge and Jackson three times per day (with stops at the Jenny Lake Lodge and South Jenny Lake). The company also provides five scheduled trips between Colter Bay and Jackson Lake Lodge from 7:00 a.m. to 5:00 p.m. daily. In addition, it operates charter shuttle service by advance reservation between its facilities and the Jackson Hole Airport.

Callowishus Park Touring Company

The Callowishus Park Touring Company provides tours through YNP and Grand Teton National Park. The tours operate up to six times per week during the summer, depending on demand. The company operates two vehicles: a nine-passenger van and a five-passenger sports utility vehicle. Passenger pick-up and drop-off occur in and around Jackson and at the intersection of U.S. Highway 89/26 and Gill Avenue.

Teton Science School

The Teton Science School wildlife expeditions offer year-round wildlife viewing trips around Jackson Hole. During summer, the school operates up to five trips per day. The fleet consists of four vehicles, including a 10-passenger van and three six-passenger Suburbans. Passenger pick-up and drop-off takes place at the school and lodges (if requested).

River Float Shuttles

Thirteen concessioners are authorized to operate river floats in the Park. Because of the need to transport float groups up-stream either before or after float trips, all of the concessioners use a shuttle service of one form or another. Some provide service directly from Jackson or lodges in the Park, while others require clientele to drive to the starting point (e.g., Moose) prior to boarding a shuttle for the trip to the boat launch location.

Other Concessioner Shuttles

Several of the other concessioners offer shuttles for guest transportation to activity locations, the airport, town, etc.

Taxis and Car Shuttles

Taxi Service

There are several taxi operators in the Jackson Hole region. One of the most important markets for these operators is travel to and from the airport. Transportation of hikers, anglers, and river floaters, as well as tourists of YNP and Grand Teton National Park, also represents at least a portion of the taxi business.

Car Shuttles

Three companies in the Jackson Hole area offer a car-shuttle service for hikers. The service allows hikers to travel from one trailhead to another. The clients simply leave their car at the origin and the car-shuttle driver drives it to the destination.

Jenny Lake Shuttle Boat

The Jenny Lake Shuttle Boat operates from mid-May to September between the Cottonwood Creek boat dock and the west side of the lake. Jenny Lake Boating operates the shuttle, which departs from each terminal about every 20 minutes. The company also offers a scenic lake tour once per day.

Jenny Lake Boating operates five boats with a capacity of around 19 passengers each. The boats are used for both the shuttle and tour services. The company also rents canoes and kayaks to park visitors.

The majority of shuttle users purchase round-trip tickets. People who purchase one-way tickets typically hike half way around Jenny Lake and ride the shuttle back. In the summer of 2005, ridership on the Jenny Lake Shuttle Boat totaled 127,762 people. The peak ridership month was July, when 44,098 people rode the shuttle.

Non-Motorized Travel

Bicycling has become an increasingly popular activity in the Park despite the lack of designated bicycle lanes and bicycle paths. Evidence of the interest in bicycling occurs each spring prior to opening the Teton Park Road to motor vehicles. After the road is cleared of snow by April 1, it remains closed to motor vehicles until May 1. During this time, it is available for non-motorized uses (i.e., bicycling, walking, and rollerblading). The popularity of these activities, especially with local residents, is evident on most days, and during nice weather, the Taggart Lake parking lot is often filled beyond capacity, with the overflow continuing down the road toward Beaver Creek.

There is currently no system of off-road multi-use pathways available to bicyclists and pedestrians in the Park. Moreover, there are relatively few roads within the Park with the type of wide shoulders preferred by bicyclists. However, several of the low-traffic volume roads in the Park are popular with bicyclists (i.e., Antelope Flats Road, Mormon Row, Jenny Lake Scenic Loop, and Gros Ventre Road). Bicycles are allowed only on paved and unpaved roads unless otherwise posted. Bicycles are not allowed on hiking trails or in backcountry areas.

Bicycle tours and rental bicycles are available to park visitors. For example, bicycles are available for rental at Dornan's and are also available for guests of Jenny Lake Lodge. A limited number of bicycle racks are available at some trailheads and campgrounds.

Most trips made on foot in the Park (other than hiking trips) occur in and around major activity areas. Pedestrians within the activity areas often tend to walk through parking lots or on social trails. Inadequate signing and a lack of clearly identifiable walking paths contribute to this activity, which results in unnecessary auto travel and competition for parking spaces.

Public Transportation

There is currently no true public transportation in the Park. A TBP is being developed as part of this Final Plan/EIS to determine whether it is feasible to begin a public transportation system in and around Grand Teton National Park. The TBP will provide an analysis of potential ridership; routes, stops and schedules; capital and operating costs; infrastructure and rolling stock needs; funding sources and leveraging opportunities; and coordination and partnership opportunities and will follow on previous planning efforts within Grand Teton National Park, as well as Jackson and Teton County, Wyoming.

The TBP will provide the Park with specific information necessary to support a decision on whether to institute a transit system in the Park, and if so, how to operate it effectively and efficiently. This TBP will answer the following questions:

1. What type of transit services may be "workable" in the Park?
2. What coordination is required with other entities (START, Grand Teton Lodge Company, etc.)?
3. What will transit's effect be on parking, traffic, etc.?

Objectives of the TBP include the following:

1. Review current public transportation systems in National Parks to determine models of financing and operations that exist in other locations.
2. Determine what type or types of service would be feasible. Options include fixed-route, demand responsive, flex route, or other service options.
3. Create budgets and other financial estimates that indicate the cost of capital equipment, operational expenses, and any needed facility improvements, including shelters and the associated maintenance costs. Document funding sources that could be invested in the potential transit system.
4. Investigate opportunities to coordinate/collaborate with existing public transportation providers in the area, including both public and private organizations.
5. Provide recommendations on how to proceed with the implementation of a public transportation system in Grand Teton National Park. A recommendation may be that no service is necessary.

Traveler Safety

With 140 miles (225 km) of paved roads and 70 miles (112 km) of unpaved roads, Grand Teton National Park experiences an average of approximately 157 motor vehicle accidents each year (1994-2003). The majority of these accidents is minor and/or results in property damage only; however, about 14 percent result in personal injury. There have been seven traffic fatalities since 1994, two of which were bicyclists. Also of concern are collisions between motor vehicles and wildlife (see Table 14) because there are large numbers of elk, deer, moose, and bison present in the Park.

Pedestrian Crossings

Pedestrian crossings occur at many locations within the Park, primarily within the developed activity areas. Although scenic pull outs have been well designed for accommodating pedestrians and photographers, visitors frequently pull to the side of roads at other locations. Often these stops result in visitors crossing the highway on foot to view wildlife.

Bicycle Riding Along Roadways

Opportunities exist for bicycling throughout the Park; however, bicycles are limited to the same roadways used by automobiles. While bicycling is permitted on park roads, not all visitors are comfortable with sharing the road with high-speed motor vehicle traffic. Road shoulders vary in width from almost non-existent to 5.0 ft (1.5 m). The

inherent and perceived risks of bicycling on road shoulders may discourage some visitors from bicycling altogether, and may adversely affect the experience for others by requiring them to concentrate on traffic and their own safety rather than on the scenic views. Although rare, accidents have the potential to be serious, as represented by the two fatalities in recent years.

Visitor and Employee Use and Experience

Park Visitation Trends

Over the past decade, the total number of recreational visits to Grand Teton National Park has ranged from 2.5 to 2.8 million people per year. The total visitation to the Park, including non-recreational visits, is approximately 4 million persons annually. Most of the non-recreational visits consist of vehicles traveling through the Park on U.S. Highway 26/89/191. While visitation has grown somewhat during winter and spring, it has remained constant during summer and fall (Figure 20).

Approximately 80 percent of all visits to the Park occur between June 1 and September 30, with July and August as the peak months for visitation. Visits during these months in recent years have averaged around 24 and 21 percent of the annual total, respectively. Between 1994 and 2005, the average daily number of visitors to the Park in July and August was about 20,000 and 18,000, respectively (Figure 21).

In 2005, approximately 5,000 visitors per day spent the night in the Park during July (Figure 22). Overnight visitor facilities include seven campgrounds including two with RV hookups, five lodges, a dude ranch, a hostel-style accommodation, and a 66-unit tent village. Campgrounds are located at Gros Ventre (372 sites), South Jenny Lake (50 sites), Signal Mountain (87 sites), Colter Bay (350 tent/RV sites and the 112 hook-up site RV park), Lizard Creek (61 sites), and Flagg Ranch (75 tent and 100 RV hook-up sites). The lodges include Jenny Lake Lodge (37 units), Signal Mountain Lodge (79 units), Jackson Lake Lodge (385 units), Colter Bay Cabins (166 units), and Flagg Ranch Resort (92 units). Triangle X Ranch and Climbers Ranch operate the dude ranch and hostel-style accommodations, respectively, while Grand Teton Lodge Company runs the tent village, and Grand Teton Lodge Company, Signal Mountain Lodge, and Flagg Ranch Resort operate camping facilities.

FIGURE 20
RECREATIONAL VISITS BY YEAR AND SEASON

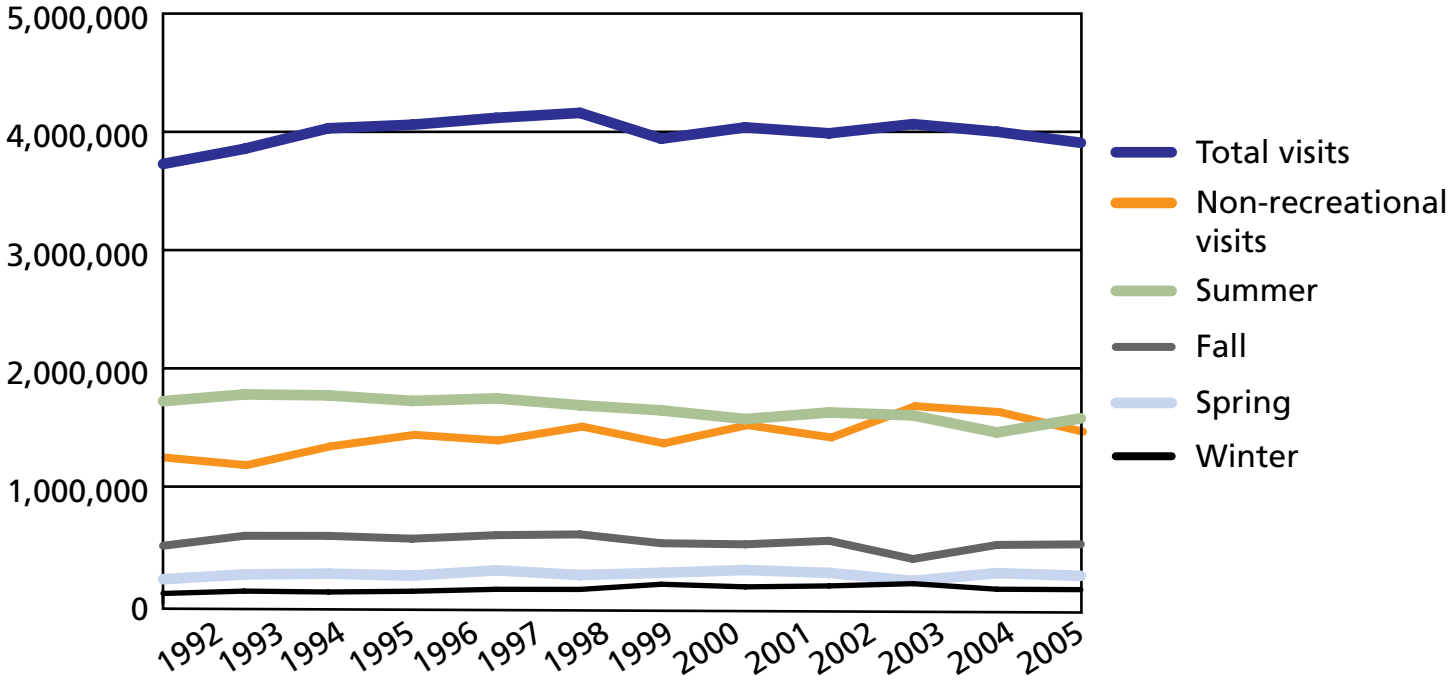


FIGURE 21
AVERAGE DAILY RECREATIONAL VISITS (1994-2005)

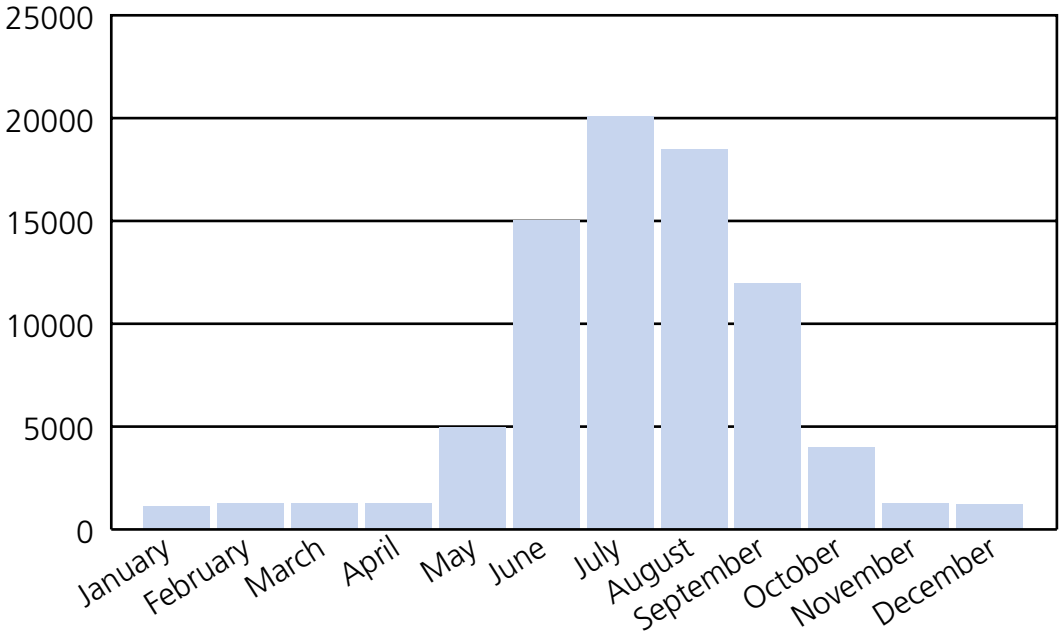
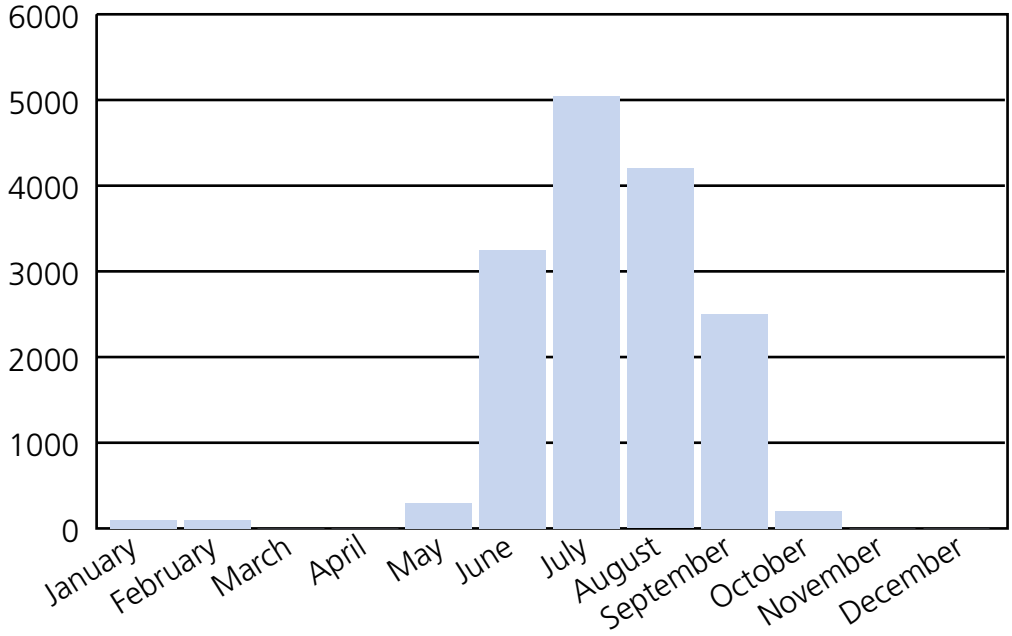


FIGURE 22
VISITORS STAYING OVERNIGHT IN THE PARK, 2005



Visitor Profiles

A survey of visitors in Grand Teton National Park conducted by Littlejohn in July 1997 found that a large proportion of park visitors travel in groups of five or fewer people. Around 88 percent of survey respondents fell into this category. Only about 2 percent of visitors responded that they were traveling with organized tour groups (Littlejohn 1998 [Figures 1 and 3]).

Analysis of the survey data reveals that, for visitors traveling in groups of five or fewer people, the average group size was around 2.8 (Grand Teton National Park 2002). This finding is consistent with the results of surveys conducted in support of this Final Plan/EIS during the summer of 2001, which found that the average occupancy of vehicles traveling inbound to the Park at the Moose Entrance Station was around 3.0 people (Grand Teton National Park 2002).

The 1997 survey data indicate that visitors stay an average of 2 days in the Park. About 45 percent of respondents reported staying less than 1 full day. Among visitors who reported staying in the Park for more than 1 day, the average length of stay was around 3.5 days. According to 2002 survey data, the typical visitor stayed about 4.5 days in the Jackson Hole area, with about 3.3 days spent visiting Grand Teton National Park. The 2002 survey estimated that 92 percent of the visitors are non-local (Loomis and Caughlan 2004).

Visitor Activities

Visitors engage in a wide variety of recreational activities in Grand Teton National Park. Some forms of recreation can be classified as "passive" in character and require comparatively little prior knowledge of the Park, advance planning, or specialized equipment. Examples of passive recreational activities include sightseeing, casual wildlife viewing, casual walking or strolling, shopping, riding the Jenny Lake shuttle boats, and picnicking. Other activities are more "active" in nature and typically require at least some advance knowledge of activity sites or services, some degree of advance planning, and some amount of specialized equipment. Examples of common active recreational activities include longer-distance hiking, backpacking, bicycling, camping, river floating, private boating, canoeing, kayaking, rock climbing, fishing, photography, bird watching, and horseback riding.

Review of the 1997 survey data indicates that the five most common activities include viewing scenery (98 percent), viewing wildlife (88 percent), driving for pleasure (71 percent), stopping at roadside exhibits (59 percent), and shopping (38 percent). These results suggest that a majority of current park visitors limit their activities to the passive rather than the active end of the scale. Only 4 percent of visitors indicated that they engaged in bicycling while visiting the Park.

In summer 2002, a survey found that the most popular recreational activities participated in during summer at Grand Teton National Park differed slightly for non-local and local visitors; bison viewing, hiking, driving for pleasure, and elk viewing were the most popular activities for non-locals, and hiking and boating were the most popular activities for locals. The survey reported that 93 percent of non-locals participated in sightseeing and 70 percent of this group participated in hiking, bison viewing, and driving for pleasure, while 56 percent of locals participated in hiking and sightseeing with the next highest percent (54.5 percent) participating in boating (Loomis and Caughlan 2004).

The survey used a four-point scale to gauge the relative importance of recreation activities. The numbers reflect the average importance on an ordinal scale where one is not important, two is somewhat important, three is important, and four is very important. Thus, the relative magnitude of the numbers provides a useful indicator of the relative importance of a recreation activity in terms of attracting people to the Jackson Hole area. Viewing the mountains was the highest rated recreation activity (3.81 for non-locals and 3.56 for locals). Viewing wildlife in general, and elk and bison in particular, were the next most important reasons for non-local recreation trips in the Jackson Hole area (3.26 and 3.06, respectively) and bicycle/mountain bike riding was rated as 1.54 by non-local visitors and 2.31 by locals (Loomis and Caughlan 2004).

Visitor Travel and Recreational Destinations

The most popular places to visit in the Park include South Jenny Lake, Jackson Lake Lodge, Colter Bay Village, Moose Complex, and points along the Snake River. Other locations that regularly attract visitors include the Moose-Wilson Road, Signal Mountain Summit Road, Signal Mountain Activity Area, Flagg Ranch, String Lake, Antelope Flats/ Kelly area, Cunningham Cabin, Menor's Ferry area, and Two Ocean/Emma Matilda Lakes area.

Visitor Experience and Attitudes

The responses to several questions in the Littlejohn (1998) survey give insight into visitor perceptions and attitudes toward the experience of being in Grand Teton

National Park. When asked to rate the importance of five park features on a scale ranging from "not important" to "extremely important," 96 percent of park visitors indicated that scenic views were either "very" or "extremely" important to them. Eighty-seven percent indicated native plants and animals as either "very" or "extremely" important to them (Table 15). While 57 percent felt recreational activities were "very" or "extremely" important, 22 percent felt that they were only "somewhat" important or "not" important at all.

Eighty-six percent of park visitors indicated that other visitors and activities did not interfere with their visit. Among the 14 percent of visitors who indicated other visitors interfered with their enjoyment of the Park, the most frequently mentioned sources included poor driver behavior, crowding, and noise.

Finally, the 1997 survey asked visitors whether they would "support visitor use restrictions and/or reservation systems" as a means of providing a high quality visitor experience and protecting park resources. Forty-seven percent of visitors responded to this question with a "yes," while another 32 percent were not sure. About 21 percent responded "no."

TABLE 15
SURVEY RESULTS ON VISITOR ATTITUDES TOWARD FIVE PARK FEATURES

	Percent of Total			
	Not or Somewhat Important	Moderately Important	Very or Extremely Important	Don't Know
Native Plants and Animals	4	8	87	1
Scenic Views	1	2	96	0
Recreational Activities	22	20	57	2
Solitude	13	23	62	2
Quiet	11	23	65	1

Visitor Access and Circulation

Currently, the most common form of visitor access to Grand Teton National Park is the private or rented automobile. For this project, a survey of Jackson Lake Lodge guests was conducted in which 100 percent of survey respondents reported having arrived in the Park either in their own or a rented car, sport utility vehicle, pickup, or van. The camper surveys conducted at the Colter Bay and Gros Ventre campgrounds show similar results (82 percent and 89 percent, respectively). There were no "bicycle campers" in the campgrounds on the survey days (Grand Teton National Park 2002).

Visitors who pass through the Moose Entrance Station also travel mostly by automobile. In the summer 2001 Vehicle Intercept Survey, travel in automobiles accounted for 97 percent of all visitor trips through the Moose Entrance Station. Travel by RV accounted for around 2 percent of visitor trips, while travel by motorcycle, bicycle, taxi, tour bus, or shuttle bus accounted for the remaining 1 percent (Grand Teton National Park 2002).

Similarly, within activity areas, visitors often drive to places rather than walk. This is true even when distances between travel origins and destinations are relatively small. For example, many campers in the NPS campground at Colter Bay drive to the lakeside rather than walk, even though the distance is less than 1,500 ft (457 m) in many instances. Factors that may explain this behavior include a lack of formalized and safe pedestrian facilities and a lack of signs and other way-finding devices. Lack of formalized and safe pedestrian facilities is particularly problematic, as it means that pedestrians frequently must travel through parking lots or along roadsides to reach travel destinations. It also means that social trail formation is more common than it might otherwise be which contributes to resource degradation.

Bicycles are allowed on park roads; however, there is currently no system of multi-use pathways available for bicyclists. Road shoulder widths vary throughout the Park, and the lack of wide shoulders on some segments may discourage some visitors from bicycling or reduce the enjoyment of the activity due to concerns about personal

safety. However, several of the low-volume roads in the Park have proven popular with bicyclists, particularly those riding as part of organized tour groups. Popular low-volume roads include Antelope Flats Road, Gros Ventre Road, and Mormon Row. Indicators of the existing visitor demand for bicycling include the number of bicycle tour groups per season, bicycles per inbound vehicle, bicycles per visitor group, and bicycles per capita among the visitor population. Data collected by the Park Business Resources Division show that organized bicycling tours have numbered approximately 180 per season in recent years, with tour group sizes averaging around 11 or 12 people each (or roughly 1,980 to 2,160 people in total) (K. McMahill 2002, pers. comm.).

Estimates of the other indicators may be derived from the survey data collected during the summer of 2001. For example, the Vehicle Intercept Survey at Moose found that about 2.3 percent of all in-bound vehicles carried one or more bicycles, with the ratio between the total number of bicycles and the total number of vehicles equal to about 0.029 to 1.000. The surveys at Colter Bay and Gros Ventre campgrounds found that about 22 and 23 percent of camper groups, respectively, had one or more bicycles. The Colter Bay and Gros Ventre surveys also found that there were about 0.57 and 0.69 bicycles per campsite and 0.19 and 0.26 bicycles per camper on average, respectively.

Park and Concession Employees

Major employers in Grand Teton National Park include the NPS, park concessioners, and the Jackson Hole Airport. Smaller employers include Dornan's, Teton Science School, Grand Teton Natural History Association, and University of Wyoming – NPS Grand Teton Research Center.

There are approximately 2,280 people who work in the Park during the summer. Winter employment totals around 590 people. Approximately 80 percent of the NPS employees live inside Grand Teton National Park or the JDR Memorial Parkway, and about 43 percent live within walking distance of their worksites. Clusters of residences within the Park are located at Colter Bay (24 percent), Moose (14 percent), Beaver Creek (14 percent), Highlands (7 percent), Lupine Meadows (5 percent), Moran Junction (4 percent), Flagg Ranch (3 percent), and various others (9 percent). Residential locations outside of the Park include Jackson (17 percent of employees), Buffalo Valley (1 percent), areas in Idaho (1 percent), and various others (1 percent). Key NPS work sites include Moose, Beaver Creek, Lupine Meadows, South Jenny Lake, Colter Bay, and Moran Junction (NPS 2002).

Nearly all concession employees live inside the Park – most within a short distance of their work-sites. The exceptions include some managerial employees who live in places such as Jackson, Buffalo Valley, and Wilson. Key employment locations for concessioners include the Moose area (float trip operators), Climbers Ranch, Lupine Meadows, South Jenny Lake, Jenny Lake Lodge, Signal Mountain Lodge, Jackson Lake Lodge, Colter Bay, Triangle X Ranch, and Flagg Ranch Resort (Charlier Associates 2001). Dornan's is also a major private employment site (though not concession operated). With over 1,000 employees, Grand Teton Lodge Company is by far the largest non-NPS employer in the Park. Its responsibilities include operation of Gros Ventre Campground; Jenny Lake Store, Lodge, and Campground; Jackson Lake Lodge; and all of the activities at Colter Bay (including general store, laundry, restaurants, campground and RV park, Colter Bay Cabins, Colter Bay Tent Village, gas stations, and marina). Signal Mountain Lodge is the next largest employer, with about 150 employees. Triangle X Ranch is third largest, with around 70 employees (Charlier Associates 2001).

Employee Access and Transportation

Employee surveys were conducted during the summer of 2001 in support of this Final Plan/EIS. The surveys were intended to answer questions regarding the travel influences, patterns, and preferences of three distinct employee populations: those of the NPS, Grand Teton Lodge Company, and Signal Mountain Lodge. The survey questions asked respondents to provide information on such things as mode of travel to work, residence location, availability of a driver's license, availability of an automobile, availability of a bicycle, and so forth. The surveys also gave respondents an opportunity to provide open-ended comments on any transportation-related issues. A total of 203 NPS employees (around 60 percent of all employees) completed a survey form. Among this group, approximately 50 percent reported that "driving alone" was their typical mode of travel to work. Other reported travel modes included walking (31 percent), riding a bicycle (10.5 percent), carpooling (7.5 percent), and riding a motorcycle (0.5 percent). Around 98 percent of NPS employees reported access to an automobile or motorcycle. People who lived within a mile or so of their work sites tended to travel more by bicycle and foot compared to those who lived farther away (NPS 2002).

Approximately 158 employees of Grand Teton Lodge Company completed the survey. Modes of travel to work included walking (45.5 percent), driving alone (25 percent), riding a bicycle (20 percent), carpooling (6.5 percent), riding the bus (2 percent), and riding a motorcycle (1.5 percent) (NPS 2002). Grand Teton Lodge Company provides transit service for its employees between Colter Bay and Jackson Lake Lodge, as well as round-trip service to Jackson three times a day. The pattern of responses of Grand Teton Lodge Company employees to the survey tends to reflect the fact that many (particularly those in certain employment categories, such as housekeeping, maintenance, and food service) are not residents of the United States. A large number of employees are from Mexico and Central and South America, while others are from Eastern Europe. Their lack of access to transportation options raises questions about basic mobility and employee satisfaction, particularly considering that their work locations are relatively isolated. For example, in the open-ended comment section of the survey, many employees reported having difficulty traveling to and from Jackson to go shopping, attend church services, etc. (NPS 2002).

Social and Economic Environment

Region of Influence

The socioeconomic region of influence is a two-county area encompassing Teton County, Wyoming, and neighboring Teton County, Idaho. The two-county area determination is based on the location of Grand Teton National Park and the inextricable linkages between visitors attracted to the Park and the economic and social structures of these two counties. In recent years, visitation to Grand Teton National Park has averaged approximately 2.7 million recreational visits. Over 80 percent of the annual visitation to the Park occurs from May through September.

Historically, the local tourism industry was centered in Jackson and catered primarily to a transient visitor population. This transient demand gave rise to an extensive base of visitor-oriented shopping, lodging, and other hospitality establishments and services in Jackson and the surrounding area. There are more than 4,800 lodging rooms, cabins, and other short-term accommodations in the valley (Jackson Hole Chamber of Commerce 2001-2002). Over time, the region's exceptional scenic, wildlife, and outdoor recreation opportunities have gained worldwide recognition and stimulated strong seasonal and second-home development. Such development has become a driving force in the local economy, spawning a wide range of economic changes, including extensive new real estate development, rapidly rising real estate values, and changes in the composition of the visitor and resident populations. In turn, those changes have fostered concerns regarding open space in Teton County, the linkage between and community interest in sustainable development, economic prosperity, and quality of life.

A consequence of these trends has been the development of a strong economic interdependency between the two Teton counties. That interdependency has evolved over time, primarily in conjunction with a substantial work force commuting into Teton County, Wyoming, from its neighbor. This commuting pattern is one response to housing availability and affordability constraints in Jackson and Teton County, Wyoming, as the area's popularity as a year-round tourism and resort area has grown. This section highlights key economic and social characteristics and trends in the two Teton counties. The primary emphasis is on Teton County, Wyoming, where the most direct relationship between the Park and community exists.

Population, Demographics, and Mobility

The population of Teton County, Wyoming, increased by 63 percent between 1990 and 2000 (Table 16). About 46 percent of the total resided in the Town of Jackson, the sole incorporated municipality in the county. The remaining residents lived in several unincorporated communities, large-tract rural subdivisions, and other outlying areas of the county.

Based on the inventory of lodging accommodations and large number of seasonal residences, the summer population of Teton County, Wyoming, is likely 2 to 2.5 times its resident population. In July, that peak includes almost 7,000 overnight visitors and employees living in the Park.

The population of Teton County, Idaho, increased by 74 percent between 1990 and 2000, and by another approximately 24 percent between 2000 and 2005. Driggs and Victor, the largest towns in Teton County, Idaho, registered populations of 1,132 and 870 residents, respectively, in the 2000 census.

TABLE 16 TETON COUNTY ACTUAL POPULATION GROWTH, 1990-2000, AND ESTIMATED 2005 GROWTH			
	Town of Jackson	**Teton County, WY**	**Teton County, ID**
1990 – Census	5,127	11,173	3,439
2000 – Census	8,647	18,251	5,999
2005 – Census estimate	*8,825	19,032	7,467
Growth, 1990 to 2005	3,698	7,859	4,028
Percent Growth	72%	70%	117%
** 2003 estimate* *Sources: U.S. Census Bureau, (a) and (b)*			

The average household size in Teton County, Wyoming is 2.36 persons (compared to a statewide average of 2.48 persons) and 2.87 persons in Teton County, Idaho. With a median age of 35.0 years, the population of Teton County, Wyoming, tends to be older than the 31.3 year median of its Idaho neighbor but younger than the statewide average of 36.2 years (U.S. Census Bureau (c)). The differences in household sizes and ages reflect many factors, including the effects of limited housing availability and affordability in the Jackson area in promoting families, particularly those with children. Many families reside elsewhere and at least one household member commutes to work. The area's amenities and popularity have also prompted retirement-related migration in Teton County, Wyoming.

Housing

The employment and income data provide insights into economic conditions in the region. For many working households and those on fixed incomes, a high cost of living offsets many of the benefits of high wages in Teton County, Wyoming. Local housing costs, driven by a combination of a constrained supply and strong demand, are a major contributor to high living costs. Supply constraints reflect the limited amount of private land in the county. Of the total 2.7 million acres (1.1 mission ha) in Teton County, Wyoming, 97 percent is public land, most of which is managed by the federal government. Private lands total only about 76,000 acres (30,750 ha) acres; of that, about 13,600 acres (5,500 ha) are under conservation easements that preclude further development. Consequently, the amount of developable land available to meet residential, commercial, local community service, and other uses is limited.

In 1990, the housing stock of Teton County, Wyoming, numbered 7,060 dwelling units. About one-third of the total was in Jackson. Between 1990 and 2000, the housing stock increased by 45 percent with the net addition of 3,207 units. About half of the increase occurred within Jackson. In 2000, the housing stock of Teton County, Idaho, totaled 2,632 dwelling units. That total represented a 60 percent expansion compared to the total in 1990. Of the nearly 13,000 total housing units in the two counties, the 2000 census tallied only 657 units actually for sale or rent in the two-county region.

Renters occupied 58 percent of all housing units in Jackson, compared with 43 percent owner-occupancy. Owner-occupancy was the norm elsewhere in the region, with owners occupying 67 percent of occupied units in Teton County, Wyoming, and 74 percent of such units in Teton County, Idaho.

Housing value and monthly rent data from the 2000 census provide insights into the relative housing affordability in the two counties. Based on samples of owner-occupied and renter-occupied dwelling units, the median value of an owner-occupied unit in Teton County, Idaho, is $133,000. Although higher than the comparable statewide medians of $96,600 for Wyoming and $106,300 in Idaho, that value is about 63 percent below the $364,400 median value in Teton County, Wyoming. However, housing values for non-rental units in Teton County, Wyoming, exclude the many seasonal or recreational use units, which are among those with the highest values.

The likelihood that actual housing values are even higher than reported in the census is suggested by local real estate market data. Sales prices for typical single-family residences ranged from $150,000 to $995,000 in 1999, with prices of luxury or "trophy" homes as high as $7.5 million.

Monthly rents in Teton County, Wyoming, are higher than those in Teton County, Idaho, and the corresponding statewide averages. The median gross monthly rent

reported for Teton County, Wyoming, was $707 per month in 2000. The median in Teton County, Idaho, was 15 percent lower at $603, and the comparative statewide averages for Wyoming and Idaho were $437 and $515, respectively. A major source of the variance is the large share of rentals in Teton County, Wyoming, with monthly rents of $1,000 or more.

Local Communities

The affected area for this analysis includes the developing areas of Teton County, Wyoming, surrounding Grand Teton National Park to the east and south; YNP to the north; and the Teton crest, with several small communities on the "Idaho side," including the western-most portions of Teton County, Wyoming, as well as Teton County, Idaho, to the west.

Lifestyles and Social Conditions

The area's extensive wildlife and natural resources, outstanding scenic vistas, outdoor recreational opportunities, and western heritage contribute to lifestyles and social conditions valued by residents and visitors alike. Population and economic growth and new development, spurred by individuals seeking to share in or benefit from the area's increasing popularity, brought about both opportunity and conflict.

> *Rapid growth was diminishing the small town values and western heritage cherished by so many. Housing had become so scarce that it was forcing some residents to leave the community. Development was beginning to disrupt open ranchlands and natural resources. Improvements in the valley's infrastructure – transportation, sanitary sewer, parking – lagged sharply behind population and visitation growth* (Teton County Planning Department 2000).

Through a community visioning process, "Residents expressed a strong desire to retain a rural western character and a sense of true community. They wished to maintain a socially and economically diverse population…" and were "…committed to preserving open space, affordable housing, and wildlife."

Guiding principles adopted in the plan were to "…create a sustainable visitor-based economy, not dependent upon growth, and an economy that reflects the unique …character of Jackson and the outdoor recreational opportunities of Teton County …" and "…provide property owners and local businesses with as much flexibility as possible in the use and development of their property" (Teton County Planning Department 2000).

The vision also included the preservation of scenic vistas, wildlife diversity and abundance, and good schools and other public infrastructure and services to support community life.

Over the course of time, residents, elected officials, local government entities, civic and community groups, businesses, and other organization have all engaged in efforts focused on realizing dimensions of the vision. Achievements include substantial investment in new infrastructure, including government administrative facilities, schools, the library and hospital, and the START bus system. Local government employment has expanded in response to increasing demand for services. Major expansions of the business community have occurred. Efforts to protect open space and wildlife habitat have resulted in more than 13,000 acres of private land being covered by conservation easements to limit future development. However, a lack of consensus exists in the community with respect to specific goals and objectives expressed in the vision or how best to reconcile the inevitable differences in priorities or conflicts that arise during implementation. Major topics of ongoing interest include affordable housing, land use and the development of rural lands, transportation, the management of Grand Teton National Park and other public lands in the area, how to balance the interests of residents and visitors, and the relationship between Jackson and Teton County in economic, social, and political terms.

Regional Transportation Plan

Teton County, in conjunction with the Town of Jackson, shares a regional comprehensive plan. The plan was updated in 2000 with the addition of Chapter 8, "Regional Transportation Plan." This plan provides a forecast of future growth and development within the planning area.

A principal focus of the plan is to reduce and manage the impacts of traffic growth occurring in the valley because of population growth and commercial development. The plan sets policies and programs designed to limit traffic growth through a combination of mode shift and land use strategies. Specifically, the plan sets a goal of reducing single occupant vehicle travel to 42 percent of daily person trips, down from 55 percent in 1996. By 2020, "alternative modes" (i.e., walking, bicycling, and transit) would account for 28 percent of daily person trips, up from 15 percent in 1996. The plan also sets policies to focus future development in the existing town as part of a "town as heart" initiative.

Other land use policies included in the plan are the continued use of conservation easements to avoid traffic growth in certain corridors and steering of development into "mixed use villages" suitable for development of improved transit service and pathway networks. One of the most important intended outcomes of the plan is a reduction in forecast 2020 vehicle traffic on key area roadways (many of them state highways) in order to avoid future multi-lane construction projects to the extent possible.

The Regional Transportation Plan calls for a "systematic expansion of the public transit system in Teton County." Both public and private transit providers are to play a role in this expansion. Transit services that are to be considered as part of this expansion include (among others):

> *Transit service to popular Grand Teton National Park sites, and provisions for integrating with future Grand Teton National Park transit systems; and, use of the proposed Multi-Agency Campus (MAC) site as a regional transit node and for additional parking opportunities in North Jackson* (Regional Transportation Plan, p. 8-30).

The regional pathways program, providing routes for walking and bicycling, is another major emphasis of the plan. The plan states that:

> *The Town, County, and WYDOT street and roadway systems will be designed to safely accommodate and encourage pedestrian and bicycle use as important modes of travel. A system of separated pathways connecting major origins and destinations in Teton County will be incorporated into the transportation system.*
>
> *The Town, County, and WYDOT will coordinate with public land management agencies to connect the pathway system and on-street pedestrian/bicycle facilities with pathway and trail systems on federal lands, including Grand Teton National Park, the National Elk Refuge, and the Bridger-Teton and Targhee National Forests" (Regional Transportation Plan, p. 8-33).*

Finally, the plan sets average daily traffic in summer and level of service goals for regional arterial roadways, including roadways that provide access to Grand Teton National Park.

Transit Development Plan — START

The Jackson/Teton County Transit Development Plan: 2000-2005 and Long Range was adopted by Teton County and Jackson in June 2000 (Teton County 2000). The Jackson/Teton County Transit Development Plan (TDP) was based on an evaluation of current operations of the START public bus system, including relationships between the START cost structure, routes, service levels, fleet requirements, and other factors. The TDP met state and federal requirements for transit planning to support eligibility for federal transit assistance.

Based on extensive public involvement and on policies articulated in the Jackson Regional Transportation Plan, the TDP provided service recommendations and a financial plan for implementation. The recommendations were based on realization of the 2020 Regional Transportation Plan goals (including a goal of 5 percent of daily person trips on transit) and defined a phased implementation program with a detailed operations plan for the first 5 years (2000–2005). In the first 5 years, the TDP calls for expansion of local route service, including higher frequency service on existing routes as well as additional routes. The TDP recommends initiation of commuter services, including connections to Alpine and over Teton Pass.

Specific TDP elements relevant to Grand Teton National Park include:

> *Initiate Public Transit Service Between Jackson and Grand Teton National Park (Colter Bay). A limited, public transit service should be initiated between Jackson (MAC) and the Colter Bay area of Grand Teton National Park during the peak summer season. In addition to helping to reduce auto congestion, this service will enhance economic activity in Jackson by encouraging multi-day stays in the community and by increasing the community's ability to market itself as a "base camp" for visits to the park (TDP, p. 111).*
>
> *MAC Transit Center. The provision of an efficient transit network in the Jackson Hole region requires an attractive and operational-efficient transit center. The MAC project proposed to be located in north Jackson is recommended as the most feasible location for this central transit center. The facility should accommodate up to six regular route buses at one point in time and should provide heated interior waiting space, restrooms, and a transit information center ...This facility will allow convenient, direct transfers between [local routes] and the Grand Teton National Park route, and will be the terminus for commuter services (TDP, p. 113).*

Transit ridership on START routes has grown considerably in recent years. During July 2002, START carried 27,500 rides, up from 10,500 in July 1999. Much of the growth in summer ridership is due to implementation of the Town Square Express – a local route recommended in the TDP. Winter (ski season) ridership on the START system totaled 130,000 rides in 1999 and grew to 204,000 rides in 2002. Again, much of the growth was due to the Town Square Express operating within Jackson.

Jackson Hole Pathways Program

The Jackson Hole Pathways Program is a jointly-funded independent Department of the Town of Jackson under the direction of the Town Administrator. The Pathways Program has adopted the following objectives:

Improve facilities – Systematically complete the Pathways Improvement Program list of on-road and off-road improvements for bicycling, walking, horseback riding, and Nordic skiing.

Increase use – Double the percentage of transportation trips made by bicycling, walking, and other non-motorized modes by 2015.

Enhance safety – Decrease the number of bicycle and pedestrian accidents and multi-user trail conflicts by 10 percent.

Meet needs of all levels of bicyclists – Create a comprehensive network of on-road and off-road facilities that connect neighborhoods and provide safe, convenient access to schools, employment centers, and other destinations, and that are integrated with the roadway and transit systems.

Meet needs of pedestrians, including persons with disabilities – Make all streets and intersections "pedestrian-friendly" and accessible.

Meet needs of equestrians – Create a network of trails and trail access points that connect horse-friendly areas of the county with public lands and provide safe, convenient access to major equestrian destinations.

Meet needs of Nordic skiers – Create a network of winter Nordic trails and trail access points that provide close to home Nordic skiing opportunities on public and private lands.

Increase safety through promoting education and enforcement – Play a constructive role in facilitating the creation of education programs by providing teacher training, curriculum materials, and other support services, and in facilitating enforcement programs with law enforcement officials, the public, and decision makers.

Encourage and promote bicycling and walking – Shift 10 percent of transportation trips to bicycle and walking modes by 2015; conduct a promotion campaign for bicycling and walking transportation trips.

The Pathways Program has built a network of off-road multi-use pathways radiating outward from Jackson, and has worked with other agencies to build additional pathways. A pathway has recently been completed along Wyoming Highway 390 from its junction with Wyoming Highway 22 to the Park boundary. The Pathways Program has also identified a connection from the town north along U.S. Highway 89/26 to Moose as one of its highest priority segments.

Forecasted Future Growth and Commercial Development

The community's recent land development pattern has been characterized as residential development that has been spread, somewhat uniformly, over a large area with commercial services concentrated in Jackson and a few, relatively small development nodes in the county. This pattern is expected to continue, in accordance with the currently adopted Land Development Regulations for Jackson and Teton County, Wyoming.

Comprehensive land-use plan forecasts indicate that greater amounts of residential development will occur in the county than in the town over the next 20 years. People living and working in such dispersed development patterns are dependent upon automobiles for transportation. These land use patterns are difficult to serve with alternative modes of transportation (i.e., transit, walking, and biking) and are major contributing factors to projected future traffic congestion.

About 400 building permits are approved each year in rural Teton County, most for residential development. The most active areas of development outside of Jackson are the "South Park" area, southeast of town between the Snake River and the Gros Ventre Range, and the "West Bank" area, including the unincorporated village of Wilson, scattered development along Wyoming Highway 390, and Teton Village just south of the Park. Some continued development is also occurring in and around Jackson Hole Golf and Tennis, just south of the airport, and in Buffalo Valley to the east of the Park along Togwotee Pass Road (U.S. Highway 287).

Based on residential development rates and trends in geographical preferences, by 2020, the community will contain about 12,489 homes; 40 percent of which will be located in Jackson and 60 percent in the unincorporated areas of the county. This is equivalent to an estimated population of 27,600 by the year 2020.

This 2020 forecast represents about 54 percent of total residential development potential in the unincorporated county according to current zoning. As for Jackson, the remaining residential development potential under current zoning and land development regulations is anticipated to be built out before the year 2020, based on the historical trend of residential development growth.

Commercial development, analyzed by employee numbers, is concentrated in Jackson. The community offered about 15,600 jobs in 1996. The Town of Jackson contained businesses that represented about 77 percent of the jobs; unincorporated areas of the county contained the other 23 percent. Based on commercial development trends, by 2020 the community will offer about 27,300 jobs, with Jackson containing 74 percent of the jobs and the unincorporated county containing the remaining 26 percent. These forecasts of commercial development represent about 87 percent of the total commercial development potential according to current zoning.

Within Jackson, recent land development patterns for community commercial services have been moving away from downtown Jackson southward along West Broadway and U.S. Highway 89. As such, the last remaining vacant parcels in west Jackson and in the Jackson Business Park have been developed or approved for development within the last 5 years.

The development area likely to have the most direct relationship with the Park and its transportation program is Teton Village, situated at the base of the Jackson Hole Mountain Resort along Wyoming Highway 390, about 1.0 mile (1.6 km) south of the Granite Canyon Entrance Station. A resort master plan for this area was approved by Teton County in 1998, and the area is at approximately 60 to 70 percent of the approved buildout. Teton County approved an application in 2005 by another landowner, with lands adjacent to Teton Village, for an expansion of the resort master plan, which includes additional dwelling units and commercial space. In addition to the currently approved master plan, the expansion could add several hundred housing units and slightly over 80,000 ft^2 of commercial space to the resort.

The build out of Teton Village is not explicitly tied to any specific actions being considered by the Park. Clearly, the Moose-Wilson Road provides a direct connection in the summer between Teton Village and the Park, and provides an alternative route to the regional airport via the Park's roadways. However, Teton County has not, in its review and approval of the Teton Village master plan, assumed that the Moose-Wilson Road would be improved in any way or kept open for traffic in the winter months. The county's approval of the resort master plan, and expansion of that master plan, assumes that the Moose-Wilson Road continues to exist in its current state – both in terms of design and in terms of operation and maintenance. Traffic impact studies completed for these projects (and for specific developments within the resort area) assume that the resulting traffic connects elsewhere in Teton County via Wyoming Highway 390 to the south.

Similarly, the county has not contemplated that a direct transit connection would be established between Teton Village and destinations within the Park or other destinations requiring travel through the Park. The extensive evaluation of transit service to Teton Village over the past 5 years has focused on a transit connection between Teton Village and Jackson via Wyoming Highway 390 to the south.

Park Operations

The Grand Teton National Park operational budget for FY 2006 was approximately $10.1 million, including funds for staff salaries, supplies and materials, and other operational needs. This amount does not include other funds, such as those for construction or special projects, which are allocated on a year-by-year, project-by-project basis.

The Park staff consists of approximately 150 permanent employees and about 200 seasonal employees, most of whom are employed during the busy summer season. The Park staff is organized into several divisions, including Ranger Activities, Interpretation, Science and Resource Management, Facility Management, Business Resources, and Administration.

The Facility Management Division is the largest operational unit in the Park, with a budget of approximately $3.9 million. The division is responsible for planning, design, construction, operation, and maintenance of all roads, trails, buildings, and utility systems in the Park. The second largest operational unit in the Park is the Ranger Activities Division, with an annual budget of approximately

$2.0 million. Rangers are responsible for providing visitor services and resource protection, including the management of programs such as law enforcement, wildland and structural fire, search and rescue, fee collection, emergency medical services, and a joint fire/law enforcement/dispatch center with USFS. The division maintains a 24-hour per day operation during the busy summer season; however, hours of operation are reduced at other times of the year, when park activities have decreased.

The Division of Interpretation is responsible for operating park visitor centers and providing a wide variety of informational and educational programs to park visitors. These include guided walks, campfire programs, roving interpretation, and other services, as well as issuing permits for backcountry camping and boating. The division also manages the planning and design of media-based interpretation, such as brochures, site bulletins, wayside exhibits, and other materials.

The Division of Science and Resource Management performs a wide variety of duties associated with stewardship of the Park's natural and cultural resources. This includes research, wildlife and vegetation management activities, control of noxious weeds, and programmatic duties related to ensuring compliance with applicable laws, policies, and regulations.

Development of additional facilities or new operational responsibilities would require a corresponding increase in staffing and budget. Management of new facilities (i.e., multi-use pathways) would require both routine and cyclic maintenance in order to ensure that the new facilities are maintained in good condition. Such maintenance is necessary, not only to ensure that the facilities continue to serve the purpose for which they were constructed but also to reduce life-cycle costs, which would ultimately increase if not properly maintained. Similarly, operational activities associated with new facilities and programs would include additional ranger patrols, production of new informational and interpretive materials, control of invasive weeds along pathway corridors, nuisance bear management, maintenance and repair of road shoulders and pathways, and management and oversight of transit services. Increases in park staff levels in order to address the additional operational requirements also require a corresponding need for housing, vehicles, office space, and administrative services.