CHAPTER 3
AFFECTED ENVIRONMENT

Introduction

This chapter describes the resources and values that could potentially be affected by plan alternatives. These topics were selected based on public comment and review of environmental statutes, regulations, executive orders, and NPS Management Policies (NPS 2001). Several resources were dismissed in Chapter 1 from further in-depth analysis, including floodplains, wild and scenic rivers, air quality, soundscapes, historic structures, cultural landscapes, ethnographic resources, Indian Trust resources, land use, museum collection, minority and low income populations, lightscape management, prime and unique agricultural lands, certain threatened and endangered species (whooping crane), certain species of special concern (wolverines and harlequin ducks), and certain wildlife species (white-tailed deer, bighorn sheep, and fish). Refer to Chapter 1, Impact Topics Dismissed from Further Analysis, 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. Impacts of the alternatives on each of these resources and values are described in Chapter 4, Environmental Consequences.

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 wildlife of the area. The Snake River terraces are covered with a mix of open sagebrush, 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, experiencing the wilderness, and experiencing 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.

There are three types of views within the park:

Background views: These are seen at somewhat 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. 26/89/191; views of Willow Flats from the Jackson Lake Lodge observation deck; or views of Mormon Row from 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 Teton Park Road; the immediate surroundings of an activity area; or a relatively enclosed setting such as 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. In particular, 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 Pleis-

tocene 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). The most dominant are listed in Table 6 and shown in Figure 9. These generally loamy soils were deposited by glacial melt-water and sustain the park's dominant vegetative communities. They 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 are generally represented by Tineman-Bearmouth or Bearmouth gravelly loams or Taglake-Sebud Association.

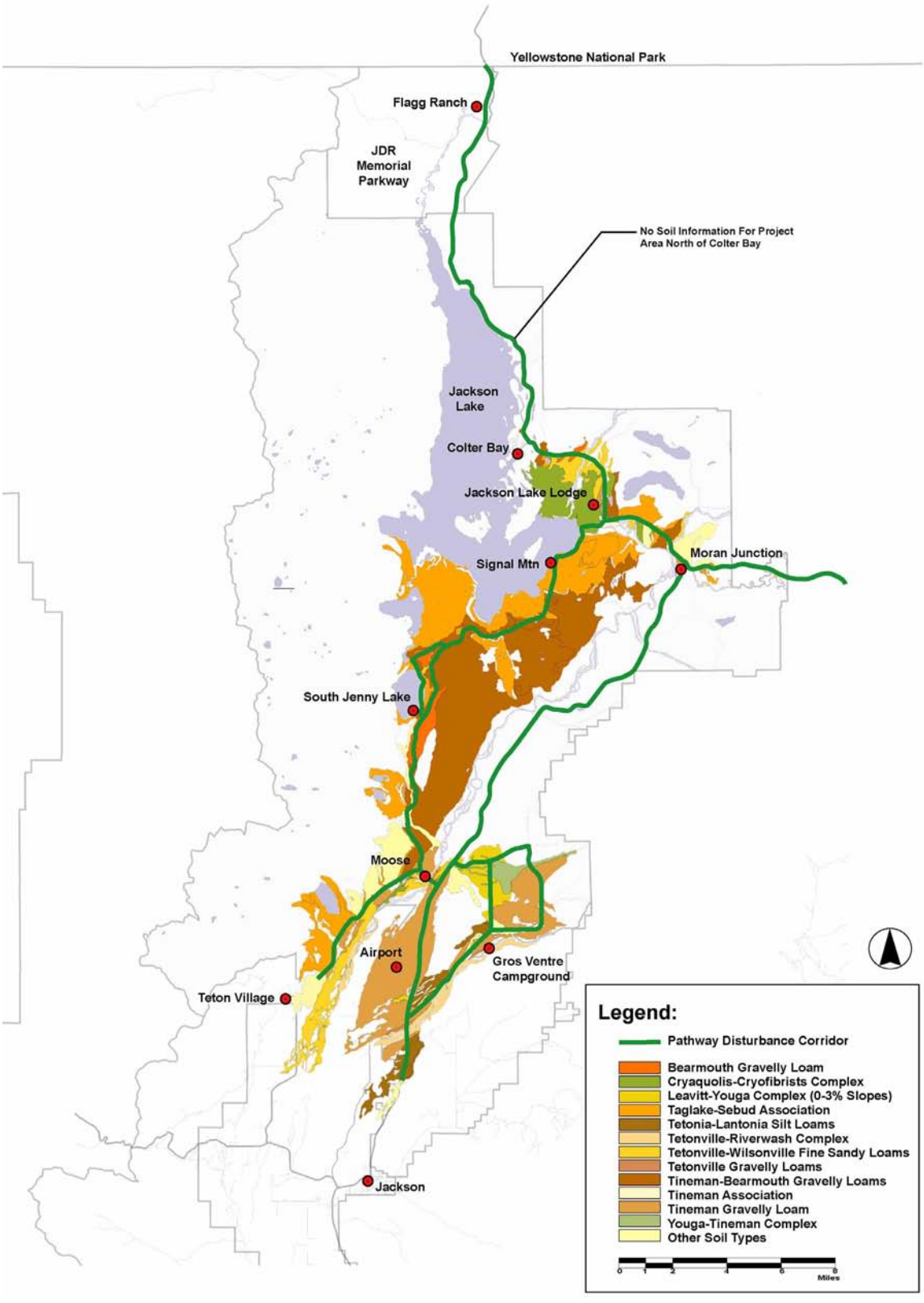
TABLE 6
DOMINANT SOIL TYPES WITHIN GRAND TETON NATIONAL PARK

Soil Type	Characteristics	Percent of Project Area
Tineman-Bearmouth gravelly loam	Very deep, well-drained soils that formed in alluvium that is 10 to 20 feet deep over extremely cobbly or extremely gravelly sand. These soils are on flood plains, stream terraces, and fans in mountain valleys.	17.6
Taglake-Sebud Association	Deep, well-drained soils formed in glacial till, slope alluvium and colluvium derived from igneous and metamorphic rock. These soils are on alluvial fans, till plains, moraines, hills, and mountains.	13.4
Tineman gravelly loam	Very deep, well-drained soil along the Snake River; surface runoff is slow and the erosion hazard is slight. Soils are on nearly level to steep alluvial fans, stream terraces, mountains and moraines. Slopes are 0 to 40 percent. The soils formed in noncalcareous alluvium and glacial till.	11.9
Tetonia Lantonia Silt Loam	Very deep, well-drained, moderately permeable soils on plains formed in loess from mixed sources.	3.9
Bearmouth Gravelly Loam	Deep, well-drained 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.	3.8
Cryaquolis Cryofibristis Complex	Boggy or marshy soils exhibiting a deep horizon of organic material.	3.4
Tetonville-Wilsonville fine sandy loam	Nearly level soils in old braided stream channels in flood plains; seasonal high water table is 1 to 3 feet during May to July; surface runoff is slow and the erosion hazard is slight.	3.3
Leavitt-Youga Complex	Nearly level soils on alluvial fans and stream terraces; surface runoff is slow and erosion hazard is slight.	2.8
Tetonville Riverwash Complex	Nearly level soils on flood plains; seasonal high water table is 1 to 3 feet during May to July; surface runoff is slow, and erosion hazard is slight.	2.6
Youga-Tineman complex	Deep, well-drained soils formed from glacial till or outwash materials. Generally found on upland hills, plateaus, foot slopes, or fans; runoff is medium to rapid.	1.6
Other[1]		17.6
TOTAL		100.0

Source: Young 1982

[1] *These other soil types each individually represent less than 1 percent of the project area.*

FIGURE 9
DOMINANT SOIL TYPES IN AREA



These soils developed from the porous quartzite sand and gravel deposited by glacial meltwater. 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 some ground cover has been eliminated by previous vehicular and human uses.

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. These areas are characterized by braided stream channels supporting wetland riparian vegetation, such as cottonwood, willows, blue spruce, and sedges. 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 zero to three percent. The Youga-Tineman soils formed in alluvium at elevations of 6,000 to 7,000 feet northeast of Blacktail Butte. The very deep, well-drained Youga soil is composed of silty clay loam, formed in layers about six 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 seven 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.

Vegetation

The Teton Range dominates the landscape in the park and, at the lower and mid-elevations, supports montane forests (lodgepole pine, Douglas fir, limber pine), subalpine forests (Engelmann spruce, subalpine fir, whitebark pine), and mountain shrub communities (chokecherry, serviceberry, Scouler's willow, etc.). 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 blue spruce, narrowleaf cottonwood, silver buffaloberry and various willow species. Hydrology associated with Jackson Lake also supports a large and diverse willow community (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, and cottonwood.

Cover Types

The most recent land cover type classification for the park was completed in 1985 in an effort to map and assess grizzly bear habitat (Mattson and Despain 1985). Although a new vegetation classification system is currently being implemented in the park, cover type categories described in Mattson and Despain (1985) represent the most complete system of data and, therefore, are used in this EIS. Wildlife and human disturbances have altered portions of the project area since the 1985 classification was performed, but for the most part, dominant overstory vegetation remains the same. The primary cover types found along transportation corridors in the park are presented in Table 7 and shown in Figure 10. Table 8 describes the dominant cover type by major roadways affected by the proposed activities.

FIGURE 10
DOMINANT VEGETATION IN THE VICINITY OF THE PROJECT AREA

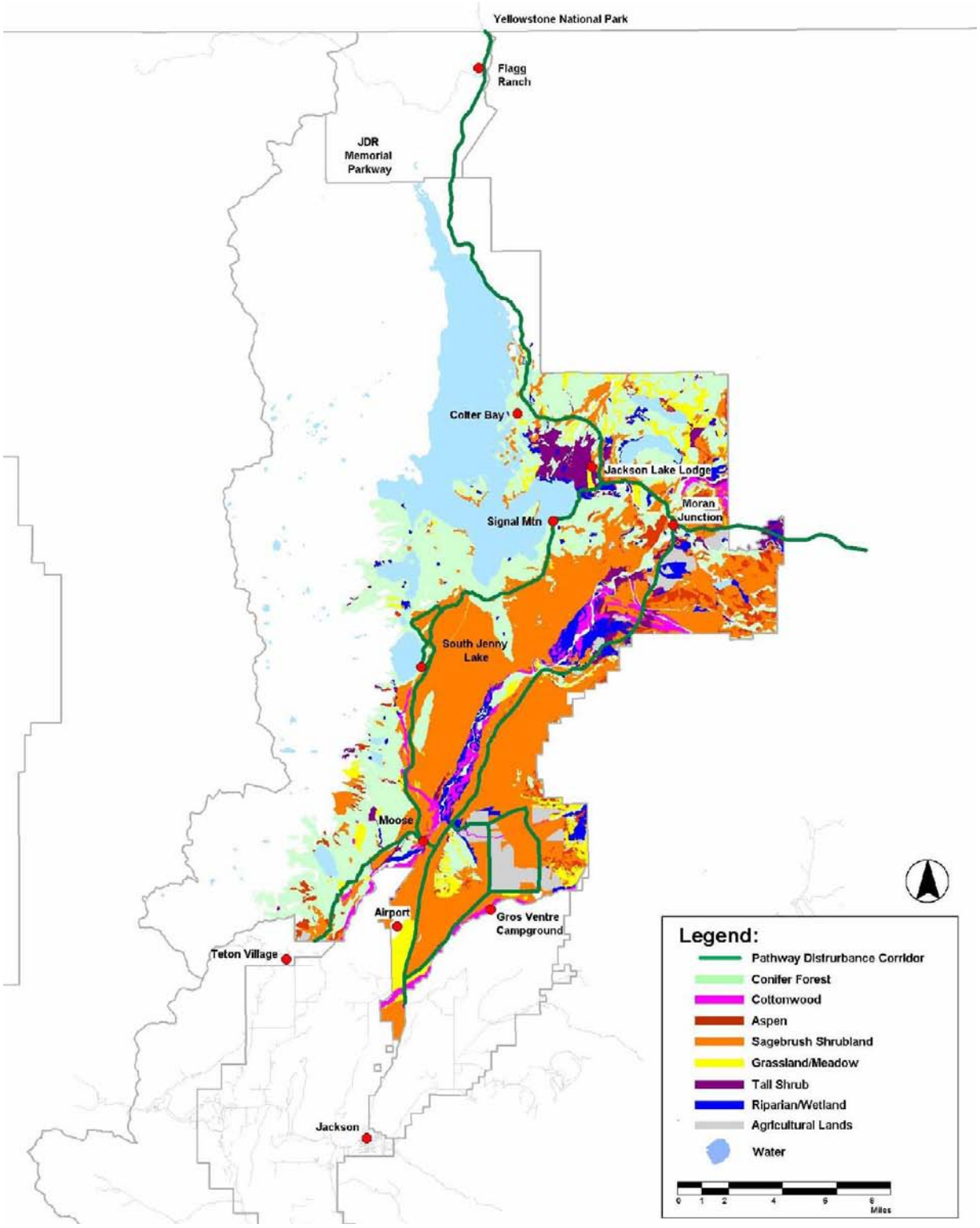


TABLE 7 DESCRIPTION OF VEGETATION TYPES FOUND IN THE PROJECT AREA	
Forested Cover Type Descriptions	
Lodgepole Pine	Seedling-sized (post-disturbance) to over-mature lodgepole pines dominate the overstory; understory tree regeneration consists mainly of lodgepole pines. Some Engelmann spruce, Douglas fir, subalpine fir, and/or whitebark pine may be present.
Douglas Fir	Seedling-sized (post-disturbance) to over-mature Douglas fir trees dominate the overstory; understory tree regeneration consists mainly of Douglas fir. Some lodgepole pine, Engelmann spruce, subalpine fir, and/or whitebark pine may be present.
Spruce/Fir	Stands dominated by Engelmann spruce and subalpine fir in both overstory and understory; lodgepole pine, Douglas fir, and/or whitebark pine may be present as minor stand component.
Cottonwood	Sapling-sized to over-mature cottonwood trees dominate the overstory with few conifers present; understory consists of shrubs, grasses, and forbs.
Aspen	Sapling-sized to over-mature aspen trees comprise greater than 50 percent of the forest canopy; understory is variable and may consist of tall shrubs, low shrubs, or grasses and forbs.
Non-Forested Cover Type Descriptions	
Dry Sagebrush Shrubland	Primarily big sagebrush interspersed with low sagebrush, rabbitbrush, and antelope bitterbrush; understory of shrubs, grasses, and forbs; sites are generally flat or convex at elevations below 7,500 feet.
Moist Sagebrush Shrubland	Primarily mountain big sagebrush and silver sagebrush with shrubby cinquefoil as a co-dominant. Herbaceous vegetation is typically dense and diverse. Sites are usually above 7,000 feet, have deep, moderately saturated soils, and are found on moist benches, floodplains, and hillsides.
Dry Grassland Meadow	Open meadows dominated by native grasses that tolerate dry conditions; sites include dry, south-facing hillsides or flat to convex ground below 7,500 feet.
Moist Grassland Meadow	Open meadows dominated by native grasses and forbs that occur on deep, medium-textured soils; sites have undulating topography and include hillsides and level or convex floodplains.
Tall shrub	Tall willows, alder, or birch-dominated riparian areas; sites occur within floodplains and along streams usually below 7,500 feet.
Marsh/fen	Sedges dominate these wetlands with rushes and grasses occasionally present; sites are low-lying and concave or on gentle slopes with seepage; soils are saturated for much or all of the growing season.
Wet Meadow	Grasses, sedges, rushes, and forbs co-dominate these wetlands that occur in floodplains, basin meadows, and on gentle slopes with seeps; sites are moderately saturated throughout much of the growing season.
Moist Forb Meadow	These meadows consist of a diverse and generally tall mixture of grasses and forbs on north- and east-facing slopes. Vegetation is lush and seasonally moist in the spring and early summer but dries out in the fall.
High Elevation Grassland	Bunch grasses and forbs dominate these upslope and ridgeline areas with shallow soils. Vegetation is generally low with much open ground and bare rock in between. Typically, this cover type occurs at elevations above 8,000 feet but was delineated in the cover type mapping north of Colter Bay at 6,800 feet.
Wet Forest Opening	Bluejoint reedgrass, sedges, and arrow-leaved groundsel generally dominate; sites include potholes, swales, and riparian areas.
Agricultural Lands	Sites (many historical) where native vegetation has been altered by plowing, disking, and/or leveling; seeding and harvesting of agricultural crops, hay, or pasture.
Source: Mattson and Despain 1985	

TABLE 8 DOMINANT COVER TYPES BY PROJECT AREA ROADWAY	
Road	**Cover Type Description**
U.S. 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. 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. The 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.
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.
The 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.

Noxious Weeds

Noxious weeds (exotic and invasive species) have become an increasing concern in the park in recent years, and weed control is viewed as a significant, long-term management issue within the park. 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, and humans (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 also can provide a vector for seed dispersal.

Weeds such as spotted knapweed, Russian knapweed, Dyer's woad, dalmatian toadflax, yellow toadflax, marsh sowthistle, sulfur cinquefoil, perennial pepperweed, and leafy spurge 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 noxious species common within the park include thistles (musk, bull and Canada), oxeye daisy, orange hawkweed, common tansy, St. Johnswort, houndstongue, wooly mullein, and cheatgrass.

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 com-

munities (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 completely eliminate weeds from the park (Haynes 2002, pers. comm.). Various methods to control or reduce the spread of invasive species include herbicide application, biological controls (insect introductions), and mechanical treatments. A total of 685 acres and 340 miles of road right–of–way were chemically, mechanically, and biologically treated in 2000 (Grand Teton National Park 2000).

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 (Figure 11). 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 significant 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

Jackson Lake, the Snake River, and 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 has designated these waters as Class 1 – Outstanding Resource Waters. No further degradation of these waters is allowed, with restrictions for avoiding all point source discharges.

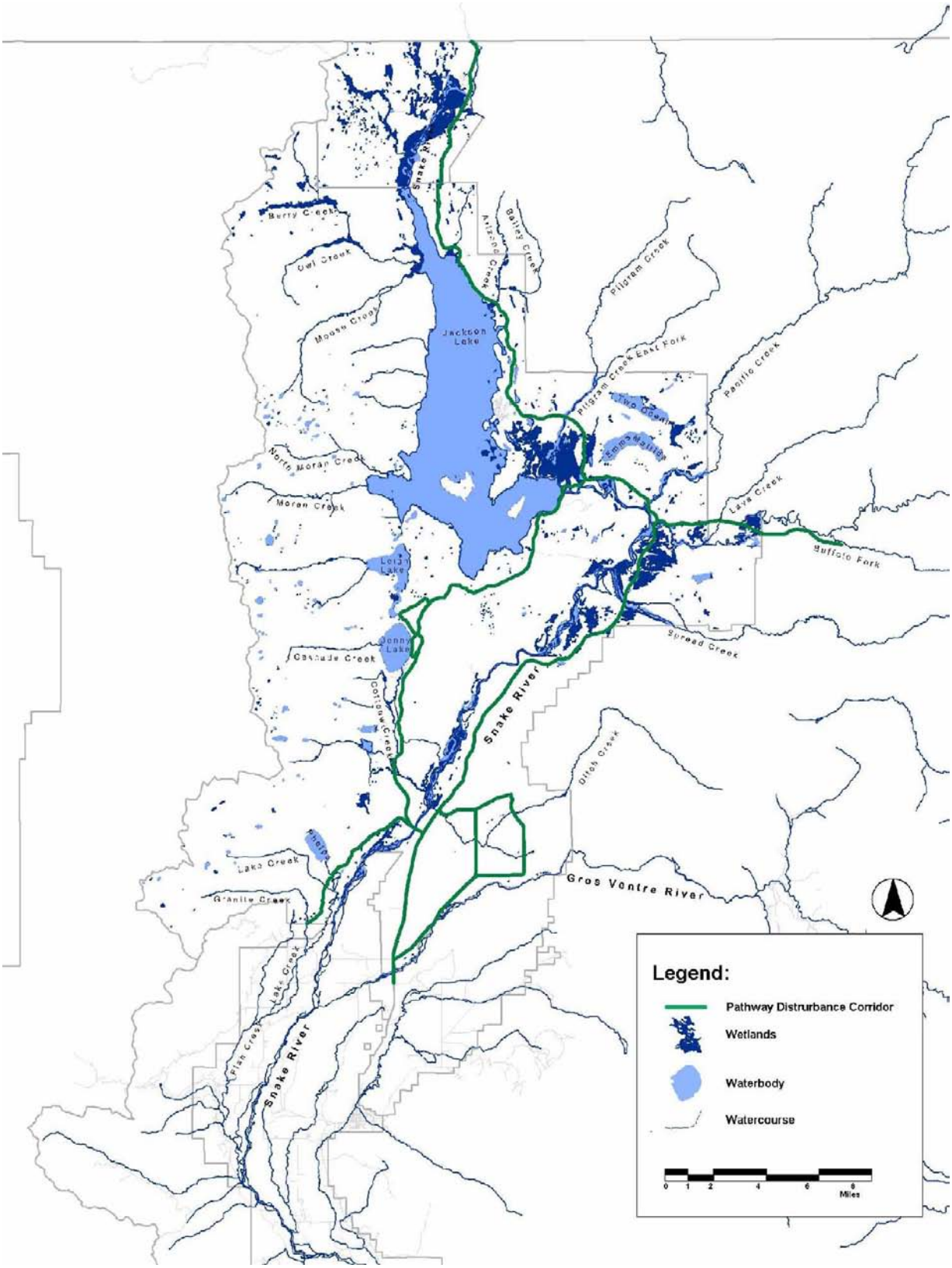
Jackson Lake is located in the northern part of the park. It is fed primarily by the Snake River, flowing south from Yellowstone National Park. Numerous other small creeks drain from the surrounding mountains and wilderness areas, including Pilgrim Creek, which enters the lake in the Willow Flats area 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 Bureau of Reclamation in 1916. The maximum designed water surface elevation is 6,769 feet. The 100- and 500-year floods can be controlled to avoid exceeding the maximum water surface elevation of 6,769 feet (Bureau of Reclamation) (Colter Bay DCP 1988). Recreational boating is allowed on Jackson Lake, with active marinas and boat put-ins at Leeks, Colter Bay, and Signal Mountain Lodge.

The Snake River reemerges from the southeast end of Jackson Lake at the dam and flows east for approximately five miles 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 (Moose Visitor Center and Area Plan/EA 2001). Farther south, the river returns to a braided form, but its western boundary is contained by a levee maintained by the U.S. Army Corps of Engineers. 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 plan. Recreational raft and float trips occur along the length of the Snake River within the park with numerous access points provided.

The Leigh/String/Jenny Lake complex is a series of waterbodies formed by glacial activity and fed primarily by mountain drainage. They 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 transportation plan, 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 powerboat trips across the lake between South Jenny Lake

FIGURE 11
HYDROLOGIC FEATURES IN THE PROJECT AREA



area and the access area for Cascade Canyon and Hidden Falls.

Ground Water

Ground water is recharged 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, and therefore supports utilization for drinking water, recreation, and other commercial uses. Much of the aquifer exhibits high permeability and significant 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 U.S. Army Corps of Engineers (ACOE) and the Environmental Protection Agency (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."

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 Executive Order 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 report 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. Very 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

8) Biotic community support

Three wetland types are expected to be present within the project area (Figure 11) and include palustrine emergent, palustrine scrub-shrub, and open water.

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 (*Carex* spp.), 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). These wetlands also provide cover for nesting and loafing waterfowl, 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 feet tall. Plant species may include true shrubs, due to environmental conditions. 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 (*Salix* spp.), 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, neo-tropical songbirds, and small mammals.

Open Water: 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.

A variety of 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 limited. National Wetlands Inventory (NWI) mapping was completed in 1990 by the USFWS and is available for the entire project area. 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 (Mattson and Despain 1985) includes locations of vegetative cover types typical of wetlands in the project area and contributed to a preliminary assessment of wetland impacts. A wetland delineation will be performed once an alternative has been selected and will provide more accurate locations of wetlands and open water habitats within the project area.

The primary wetland and open water features found along each major roadway within the project area are presented in Table 9 and depicted on Figure 11. All proposed multi-use pathways and transit infrastructure, regardless of alternative, would be designed to avoid wetland impacts, wherever possible. If potential adverse impacts are identified when project locations and design are finalized, a wetland Statement of Findings would be prepared and included in subsequent compliance for the specific project.

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

Threatened and Endangered Species

The park contains five vertebrate species and no plant species listed under the Endangered Species Act as threatened, endangered, experimental, or candidate species (Table 10).

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 changed to threatened in Wyoming 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. 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 the 1940 Bald Eagle Protection Act (16 U.S. Code 668).

Between 1970 and 1995 the bald eagle population in the Greater Yellowstone Area increased exponentially (Stangl 1999). This growth was attributed to a significant reduction in the level of environmental contaminants such as DDT, and the protection of nesting habitat (Stangl 1999).

TABLE 9 DOMINANT WETLAND AND OPEN WATER FEATURES BY PROJECT AREA ROADWAY	
Road	**Cover Type Description**
U.S. 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 the 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 and Beaver Creeks, where palustrine scrub-shrub and palustrine emergent wetlands are present. 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 the 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.
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 the 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.

TABLE 10 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: U.S. Fish and Wildlife Service (USFWS 2002a)

Grand Teton National Park contains 12 known nesting territories and pairs; however, not all pairs breed in the park each year (Table 11). 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 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 0.5-mile buffer zone around active bald eagle 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 (Swensen et al. 1986; Stangl 1994). Most nesting territories are located along major rivers or lakes within 5 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 *(Pseudotsuga menziesii)*, black cottonwood *(Populus trichocarpa)*, and spruce (*Picea* spp.) Nearby food, suitable perches, and security from human activities are important habitat components for both nest and roost sites.

The nearest bald eagle nests are approximately 1.25 and 1.75 miles from the proposed project area and located along the Snake River. The project area does contain suitable nesting habitat in areas along the Snake River near the Moose bridge and the 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 Endangered Species Act as of 2000. Lynx are considered rare in Wyoming by the USFWS (1998a, 1998b) and are classified as a Species of Special Concern−Class 2 by the Wyoming Game and Fish Department, indicating that habitat is limited and populations are restricted or declining (NPS 1998). Historical information suggests that lynx were present but uncommon in Yellowstone National Park from 1880 to 1980. Records of lynx in Wyoming show the highest concentrations of confirmed observations in the northwest corner of the state including Yellowstone National Park, 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 8-12 degrees and at elevations from 7,995-9,636 feet (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 snowshoe 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 wildlife observation files), some of which may not be credible because lynx are easily confused with bobcats. 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 (Cunningham 2002, pers. comm.). McKelvey et al. (2000) documented

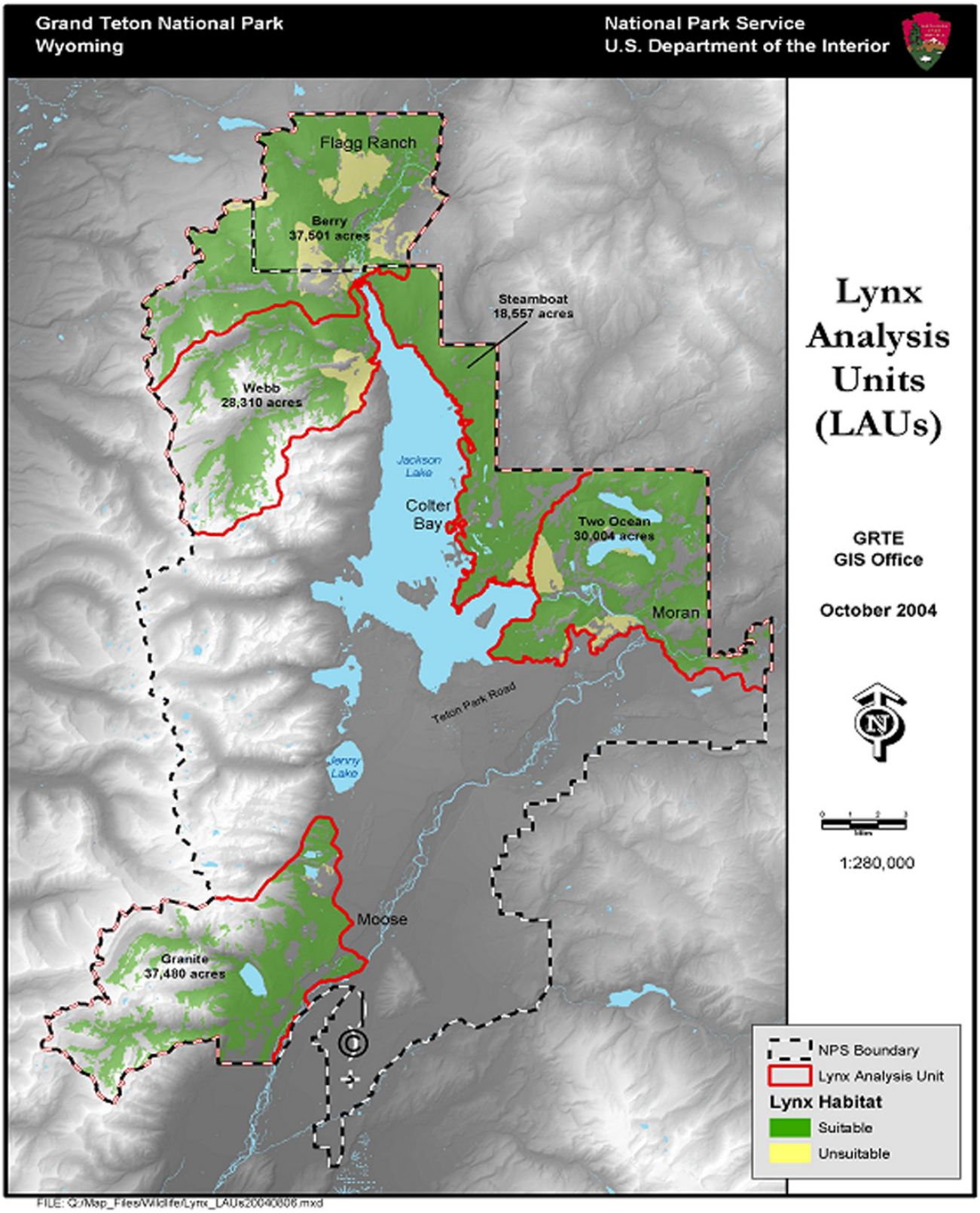
22 reports of lynx in the park between 1917 and 1997, with the majority of sightings occurring in the mid-1970's and early 1980's. Recent efforts to document lynx in Grand Teton National Park and neighboring Yellowstone National Park have had limited success. A 169-km snow-track transect survey in northern Grand Teton National Park and vicinity in 1998 found no evidence of lynx (S. Patla 2000, pers. comm.). Pyare (2001, 2002) located possible lynx tracks and a day-bed along Arizona Creek (Steamboat LAU) and productive snowshoe hare habitat near Grassy Lake Reservoir and Glade Creek (Berry LAU) in Grand Teton National Park during lynx surveys, but found no evidence of lynx in three years (2000-2002) of systematic hair snaring surveys in the park's best lynx habitat. In Yellowstone National Park, 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 the park. During the summer of 2004, a male lynx translocated to Colorado traveled through Grand Teton and Yellowstone National Parks (K. Murphy, pers. comm.).

TABLE 11
BALD EAGLE TERRITORIES AND PRODUCTIVITY IN GRAND TETON NATIONAL PARK, 1987-2004

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

Whether or not lynx currently reside in Grand Teton National 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 Canada lynx is believed present in Grand Teton National Park. Low habitat quality (e.g., low densities of snowshoe hares) may mean that Canada lynx, if present, would occur at

FIGURE 12
LYNX ANALYSIS UNITS (LAUS)



very low densities, perhaps only as transients (S. Cain 2002, pers. comm.).

Lynx Analysis Units (LAUs) and potential lynx habitat within Grand Teton National Park are depicted in Figure 12.

The five LAUs cover 149,827 acres and include aproximately 96,000 acres 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. Other regionally important linkage zones occur around Togwotee Pass and the Teton Wilderness linking areas in the southern Greater Yellowstone Area to Yellowstone, at Teton Pass connecting the southern Greater Yellowstone Area to the Teton Range and at the head of Granite Canyon connecting the east and west sides of the Tetons (Claar et al. 2003).

Project area roads transect 3 of the 5 lynx LAU's. The southern portion of the North Park Road, which is part of proposed improvements under Alternative 3, 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 inside 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 one percent of its historic range in the lower 48 states (USFWS 1993). Grizzly bears currently inhabit much of the Greater Yellowstone Area, including portions of Yellowstone National Park, Grand Teton National Park, and Bridger-Teton, Shoshone, Caribou-Targhee, Gallatin, and Custer National Forests.

Between 1800 and 1975, this grizzly population was reduced from an estimated 100,000 animals to less than 1,000 as a result of habitat destruction and intensive persecution from livestock interests (USFWS 1982). By 1974, some scientists estimated that fewer than 200 grizzlies remained in the Greater Yellowstone Area (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 1986). The IGBC is comprised of representatives from the NPS, USFWS, U.S. Forest Service (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 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 Greater Yellowstone Area including much of Grand Teton National Park (Figure 13). The revised Grizzly Bear Recovery Plan established measurable population parameters as indicators of population status for the Greater Yellowstone Area (USFWS 1993). The USFWS would consider removing the Greater Yellowstone Area population of grizzly bears from threatened species status when these demographic recovery goals are met. The grizzly bear population recovery parameters for the Greater Yellowstone Area are:

- An average of 15 adult females with cubs-of-the-year over 6 years inside the recovery zone and within a 10-mile area surrounding area.
- Sixteen of 18 Bear Management Units (BMU's) occupied by females with young for 6 years; no two adjacent BMU's shall be unoccupied.
- Known human-caused mortality not to exceed four percent of the minimum population estimate based on the most recent three-year sum of females with cubs.
- No more than 30 percent of this four percent mortality limit shall be females. These mortality limits cannot be exceeded during any two

consecutive years for recovery to be achieved.

- Approximately 125,000 acres of Grand Teton National Park are within the Primary Conservation Area as defined by the Conservation Strategy for the Grizzly Bears in the Yellowstone Ecosystem (USFWS 2003). Development within this recovery zone is restricted and requires an equivalent area within the conservation area to be restored as useable grizzly bear habitat.
- 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 the primary conservation area, and state plans that outline management strategies outside of the primary conservation area, must be developed and approved by the USFWS.

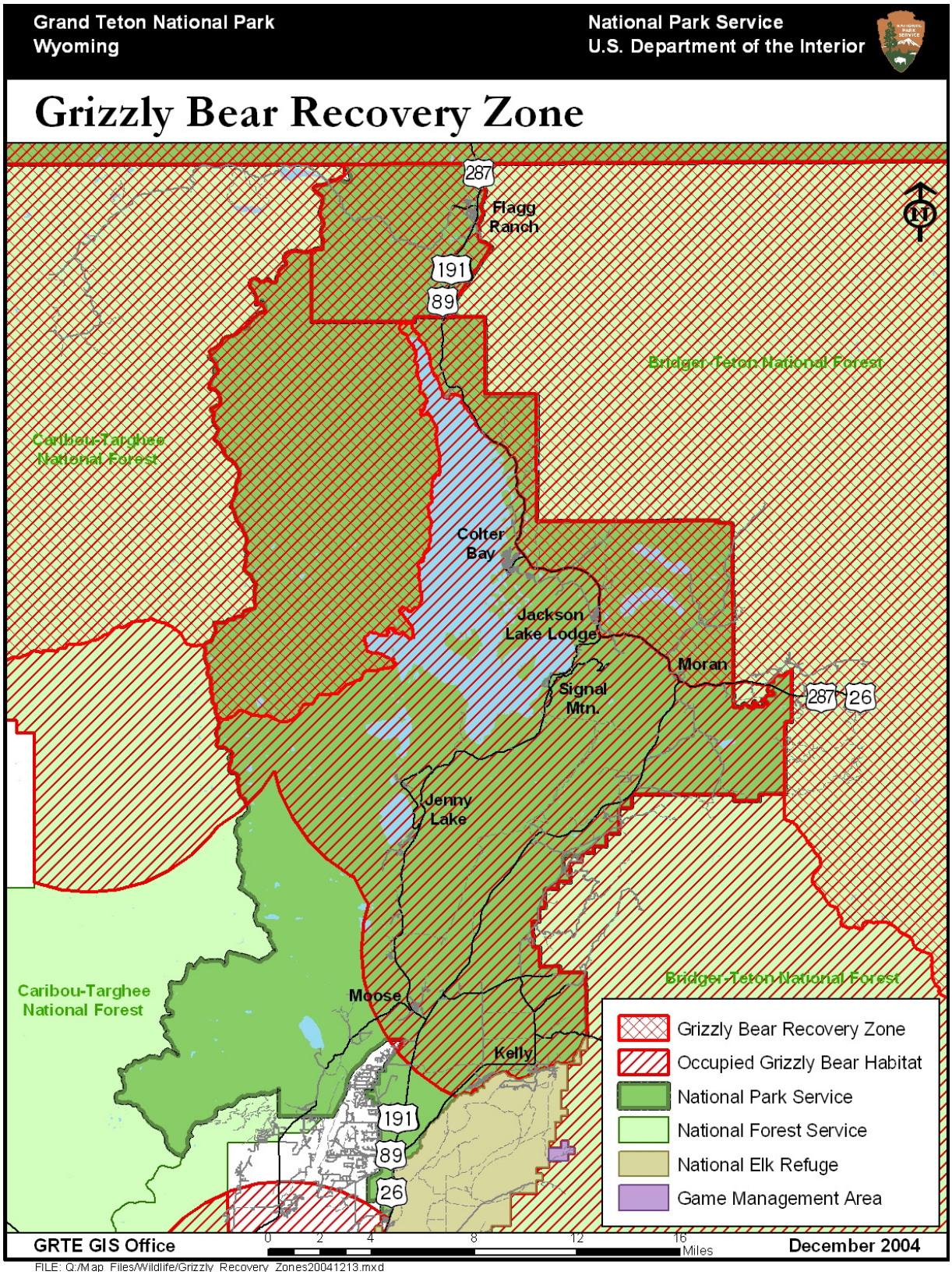
After being listed as a threatened species in 1975, grizzly bear population estimates in the Greater Yellowstone Area continued to decline through the early 1980's. Starting in the mid-1980's, annual minimum population estimates have increased (Haroldson et al. 1998, Haroldson 2004), largely due to lower numbers of human-caused grizzly bear mortality, especially of adult female grizzly bears. In 2003, 53 unduplicated females with young were estimated in the Greater Yellowstone Area (Haroldson 2004), and 49 were observed in 2004 (IGBST, unpublished data). Absolute minimum population estimates for grizzly bears in the Greater Yellowstone Area, 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 416 in 2003 (Haroldson 2004). 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-1980's.

All grizzly bear population recovery parameters were achieved for the first time in 1994, but grizzly bear mortality limits were exceeded during the next three years (1995-97). All population recovery parameters were again achieved from 1998-2003 and habitat-based recovery criteria, a conservation strategy, and state plans have been developed. USFWS is moving toward proposing delisting for the Yellowstone grizzly bear, which may occur sometime during 2005. However, recovery mortality limits were exceeded in 2004 and will likely be exceeded in 2005 (because mortalities are calculated on a multi-year running average); the effects on delisting of which are unknown at this time.

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 et al. (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 for males), encompassing diverse forests interspersed with moist meadows and grasslands in or near mountains. In the spring, bears usually range at lower elevations and go to higher altitudes for winter hibernation. Food habits of grizzly bears in the Greater Yellowstone Area have been described by Knight et al. (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 are also used (Mattson et al. 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. Typical den sites are situated on high, remote, mountain slopes where deep snow functions as insulation and persists until spring (Podruzny et al. 2002). Grizzlies often dig beneath the roots of large trees to create hibernacula. The greatest threat to grizzly bears is human-caused mortality. Grizzlies 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 eventually 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).

FIGURE 13
GRIZZLY BEAR RECOVERY ZONE IN THE GRAND TETON NATIONAL PARK AREA



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 Greater Yellowstone Area (Pyare et al. 2004; Schwartz et al. 2002). Grizzly bears are now relatively common in the southern Greater Yellowstone Area, 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 2003). Grizzlies have been infrequently observed on the valley floor south of the Triangle X Ranch, 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).

Management of grizzly bears and grizzly bear habitat in Grand Teton National Park follow the Interagency Grizzly Bear Guidelines (1986) and the park's Human-Bear Management Plan (Grand Teton National Park 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 (Grand Teton National Park 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 (Grand Teton National Park 1989) calls for educating the public and providing information on grizzly bear occurrence and how to avoid bear encounters, removing artificial food sources, enforcement of regulations, managing and controlling nuisance bears, and continuing to conduct grizzly bear research.

Management of grizzly bears in both the Greater Yellowstone Area 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 very 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 300 feet 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 100 meters of roads are dragged away from roads or are loaded into trucks and hauled to areas away from visitor activity.

Bears, both grizzlies and black, in the Greater Yellowstone Area are subject to being killed by vehicles. No grizzly bears have been hit and/or killed by vehicles on the Grand Teton National Park roads (Grand Teton National Park, unpubl. data), but 14 grizzly bears have been road-killed within the Greater Yellowstone Area since 1977 (Haroldson 2004, pers. comm.). A total of 17 black bears have been killed by vehicles on Grand Teton National Park roads since 1992 (Grand Teton National Park, unpubl. data) and eight black bears and two grizzly bears were hit and killed by vehicles on roads in Yellowstone National Park between 1989 and 1998 (Gunther and Biel 2000). Because black bears are ecologically similar to grizzly bears and have been hit and killed by vehicles in Grand Teton National Park, it is reasonable to assume that it is only a matter of time before a grizzly bear is hit and killed by a vehicle. A young male grizzly bear was found dead within 100 meters of Teton Park Road near Jackson Lake Junction in May 2003, but the cause of death was undetermined. Although the necropsy was inconclusive, 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 subspecies of the northern Rocky Mountain wolf was initially listed as an endangered species in 1973 (38 FR 14678). Due to taxonomic concerns, 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 Greater Yellowstone Area (Young and Goldman 1944), human persecution resulted in their extirpation by the 1930's (Phillips and Smith 1996).

Fourteen wolves representing three packs from Alberta were released into Yellowstone National Park in March 1995, and an additional 17 wolves from British Columbia were released into more widespread locations throughout Yellowstone National Park in 1996. Wolves reintroduced into Yellowstone National Park and central Idaho are classified "nonessential experimental" according to section 10(j) of the ESA of 1973, as amended (16 U.S.C. 1531). However, in national parks and wildlife refuges, nonessential experimental populations are treated as threatened species and all provisions of Section 7 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 Rockies recovery areas (i.e., Greater Yellowstone Area, central Idaho, and northwest Montana). Once 30 pairs are established and reproducing across the three recovery areas for three 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. Idaho and Montana have produced state wolf management plans and these plans have been accepted by the USFWS. At the end of 2004, the state of Wyoming was in litigation with the U.S. Fish and Wildlife Service over the latter agency's rejection of the Wyoming plan. Delisting cannot occur until this case is resolved and 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, riparian, and alpine areas). Wolves tend to be flexible in their habitat needs and are considered habitat generalists. Key components of wolf habitat are: 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 lions 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). Small mammals also provide an important source of food during the non-winter months.

Occurrence Within the Project Area

At the end of 2003, at least 301 wolves in 27 packs occupied the Greater Yellowstone Area. The Teton Pack is the only wolf pack currently using Grand Teton National Park consistently, although observations of other wolves with unknown pack affiliations are regularly reported in the park. 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. This pack first denned in Grand Teton National Park in 1999 and has continued to den in Grand Teton National Park since. In spring 2004, the Teton pack consisted of about 18 wolves (9 adults and yearlings and 9 pups).

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 recent visual observations, winter track counts, and reported sightings, the Gros Ventre Pack is believed to no longer exist.

Wolf activity 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. There is no known consistent wolf activity in the southern portion of Grand Teton National Park, but confirmed wolf sightings have been reported, and the high densities of elk in the southern portion of the park in summer and the National Elk Refuge in winter make it highly likely that wolves use this area regularly. 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 Greater Yellowstone Area. 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 Greater Yellowstone Area. One wolf, the alpha male of the Teton Pack, was hit and killed by a vehicle on U.S. 287 near the east boundary of Grand Teton National Park in 1999 (Grand Teton National Park, unpubl. data). Twelve wolves were killed by vehicles in Yellowstone National Park between 1995-2001. 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 Greater Yellowstone Area (i.e., Teton pack in 1999 and the Chief Joseph pack in 2001). In early 2005, one wolf was killed in the park near Moran Junction. It is reasonable to expect that a wolf could be hit and killed by a vehicle in the park sometime in the future.

Yellow-billed Cuckoo *(Coccyzus erythropthalmus)*

A candidate species for listing as threatened or endangered that may be found in Grand Teton National Park is the yellow-billed cuckoo *(Coccyzus erythropthalmus)*. Little is known about the status and occupancy of the yellow-billed cuckoo in the park. The only sighting of this species reported to the park was documented in 2001 at the Teton Science School's MAP station.

Yellow-billed cuckoos occur in riparian areas west of the Continental Divide and typically nest in tall cottonwood and willow riparian habitats. Suitable cuckoo habitats within the project include areas along the Snake River, Cottonwood Creek, and Christian Creek.

Bird Species of Special Concern and Neotropical Migratory Birds

In conjunction with species classification systems generated by the WGFD, Wyoming Natural Diversity Database (WYNDD), and USFWS, Grand Teton National Park maintains a sensitive species list that is used for establishing monitoring priorities and for evaluating project impacts. The WGFD classifies certain non-game animal species as "species of special concern" and categorized 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). Animals 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, significant loss of habitat, or sensitivity to human-caused mortality or habitat disturbances" (Fertig and Beauvais 1999). Migratory Bird Species of Management Concern in Wyoming (MBSMC) are designated 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.

Neotropical Migratory Birds

Neotropical migratory birds include raptors, passerines, and shorebirds that breed in North America, but migrate to Mexico, Central and South America for the winter. In Wyoming, 162 bird species are considered neotropical migrants (Cerovski et al., 2000) with peak migration periods occurring in May and September through early October. Nesting is typically initiated from mid-May to mid-June, and most young fledge nests sometime in June to mid-July.

Neotropical migratory birds are of particular interest to wildlife managers because population declines have been occurring throughout the birds' North American range. Habitat fragmentation and loss of winter range are at least two factors believed responsible for these declines (S.H. Nicholoff 2003).

All migratory birds in the park are protected under the Migratory Bird Treaty Act, 16 U.S.C. 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

Bird species of special concern that occur in Grand Teton National Park and in the project area are listed in Table 12.

Many neotropical migratory bird species that are not designated as sensitive also occur and breed in Grand Teton National Park. These species include, but are not limited to, osprey, short-eared owl, vesper sparrow, chipping sparrow, ruby-crowned kinglet, northern flicker, downy woodpecker, hairy woodpecker, yellow warbler, yellow-rumped warbler, white-crowned sparrow, and western tanager.

Breeding bird surveys (BBS) are conducted each year in the park. Road transects are located: 1) along the North Park Road from Lizard Creek Campground to the junction of the North Park Road and the Teton Park Road, and 2) along the Teton Park Road at the RKO junction to the junction of the North Park Road. A sub sample of a system of 30 sites set up by Dr. Martin Cody, UCLA, throughout the front- and back-country are also surveyed annually. Results from BBS surveys indicate that riparian and wetland habitats generally contain the highest density of bird species in Grand Teton National Park (Grand Teton National Park 2003). In addition, many bird species of special concern migrate, breed, and nest throughout the park, including not only riparian habitats but also sagebrush-grassland plant communities and deciduous and coniferous forests (Wolff, pers. com). The mixture of wetland, riparian, forested, and upland habitats found within the proposed project area makes it certain that a variety of bird species of special concern and neotropical migratory bird species are present and breed in and adjacent to the project.

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. Currently, the USFWS is reviewing these petitions and a final decision to list the grouse will be made in December 2004. 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

TABLE 12
BIRD SPECIES OF SPECIAL CONCERN THAT ARE IN GRAND TETON NATIONAL PARK AND IN 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
Yellow-billed cuckoo	NSS2	Level 2	Riparian forests
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 significant 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 significant loss; species is sensitive to human disturbance.

[2] **USFWS Status:**
Level 1: Conservation Species

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 (WY-GSG-CP; Wyoming Greater Sage-Grouse Conservation Plan 2003) 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 1940's, surveys have indicated a 70 percent decline in 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 (Connelly et al. 2000, Holloran and Anderson 2004). 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 5-6 km (2 to 4 miles) of the lek, but some nests may be more than 20 km (12 miles) away (Autenrieth 1981, Wakkinen et al.1992). In Grand Teton National Park, known nests average 4.5 km (range from 2.3 km to 10.0 km) from active leks (Hollaran and Anderson 2004) and are located throughout Antelope Flats, Ditch Creek, Baseline Flats, the Potholes, east of Timbered Island, east of the Jackson Hole Airport and along U.S. 26/89/191.

Early brood-rearing habitat is typically close to nest sites (Gates 1983) 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 (Gates1983, Connelly et al. 1988). Known brood-rearing locations in Grand Teton National Park include Antelope Flats, Baseline Flats, northeast of the Jackson Hole Airport, north of 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 the outside highway, the Jackson Hole Airport, Lost Creek Ranch, the Potholes, Wolff Ridge, and areas near the town of Kelly and the Teton Science School (Holloran 2001, Hollaron and Anderson 2004).

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. 26/89/191, especially near the 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 the Moose junction, and from the Moose Entrance Station to the Potholes. No leks are directly within the project area but two, the Airport lek and the Timbered Island lek, are 0.5 miles and 1.1 miles from U.S. 26/89/191 and the inside Teton Park Road, respectively. Radio telemetry data indicate grouse use sagebrush habitats adjacent to the outside park highway 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 inside Teton Park Road from the Moose Entrance Station to the Potholes. No breeding, nesting, brood-rearing, or wintering habitat is known or likely to occur within the project area north of the Potholes.

Wildlife

Grand Teton National Park provides habitat for a

variety of wildlife species, including 61 mammals, four reptiles, six amphibians, 19 fish, and 299 birds (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, including elk, moose, mule deer, bison, and pronghorn antelope.

Elk

Jackson Hole and its vicinity support the largest herd of Rocky Mountain elk (*Cervus elaphus)* in North America. The summer population numbers between 14,000 and 20,000 animals, and summer ranges for Jackson Hole elk are extensive (over 1,000 sq mi) 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. Elk reside in both lower and higher elevations throughout the park in summer. Mid-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 are important for elk calving, which peaks around June 1. Elk are highly visible within the project area in the fall during the rut. During evening and early morning hours they use the large sagebrush meadows on both sides of the Teton Park Road, especially in the vicinity 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 Yellowstone National Park) and winter range (predominately 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: from the Snake River corridor south of Moose northeast and east towards Blacktail Butte, and from the Snake River corridor south of the airport east towards the Gros Ventre River. Large numbers of elk cross U.S. 26/89/191 between 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.

Moose

Shiras moose *(Alces alces shirasi)* 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 about 1,700 individuals (D. Brimeyer, per. comm. 2003). 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 unpubl. 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 popula-

tion 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, unpubl. data). 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.

Mule Deer

Jackson Hole provides year-round habitat for mule deer *(Odocoileus hemionus hemionus)*, 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 River) and are used by mule deer en route to and from crucial winter range located to the south on 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 (outside the park) the availability of artificial foods intentionally or unintentionally provided by humans. 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.

Bison

A population of bison *(Bison 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 800 animals in the fall of 2004 (S. Cain pers. comm. 2004) 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. 26/89/191. They are also occasionally found east of the Teton Park Road between north Jenny Lake junction and the Signal Mountain area.

Pronghorn Antelope

Pronghorn antelope *(Antilocarpra americana americana)* are seasonal residents of the project area. Approximately 150 to 250 pronghorn antelope summer in the park and the Gros Ventre River drainage, and generally migrate out of Jackson Hole to winter range in the Green River Basin, approximately 100 miles away (Sawyer and Lindzey 2000). Historic records and recent research indicate that pronghorn summering in Jackson Hole have migrated as far south as Rock Springs, Wyoming. Pronghorns 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 leave Jackson Hole every winter as evidenced by individuals (16-88) wintering on the National Elk Refuge and East Gros Ventre Butte during the winters of 1976/77, 1986/87, and 1992/93 through

1997/98 (Segerstrom 1997; Sawyer and Lindzey 2000). During most years, however, the majority of any pronghorn that attempt to winter in Jackson Hole do not survive because of deep snow. Pronghorns that do migrate into and out of Jackson Hole generally follow a route along the Gros Ventre River and arrive in Grand Teton National Park in May and depart by late November (Segerstrom 1997; Sawyer and Lindzey 2000). Pronghorns 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 pronghorns summering in Jackson Hole occur within the low-lying sagebrush communities on the east and west side of the Snake River floodplain (Segerstrom 1997), including Baseline Flats, the Potholes, south Antelope Flats, and the 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 and Antelope Flats area, the Potholes, Lupine Meadows, and Elk Ranch (K. Berger 2002, pers. comm.). Fawning occurs between 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, defended by bucks, are also concentrated in Grand Teton National Park. Reproductive rates for Jackson Hole and upper Gros Ventre River drainage pronghorns tends 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.).

Common Mammals

Mammalian predators inhabiting the project area include coyotes, bobcats, mountain lions, black bears, badgers, long-tailed weasels, short-tailed weasels, mink, river otters, red foxes, pine marten, skunks, and bats. Small mammals are abundant within the project area and include Uinta ground squirrels, mice, voles, shrews, chipmunks, tree squirrels, marmots, porcupines, beavers, muskrats, northern pocket gophers, and snowshoe hares.

Wildlife-Vehicle Collisions

According to Wildlife Incident Reports compiled by the park, a total of 630 wildlife-vehicle collisions were reported between 1992-2001 (unpublished data). Ninety-five percent of animals involved in wildlife-vehicle collisions on park roads were ungulates (Figure 14) and included mule deer (40 percent), elk (31 percent), moose (13 percent), bison (5 percent), and pronghorn antelope (2 percent). Non-ungulate species involved in reported wildlife-vehicle collisions included black bear, coyote, porcupine, beaver, owl, mountain lion, badger, raccoon, and wolf (Table 13). The wolf mortality occurred on a section of park roadway outside of the project area. 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 the 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 accurately predict ungulate-vehicle collisions. 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

FIGURE 14
DOCUMENTED WILDLIFE/VEHICLE COLLISIONS IN GRAND TETON NATIONAL PARK BETWEEN 1992-2001

(WVC = wildlife–vehicle collisions, UVC = ungulate vehicle collisions)

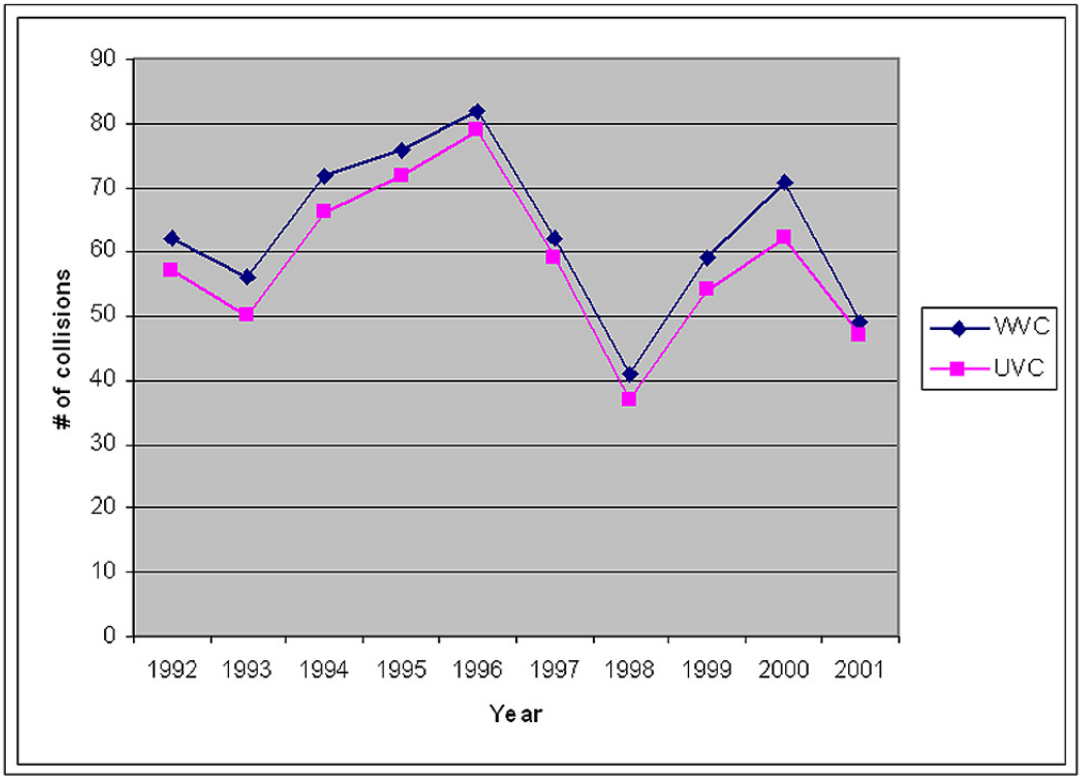


TABLE 13
WILDLIFE SPECIES INVOLVED IN DOCUMENTED VEHICLE COLLISIONS ON GRAND TETON NATIONAL PARK ROADS FROM 1992-2001

Ungulate/Black Bear			Non-Ungulate		
Species	**Number**	**%**	**Species**	**Total**	**%**
Deer	254	40.4	Coyote	10	1.6
Elk	198	31.4	Porcupine	7	1.1
Moose	83	13.2	Beaver	4	0.6
Bison	34	5.4	Sage-grouse	2	0.3
Black bear	17	2.6	Owl	2	0.3
Pronghorn	14	2.2	Mt. Lion	2	0.3
			Badger	1	0.2
			Raccoon	1	0.2
			Wolf	1	0.2
Totals	600	95.2	Totals	30	4.8

June and September (Figure 15), although collisions with moose were more frequent during non-summer months.

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

The rate (number per mile) of ungulate-vehicle collisions during summer months was found to vary depending upon the road. In general, U.S. 89 between Moose and Leeks Marina had the highest relative rate of ungulate-vehicle collisions per mile (average of 7.4 collisions/mile); U.S. 89 between Jackson Lake Lodge Junction and Leeks Marina, had the highest incidence of ungulate-vehicle collisions (8.68 collisions/ mile).

Reptiles and Amphibians

Several species of amphibians and reptiles are present in Jackson Hole (Baxter and Stone 1980) and within the project area. These include tiger salamander (*Ambystoma tigrinum melanosticum)*, northern leopard frog *(Rana pipiens)*, Columbia spotted frog *(Rana luteiventris)*, western boreal toads *(Bufo boreas boreas)*, western chorus frog (Pseudacris triseriata maculate), 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 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 Jackson Hole.

Western boreal toads are known to occur both within the Greater Yellowstone area and Grand Teton National Park. The northern Rocky Mountain population within the Greater Yellowstone Area, 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 Greater Yellowstone area and, specifically, in Grand Teton National Park. Although not often found above 6,000 feet in the northern Rocky Mountains (Baxter and Stone, 1985), it has been documented as high as 8,300 feet in Yellowstone National Park and Grand Teton National Park in geothermally influenced areas, and as high as 7,000 feet in non-geothermal areas (Koch and Peterson 1995). Sagebrush lizards have been reported in Grand Teton National Park near Pilgrim Creek, Bar BC Ranch, the Snake River Floodplain, 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. In addition, any projects implemented would avoid wetlands. If avoidance is not feasible, measures will be taken to protect wetlands from damage caused by construction

equipment, erosion, siltation, and other activities that potentially could affect wetlands.

Cultural Resources

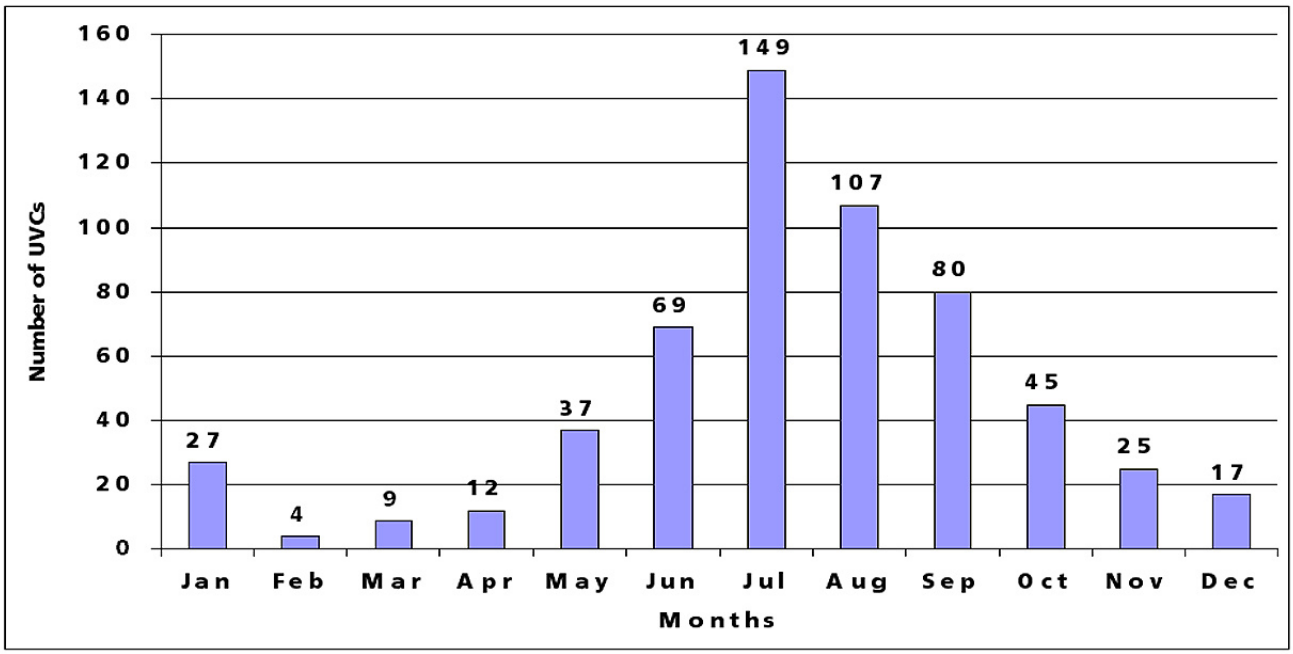
Director's Order – *28, Cultural Resources Management Guideline*, recognizes the management of five categories of cultural resources: (1) archeological resources, (2) cultural landscapes, (3) ethnographic resources, (4) historic structures, and (5) museum objects. All of these categories except archeological 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, 190 prehistoric sites are known to exist within the project area, 146 of which have not been evaluated for the National Register of Historic Places (NRHP). Thirty-eight have been classified as eligible for nomination to the NRHP, and are included in the Jackson Lake Archeological District. Two additional sites near Jenny Lake are also eligible for the NRHP, and four prehistoric sites have been evaluated as not eligible for the NRHP (NPS 1990).

FIGURE 15
THE NUMBER OF UNGULATE-VEHICLE COLLISIONS BY MONTH ON ROADS IN GRAND TETON NATIONAL PARK, WYOMING



Because archeological surveys conforming to the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation (SGAHP) 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.

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 NRHP.

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 to the NRHP. Additional fieldwork and data recovery will be necessary before any construction (Teton Corridor 1990).

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

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 NRHP, and extensive subsurface testing must be done on this end (Teton Corridor 1990).

String Lake area: One prehistoric site (48TE412) has been recorded in this area.

Jackson Lake Dam area: An archeological survey was conducted during reservoir drawdown for dam repair and these sites are now below the elevation of the reservoir (NPS Conner et al. 1987).

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

Signal Mountain area: According to a Development/Study Package Proposal (Grand Teton National Park 1984), an archeological reconnaissance survey of the Signal Mountain Developed Area was completed in 1983, and no archeological evidence was found (SML 1988).

Mormon Row/Antelope Flats area: One site has been located near 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 pull-outs, trailheads and activity centers along these roadway corridors.

There are approximately 140 miles of paved and 70 miles of unpaved roadway surface within the park. Key paved roadways include U.S. 26/89/191, the North Park Road (U.S. 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, Mormon Way, and Two Ocean Lake Road) and unimproved facilities (i.e., RKO Road).

Currently, all paved roadway segments in the park

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

Over most of U.S. 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.

Vehicle Mix and Vehicle Restrictions

The mix of vehicles in the park varies by roadway. U.S. 26/89/191 typically experiences the most diverse mix of vehicles, with personal automobiles, motorcycles, RVs, tour buses, intercity 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. Recreational vehicles, vehicles with trailers (except for horse trailers), large tour buses, and trucks are prohibited from using this road.

Traffic Volumes

Traffic 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. 26/89/191 currently is 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 Junction, 4,400 vehicles between Lupine Junction and North Jenny Lake Junction, and 3,700 vehicles north of North Jenny Lake Junction.

Exceptions to this general pattern occur on the North Park and the Moose – Wilson Road. Traffic on the North Park Road averages around 5,300 to 5,500 vehicles per day everywhere except for the portion between Jackson Lake Junction and Leek's Junction, where it averages up to 7,800 vehicles per day. Daily summertime traffic on the Moose–Wilson Road averages around 1,600 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, often fill to capacity early in the day and stay full through the late afternoon during the peak of the summer season. The Death Canyon parking lot also fills early in the day in the summer peak season, with additional vehicles using an overflow area on the roadway shoulders. Taggart Lake, Lupine Meadows, and Granite Canyon are also popular and at times fill to capacity in the peak summer season, but to a lesser extent than South Jenny Lake or Death Canyon.

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-foot Grumman shuttles, 40-foot RTS buses, and over-the-road coaches.

Alltrans 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 Grand Teton and Yellowstone, private charters, tour destination management, and customized tours throughout the intermountain west. The tours of Grand Teton and Yellowstone originate daily from Teton Village and operate via the Jackson Hole Racquet Club and Jackson before proceeding north to the parks.

Grand Teton Lodge Company. Grand Teton Lodge Company provides shuttle transportation for both its guests and employees from late April to October of 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 Jackson Lake Lodge and the airport six times per day (with stops at Jenny Lake Lodge and South Jenny Lake). Three of the trips continue to Jackson. The company also provides hourly scheduled service between Colter Bay and Jackson Lake Lodge from 7:00 a.m. to 7:00 p.m. daily.

Callowishus Park Touring Company. The Callowishus Park Touring Company provides tours through Grand Teton and Yellowstone national parks. 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. 89/26 and Gill Avenue.

Teton Science School. The Teton Science School offers 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 ten-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. A total of 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 put-in location.

Other Concessioner Shuttles. Most of the other concessioner 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 Grand Teton and Yellowstone national parks, 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 June to September between the Cottonwood Creek Boat Dock and the west side of 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 22 passengers each. The boats are used for both the ferry and tour bus services. The company also rents canoes and kayaks to park visitors.

The majority of ferry users purchase round-trip tickets. People who purchase one-way tickets typically hike half-way around the lake in one direction and ride the ferry in the other. In the summer of 2004, ridership on the Jenny Lake Shuttle Boat totaled 127,024 people. The peak ridership month was July, when 43,592 people rode the shuttle.

Non-Motorized Travel

Bicycling has become an increasingly popular activity in the park, despite the lack of designated bike lanes and bike 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 in mid-March, it remains closed to motor vehicles until May 1. During this time, it is available for non-motorized uses, such

as bicycling, walking, and rollerblading. The popularity of these activities, especially with local residents, is evident on most days, and during nice weather it is not uncommon for the Taggart Lake parking lot to be 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 is relatively little highway mileage with the type of wide shoulders preferred by bicyclists. However, several of the low-traffic volume roads in the park are popular with cyclists (i.e., Antelope Flats Road, Mormon Row, the Jenny Lake Scenic Loop, and Gros Ventre Road). Bikes are allowed only on paved and unpaved roads unless otherwise posted. Bikes 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 bike 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.

Traveler Safety

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

Pedestrian Crossings

Pedestrian crossings occur at many locations within the park, primarily within the developed activity areas. Although scenic pullouts have been well designed for accommodating pedestrians and photographers, it is not uncommon for people to pull to the side of roads at other locations. Often these stops are for the purpose of 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 feet. 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, and two fatalities occurred in recent years.

Visitor and Employee Experience

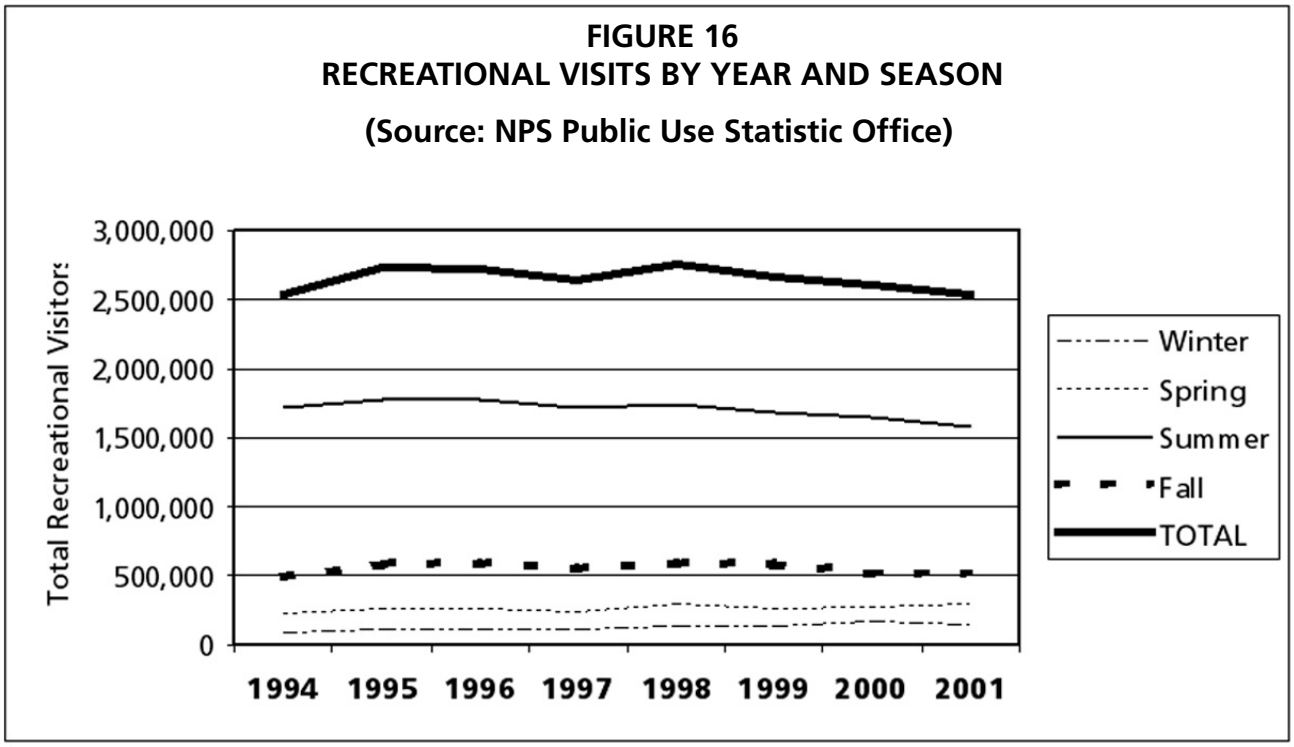
Park Visitation Trends

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. 26/89/191. While visitation has grown somewhat during winter and spring, it has remained fairly constant during summer and fall (Figure 16).

About 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 23 percent of the annual total, respectively. Between 1993 and 1999, the average daily number of visitors to the park in July and August was about 21,000 and 20,000, respectively (Figure 17).

FIGURE 16
RECREATIONAL VISITS BY YEAR AND SEASON

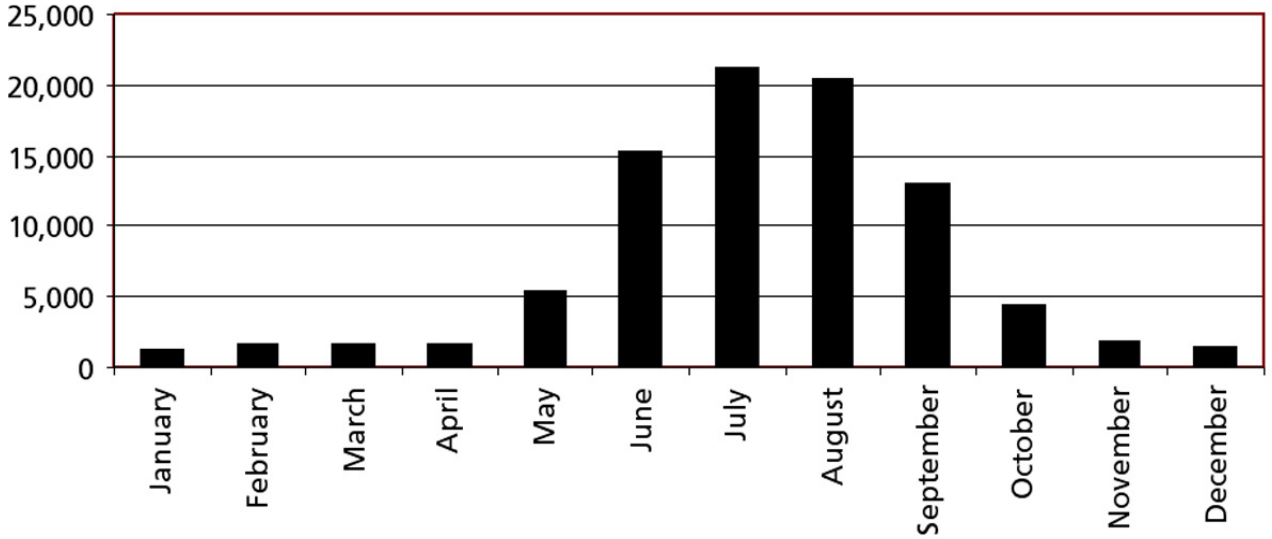
(Source: NPS Public Use Statistic Office)



Note: Seasons are defined as follows: Winter = December (of the previous year), January and February. Spring = March, April, and May. Summer = June, July and August. Fall = September, October and November.

FIGURE 17
AVERAGE DAILY RECREATIONAL VISITS (1993-1999)

(Based on data provided by NPS Public Use Statistics Office)



An average of 5,500 visitors spend the night in the park during July (Figure 18). Overnight visitor facilities include several campgrounds, five lodges, a guest ranch, a dormitory (used by rock climbers), a 112-space Recreational Vehicle (RV) park, and a 66-unit tent village. Campgrounds are located at South Jenny Lake (50 sites), Signal Mountain (87 sites), Colter Bay (350 sites), Lizard Creek (61 sites), and Gros Ventre (372 sites). The lodges include Dornan's (12 units), Jenny Lake Lodge (37 units), Signal Mountain Lodge (79 units), Jackson Lake Lodge (385 units), and Colter Bay Cabins (166 units). Triangle X Ranch and Climber's Ranch operate the guest ranch and rustic cabins, respectively, while Grand Teton Lodge Company runs the RV park and tent village.

Visitor Profiles

A survey of visitors conducted by Margaret Littlejohn in Grand Teton National Park 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 two 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 (Figure derived from Littlejohn data [Figure 1]. See Grand Teton National Park Transportation Study, Vol. 2, Appendix L.). This finding is fairly consistent with the results of the surveys conducted in support of this Plan/DEIS 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 Transportation Survey Report 2002).

The 1997 survey data indicates that visitors stay an average of two days in the park. About 45 percent of respondents reported staying less than one full day. Among visitors who reported staying in the park for more than one day, the average length of stay was around 3.5 days.

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 hiking or strolling, shopping, riding the Jenny Lake Boat, 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 four percent of visitors indicated that they engaged in bicycling while visiting the park.

Visitor Travel and Recreational Destinations

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

Visitor Experience and Attitudes

The responses to several questions in the Littlejohn 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 14). 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.

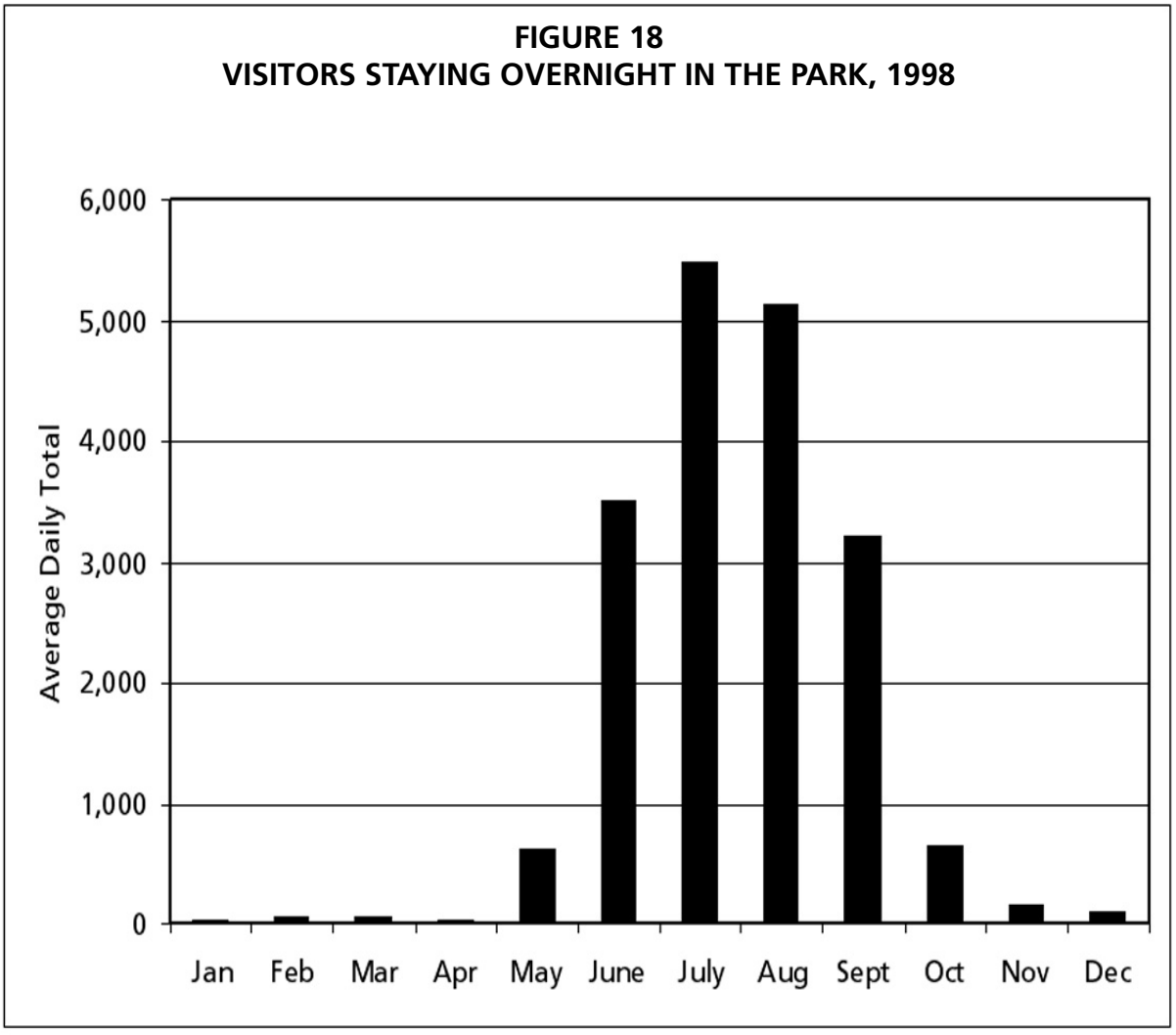
Finally, the 1997 survey asked visitors whether or not they would "support visitor use restrictions and/or reservation systems" as a means of providing a high quality visitor experience and protecting park resources. Forty-seven percent of visitors responded to this question with a "yes," while another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

Visitor Access and Circulation

Currently, the most common form of visitor access to Grand Teton National Park is the private or rented automobile. For example, in a survey of Jackson Lake Lodge guests conducted for this project, 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 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 Transportation Survey Report 2002).

Visitors who pass through the Moose Entrance Station also travel mostly by automobile. In the

FIGURE 18
VISITORS STAYING OVERNIGHT IN THE PARK, 1998



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 two percent of visitor trips, while travel by motorcycle, bicycle, taxi, tour bus, or shuttle bus accounted for the remaining one percent (Grand Teton National Park Transportation Survey Report 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 feet 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 wayfinding 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 separated 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 cyclists, particularly those riding as part of organized tour groups. Popular low-volume roads include Antelope Flats Road, Mormon Row, and Gros Ventre Road.

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 concessions office shows that organized bicycle 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) (Kim McMahill, Grand Teton National Park Concessions Office).

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 inbound 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 the 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 National Park Service, park concessioners, and the Jackson Hole Airsport. Smaller employers include Dornan's, Teton Science School, and University of Wyoming – NPS Grand Teton Research Center. The number of people

TABLE 14
SURVEY RESULTS ON VISITOR ATTITUDES TOWARD FIVE PARK FEATURES

	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%

Source: Littlejohn 1998, Figures 19-23

who work in the park during the summer totals around 2,280. Winter employment totals around 590 people.

Approximately 80 percent of the NPS employees live inside Grand Teton National Park or the John D. Rockefeller (JDR) Memorial Parkway, and about 43 percent live within walking distance of their worksites. Clusters of residences within the park are located at Moose (14 percent of employees), Beaver Creek (14 percent), Highlands (7 percent), Lupine (5 percent), Moran Junction (4 percent), Colter Bay (24 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, South Jenny Lake, Signal Mountain Ranger Station, Colter Bay, and Moran Junction (NPS 2002).

Nearly all concession employees live inside the park, most within a short distance of their worksites. 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), Climber's Ranch, South Jenny Lake, Jenny Lake Lodge, Signal Mountain Lodge, Jackson Lake Lodge, Colter Bay, and Triangle X Ranch (NPS 2000). 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. The lodge company's responsibilities include operation of South Jenny Lake store, Jenny Lake Lodge, Jackson Lake Lodge, and all of the activities at Colter Bay (including the general store, the laundry, the restaurants, the RV park, Colter Bay Cabins, Colter Bay Tent Village, the gas stations, and the marina). Signal Mountain Lodge is the next largest employer, with a total of around 150 employees. Triangle X Ranch is third largest, with around 70 employees (NPS 2000).

Employee Access and Transportation

Employee surveys were conducted during the summer of 2001 in support of this Plan/DEIS. The surveys were intended to answer questions regarding the travel influences, patterns and preferences of three distinct employee populations: those of the National Park Service, Grand Teton Lodge Company, and Signal Mountain Lodge Company. The survey questions asked respondents to provide information on such things as mode of travel to work, residence location, availability of a driver 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 more than those who lived farther away (NPS 2002).

Approximately 158 employees of Grand Teton Lodge Company completed the survey. Modes of travel to work included driving alone (25 percent), carpooling (6.5 percent), riding a motorcycle (1.5 percent), riding a bicycle (20 percent), riding the bus (2 percent), and walking (45.5 percent) (NPS 2002). The Grand Teton Lodge Company provides hourly 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 US. A large number are from Mexico, 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, and the like (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 about 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 currently more than 4,800 lodging rooms, cabins, and other short-term accommodations in the valley (Jackson Hole Chamber of Commerce). 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 15). 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

TABLE 15
TETON COUNTY POPULATION GROWTH, 1990-2000

	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
Growth, 1990 to 2000	3,520	7,078	2,560
Percent Growth	69%	63%	74%

Sources: U.S. Census Bureau, (a) and (b)

by 74 percent between 1990 and 2000. Driggs and Victor, the largest towns in Teton County, Idaho, registered populations of 1,132 and 870 residents in the 2000 census.

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 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 affects 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 householder 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 in Teton County, Wyoming, 97 percent is public land, most of that managed by the federal government. Private lands total only about 76,000 acres; of that, about 13,600 acres 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 the town of 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 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 in Teton County, Wyoming, for non-rental units exclude the many seasonal or recreation 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; Yellowstone National Park to the north; and the Teton crest, with several small communities on the "Idaho side" (which includes 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 (Comprehensive Plan for Teton County, Wyoming 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."

And 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."

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 the Town of Jackson and Teton County in economic, fiscal, and political terms.

Regional Comprehensive Plan

Teton County, in conjunction with the Town of Jackson, share a regional comprehensive plan. The plan was updated in 2000 with the addition of Chapter 8, the Regional Transportation Plan. These plans provide 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 as a result 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" (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 that multi-lane projects can be avoided to the extent possible.

The 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 (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" (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 the Town of Jackson in June 2000. The transit development plan was based on an evaluation of current operations of the Southern Teton Area Rapid Transit (START) public bus system, including relationships between the START cost structure, routes, service levels, fleet requirements, and other factors. The transit development plan 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 (including a 2020 goal of 5 percent of daily person trips on transit), the transportation development plan provided service recommendations and a financial plan for implementation. The recommendations were based on realization of the 2020 Transportation Plan goals (including a 2020 goal of 5 percent of daily person trips on transit) and also defined a phased implementation program with a detailed operations plan for the first five years (2000 – 2005). In the first five years, the transportation development plan calls for expansion of local route service, including higher frequency service on existing routes as well as additional routes. The transportation development plan recommends initiation of commuter services, including connections to Alpine and over Teton Pass.

Specific transportation development plan 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 Multi-Agency Campus (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 significantly 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 transportation development plan. 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 Pathways Program is a joint office of the Town of Jackson and Teton County, managed within the Town/County County Parks and Recreation Department. The program has the following goals:

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 provides safe, convenient access to major equestrian destinations.

Meet needs of Nordic skiers – Create a network of winter Nordic trails and trail access points that provides 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 the Town of Jackson, and has worked with other agencies to build additional pathways. A pathway has recently been completed along Wyoming 390 from its junction with Wyoming 22 to the park boundary. The Pathways Program has also identified a connection from the town north along U.S. 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 spread, somewhat uniformly, over a large area with commercial services concentrated in the Town of 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 the Town of Jackson and Teton County.

Comprehensive plan land use 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 (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 the Town 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 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 the Togwotee Pass Road (U.S. 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 the Town of 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 the Town of Jackson, the remaining residential development potential under current zoning and Land Development Regulations is anticipated to be built out within the planning period (i.e., before the year 2020) based on the historical trend of residential development growth.

Commercial development, analyzed by employee numbers, is concentrated in the Town of 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 county contained the other 23 percent. Based on commercial development trends, by 2020 the community will offer about 27,300 jobs, with the Town of 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 the Town of Jackson, recent land development patterns for community commercial services have been moving away from Downtown Jackson southward along West Broadway and South 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 five years.

The development area likely to have the most direct relationship with the park and its transportation program is Teton Village, situated about at the base of Jackson Hole Mountain resort along Wyoming 390, about 1 mile south of the Granite Canyon Entrance to the park. A Resort Master Plan for this area was approved by Teton County in 1998 and the area is at approximately 60-70 percent of the approved buildout. Currently, Teton County is considering an application by another landowner, with lands adjacent to Teton Village, for a proposed expansion of the Resort Master Plan to include additional dwelling units and commercial space. In addition to the currently approved master plan, the expansion proposal could add several hundred housing units and slightly over 80,000 square feet 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 the Village and the park, and also provide 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 its ongoing review of the proposed expansion of that master plan, assume 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 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 five years has focused on a transit connection between the village and the Town of Jackson via Wyoming 390 to the south.

Park Operations

The Grand Teton National Park operational budget for Fiscal Year 2004 was approximately $9.5 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 seasonals, 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 summer, but hours of operation are reduced at other times of the year.

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, such as 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, 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.