CHAPTER 3: AFFECTED ENVIRONMENT

This chapter describes the existing natural resources and the environmental characteristics of the area associated with the Wolf Creek EIS. The information and data presented in this chapter provides a baseline description of the environment against which the various alternatives described in Chapter 2 are evaluated in Chapter 4. The information presented in this chapter is based on the best data currently available.

3.1 SURFACE WATER

The precipitation for this project area is received primarily in the form of snow at the higher elevations. Snowfall at the Ski Area averages 39 feet a year, equating to approximately 4 feet of rainfall (CSLV 2004). In contrast the San Luis Valley floor, an extremely arid region receives approximately 7 inches of rainfall yearly (USFS 1999c).

The private property is situated in the Pass Creek Watershed located immediately east of the Ski Area. The Pass Creek watershed is a unique environment that has been formed by abundant precipitation, high elevation, and steep mountain slopes. These characteristics have formed extensive wetland areas, some of which lie within the private property. Like many of the watersheds within the RGNF, Pass Creek watershed has a history of timber harvesting.

3.1.1 Hydrologic Function

3.1.1.1 *Hydrology*

Hydrologic systems for the project area include lakes (natural and manmade), rivers, streams, overland drainage flow, and wetlands. The hydrology of the Pass Creek basin is dominated by snow. Most of the precipitation received is in the form of snow which is stored as snow pack until spring runoff (RGNF 2004). Thunderstorms do occur during the summer monsoon season, affecting the overall basin hydrology. The upper reaches of Pass Creek Watershed encompass the private property. The drainage area tributary to, and including the private property, is approximately 7.5 square miles, spanning from the San Juan Mountains along the Continental Divide, including the majority of the Ski Area. The two unnamed tributaries of Pass Creek traverse through the center of the private property flowing from west to east. These channels are perennial, fed by snow melt and groundwater. A qualitative assessment of stream health is presented in Section 4.19, Cumulative Impacts.

3.1.1.2 *Watershed Assessment*

Within the NFS boundaries, the USFS has identified watersheds with sufficient levels of disturbance for the purpose of classifying ‘watersheds of concern’. Disturbances include consideration of the presence of roads, road proximity to streams, recreational land uses, and timbered portions of the watershed. The designation as a “watershed of concern” requires a closer or more detailed evaluation of stream health. Should it be determined that stream health has been effected by disturbances in a watershed of concern, then the USFS would apply additional protection, restoration, or avoidance above and beyond protection provided by the USFS normal standards and guidelines (USFS 1996a).

Watershed assessments for seven watersheds, including Pass Creek, were performed for the *Handkerchief Mesa Environmental Analysis* (Handkerchief EA) (USFS 2000). The Handkerchief EA concluded that Pass Creek is a watershed of concern. The primary disturbance factors leading to this rating included the following:

- Presence of roads (asphalt and gravel)
- Heavy outdoor recreational use
- Fragile rangelands in poor conditions
- Presence of pipelines and canals/ditches
- Previous timber harvesting
- Poor grass cover and erosion

Recent observations indicate that, although the Pass Creek is a watershed of concern, the watershed is exhibiting good vegetation regenerating in areas where timber was previously harvested. In the alternatives development for the Handkerchief EA, the Upper Pass Creek watershed is avoided for all alternatives and is thus unaffected by future timber harvesting (USFS 2000). Roads systems within the watershed are also believed to have minimal effect due to improvements implemented over the past few years (RGNF 2004).

3.1.2 Riparian Areas

3.1.2.1 *Stream Health*

There are several small streams and wet marshy areas in the vicinity of the private property, including two unnamed tributaries of Pass Creek. These tributaries drain the Ski Area and associated facilities and a small portion of the northern part of Alberta Park, which is a large wetland feature located centrally within the private property. Although no specific springs were located in Alberta Park, moist conditions have been observed throughout most of the year when the Park is not covered with snow.

The north branch tributary runs parallel to Highway 160, collecting runoff from Highway 160 and the northern portion of the Ski Area. The south branch tributary drains the majority of Alberta Park as well as the slopes further south and then flows into Alberta Lake, a manmade reservoir located 0.25 mile southeast of the site. The tributaries converge 0.50 miles downstream of Alberta Reservoir, then flow as one stream for 0.75 miles to Pass Creek. Pass Creek flows into the South Fork of the Rio Grande River, approximately 5.5 miles north of the private property.

The watershed assessment prepared for Pass Creek in the Handkerchief EA indicated that the stream flows in Pass Creek have increased due to timber harvesting. However, these higher flows are not expected to cause streambank erosion since the harvested areas are 19 percent of the basal area (USFS 2000). The USFS manages timber harvesting to try to remain below 25 percent of the basal area for resource protection. The Handkerchief EA identified one small portion of the upper portion of the upper Pass Creek watershed where open spaces persist from

past timber harvest and the grass cover has low vigor. Erosion and livestock grazing are also evident and the streambanks are unstable. However, the overall main stem of Pass Creek is "fairly healthy". Overall channel shape, bank stability, and bed composition is adequate (USFS 2000). A site specific stream health assessment is currently being conducted to confirm these conclusions, identify stream health classification, stream type, reference channels, and to establish specific parameters for future monitoring.

3.1.2.2 *Floodplains*

From a regulatory standpoint, floodplains are defined by the extent and depths of flooding during a given design event, such as the 100-year flood, as determined by the Federal Emergency Management Agency (FEMA). The Mineral County Flood Insurance Study, Community No. 080284 A, dated April 16, 1991 (Mineral County 1991), shows the entire Pass Creek watershed, including the two unnamed Tributaries in "Zone D" which are defined as "areas of undetermined but possible flood hazards."

3.1.2.3 *Wetlands*

Three wetlands delineations have been performed for the private property. These delineations were performed by ENSR, Inc., and SE Group, both private consultants retained by the landowner. ENSR, Inc. conducted a routine delineation in 1987. In 1996, ENSR, Inc. performed a second delineation. Both delineations were conducted using USACE Wetlands Delineation Manuals in effect at the time of the field surveys, and both were reviewed by a USACE representative. In October 2001, a third survey was performed by the SE Group to relocate the previously identified wetlands, verify wetlands persistence and/or extent, identify additional wetlands where previous investigations had revealed none, and to request a re-issuance of the jurisdictional determination (SE Group 2001).

The SE Group concluded that the previously identified wetlands were persistent and had not changed in extent. Several of the wetland areas are identified as fens. Each previously identified jurisdictional wetland was verified visually according to typical dominant communities specified in the 1996 survey. The SE Group also identified two creeks (not previously delineated) that are considered waters of the U.S. with associated wetlands (SE Group 2001). Given the extensive wetland delineations performed in the past efforts, the 2001 investigation attempted to conform to the 1996 mapping by ENSR, Inc. (SE Group 2001). The SE Group mapped the wetlands and submitted a report to the USACE. On October 19, 2001, the USACE issued a letter stating concurrence with the findings of the SE Group. The letter states that the mapping is valid for 5 years (until 2006) and also states that a permit would be required for discharge of dredge or fill material into these waters. The presence of fens within these wetlands is possibly due to the persistent presence of shallow groundwater, however, fens are not specifically identified in the jurisdictional delineations prepared to date. Minor amounts of affected wetlands (<1 acre) have been identified on NFS land.

3.1.3 Sediment Control

3.1.3.1 *Surface Water Quality*

Water quality is generally excellent across most of the RGNF. Sediment is the pollutant of most concern. For most typical land uses in the RGNF, it is believed that excess sediment, beyond natural sources, is generated primarily from roads (USFS 1996a).

Water quality standards for a given reach are based on standards set by the CDPHE under Regulation No. 31 (5 CCR 1002-31) (RGNF 2004). Under Colorado's Regulation No. 31, the highest level of water quality protection applies to water considered an "outstanding" state or national resource. Pass Creek and tributaries fall under the anti-degradation review process and must be maintained and protected at their existing quality, unless the state determines that lower quality is necessary for important economic or social development. The state has classified Pass Creek for cold-water aquatic life, recreation, water supplies, and agriculture. No segments of Pass Creek are listed as impaired on the Colorado 303 (d) list (RGNF 2004).

3.2 GROUNDWATER

Existing data sources provide information on the groundwater resources in the vicinity of Alberta Park and alternatives considered in this EIS. Groundwater is primarily used as a source for public drinking water within Mineral County. However, the Ski Area uses surface water as its source for public drinking water (EPA 2004b). The Colorado Division of Water Resources, Office of the State Engineer (SEO 2002) indicates that 6 wells are located within 1 mile of the area of Alberta Park. Well yields are on the order of 3 to 15 gpm.

Data collected for geotechnical studies (Chen and Associates 1986 and 1987; Lambert and Associates 2004) indicate that the project area is underlain by glacial till. Glacial till typically has hydraulic conductivity of less than 10^{-4} centimeters per second (cm/sec) (Freeze and Cherry 1979). Site specific drilling will be required to evaluate hydrogeologic conditions in the areas of the roads and utility corridor. The geologic map of the State of Colorado (Tweto 1979) indicates that the glacial till is underlain by bedrock composed of volcanic rock (ash-flow tuff). The hydraulic conductivity of the volcanic rock can be highly variable, ranging from 10^{-7} cm/sec to greater than 1 cm/sec (Bouwer 1978).

A pump test reportedly performed in a test well on the floor of Alberta Park indicated that the till in this area has a relatively low hydraulic conductivity, with a yield of approximately 4 gallons per minute (gpm) (Chen and Associates 1987).

The shallow groundwater within the project area likely occurs under unconfined conditions. Groundwater is recharged by precipitation and snow melt. The flow of unconfined groundwater generally mimics topography, flowing from ridge tops to adjacent valley bottoms and discharging to streams, creeks, or wetlands. Locally, shallow groundwater varies from near the surface in wetland areas to depths grater than 9 feet in the steeper portions of the site (Chen and Associates 1987).

There are wetlands crossed by the existing Tranquility Road that have been permitted by the Ski Area in construction of the 2,100 feet of road. Approximately 0.5 acre would be crossed by utility corridor adjustment to Tranquility Road.

Alternative 3 would cross wetlands on USFS land north of the private property. There is less than 1 acre of wetlands that would be crossed by this proposed road.

3.3 WATER RIGHTS AND USE

In Colorado, water rights provide the necessary legal basis for diverting surface and ground water. In order to use the water, the right is exercised and the water is physically diverted. The environment potentially affected by water used for the road and utility corridor construction is the stream system extending from the north Branch and South Branch of Pass Creek at the private property and the Ski Area to the Rio Grande at South Fork, Colorado. More specifically, this includes the north branch of Pass Creek, the south branch of Pass Creek, Pass Creek between the confluence of the north and south branches and its confluence with the South Fork of the Rio Grande, and the South Fork of the Rio Grande from its confluence with Pass Creek to its confluence with the Rio Grande at South Fork, Colorado. The affected environment includes the physical stream flows in the reaches described and the water rights decreed to divert from there.

According to a State of Colorado water rights tabulation (CDWR 2004), there are only a few decreed water rights whose source is Pass Creek. In order of priority from most senior to most junior, these generally include a storage right of 16.7 acre-feet for Pass Creek Reservoir, a storage right of 597.5 acre-feet for Alberta Park Reservoir, a direct flow right of 0.001 cubic feet per second (cfs) for the Tucker Pond Campground Well #2, a direct flow right of 9.0 cfs for the Colorado Water Conservation Board's (CWCB) Pass Creek minimum in-stream flow right, the various direct flow, storage and exchange rights of the Village, the various direct flow and storage rights of the Ski Area, and a 220.2 cfs direct flow right identified as USFS quantification point 31G.

There are no decreed water rights presently associated with the Proposed Action. A state approved substitute water supply plan may be required to make uses of water for the purposes of the development of the Village. The water rights associated with the development of the Village are listed in Table A.2.3-1. Operation of the Village water rights within the limitations of the decree in Case No. 87CW7 (see further discussion in Appendix A), including provisions designed to specifically protect Alberta Reservoir and the CWCB in-stream flow right, will not cause injury to any other water rights. Future water rights on Pass Creek would be junior to the rights already decreed. Therefore, they could not be injured by operations of the already decreed rights. Trans-basin water imported into the Pass Creek drainage from the West Fork of the San Juan River by the Treasure Pass Diversion Ditch (a 7 cfs direct flow right) is not available for diversion by the Village; therefore, it should be administered past the Village points of diversion.

3.4 VEGETATION COMMUNITIES

The project area is located at the base of the Ski Area, near the top east side of Wolf Creek Pass and the Continental Divide. Directly affected NFS lands occur between approximately 10,400 and 10,600 feet, while connected private lands occur between approximately 10,320 and 10,880 feet. The project area is on the east slope of the Rocky Mountains with all streams draining into the Rio Grande basin.

3.4.1 Existing Conditions

For the purposes of this plant section, ecological analyses are considered at two scales: (1) proposed disturbance areas and (2) the project area, described below.

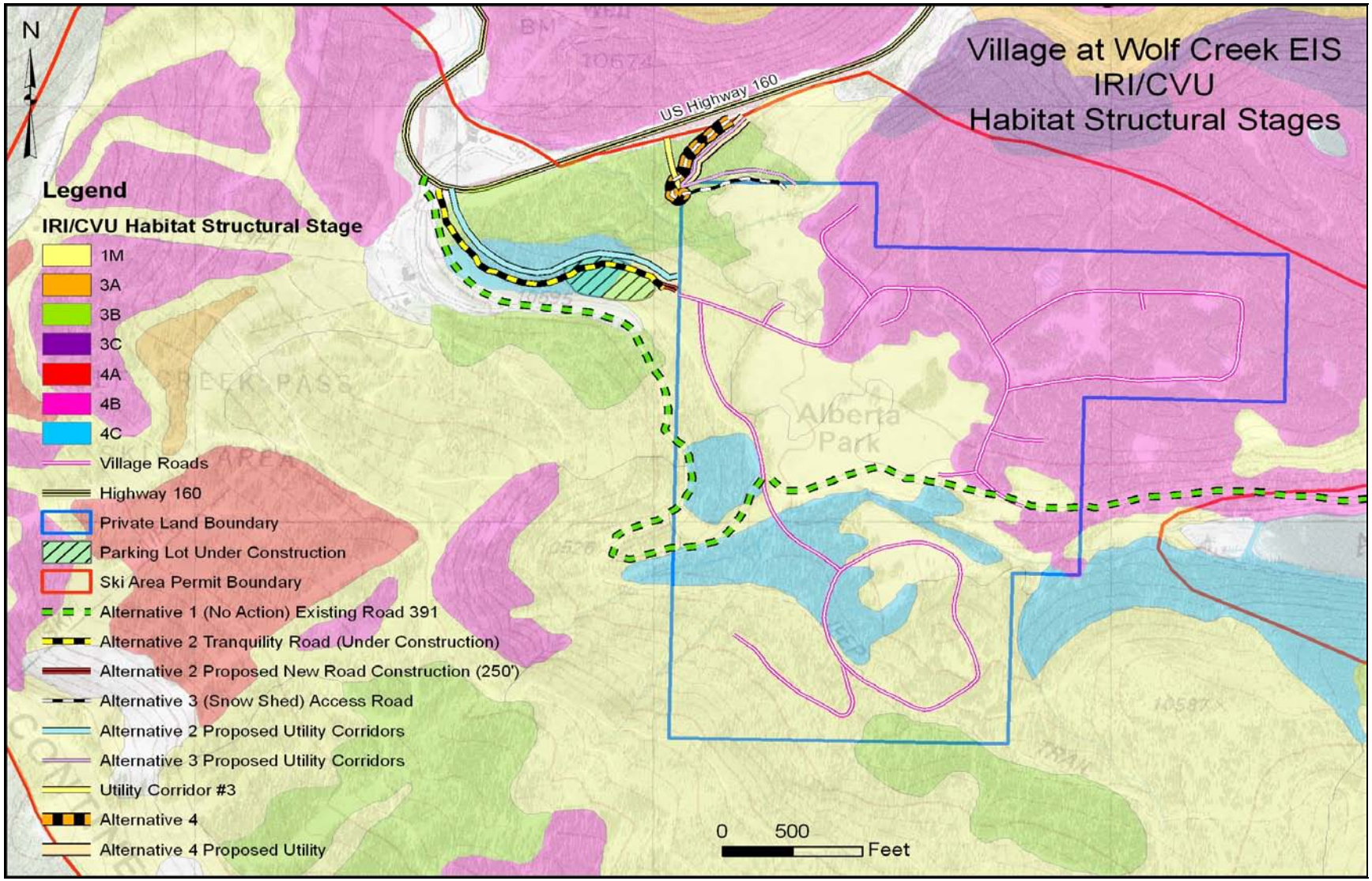
3.4.1.1 *Disturbance Areas*

Proposed Disturbance Areas on National Forest System Lands

Under the No Action Alternative, there would be no new authorized physical impacts to NFS lands. FSR 391 maintenance frequency might be increased, but it is an existing unpaved road.

Figure 3.4-1 shows Integrated Resource Inventory (IRI) Common Vegetation Unit (CVU) mapping delineations with Habitat Structural Stage (HSS) designations (Table 3.4-1) on NFS land surrounding the private property. Some of these HSS designations differ from that described in the text as a result of ground-truthing surveys conducted for this project.

Under Alternative 2, the Proposed Action, the 250-foot extension of the existing (i.e., under development) Tranquility Road would affect a 1960s-70s era clearcut. This road ROW corridor overlaps a 2,100 feet of the Ski Area's present access road and its Tranquility Road and parking lots presently under construction. Utility Corridors 1 and 2 would be developed along and adjacent to the northern flank of the existing and extended Tranquility Road. These corridors would be developed through the southern edge of an 11.3 acre, late-successional, closed canopy (HSS 4C; see Table 3.4-1) Engelmann spruce-subalpine fir (*Picea engelmannii-Abies bifolia*, hereinafter referred to as spruce-fir; scientific plant nomenclature after Weber and Wittmann [2001]) polygon and through recently disturbed, nonvegetated, access road fill slope/snow storage area adjacent to the existing Tranquility Road. These corridors would cross tributaries of East Fork Pass Creek draining the Ski Area. The proposed Utility Corridor 3, off Highway 160 to the private parcel's northwest corner, would bisect an eastern portion of the 35-acre, mature, closed canopy (HSS 4B) spruce stand (incorrectly identified as a 3B stand in Figure 3.4-1). The 11.3 and 35 acre spruce stands compose a 46 acre HSS 4B located between the Highway and the Ski Area's parking lots.



Source: RGNF RMRIS and GIS.

Figure 3.4-1. IRI CVU Mapping Delineations with HSS Designations on NFS Land Surrounding the Private Property.

Table 3.4-1. Cross Walk Defining Structure Class and Habitat Structural Stage as Used in the Ecological Analyses.

Structure Class	Habitat Structural Stage	Description
1	1 & 2	GRASS/FORB/SHRUB/SEEDLING. Stand dominance by grasses, forbs (broad-leaved herbaceous plants), shrubs and/or tree seedlings up to 1" Diameter at Breast Height -- 4.5 feet (DBH) for softwoods and 2" DBH for hardwoods.
2	3a	SAPLING-POLE. Stand dominance by trees in the majority of the 1-8.9" DBH size for softwoods and 2-8.9" DBH for hardwoods with a canopy closure of less than or equal to 40%.
3	3b & 3c	SAPLING-POLE. Same as Structure Class 2 except canopy closure is 41-100%.
4	4a	MATURE. Stand dominance by trees in the majority of the 9" or larger DBH size and tree age under 200 years for softwoods and under 100 years for hardwoods. Canopy closure is 40% or less.
5	4b, 4c & 5	LATE-SUCCESSIONAL FOREST. Two conditions are possible for meeting this category: a) Stand dominance by trees in the majority of the 9" or larger DBH size and tree age under 200 years for softwoods and under 100 years for hardwoods. Canopy closure is greater than 40%. b) Stand dominance by trees in the 5" DBH or greater size with a tree age over 200 years for softwoods and over 100 years for hardwoods. Tree crown cover is over 70 percent.

Note: Both systems are tree size and canopy closure classifications for forested cover types.

The analysis area associated with Alternative 3's Snow Shed - East Village access road and utility corridor extends between the northwest corner of the private parcel and Highway 160. The dominant habitat type of this area is subalpine fir-Engelmann spruce forest, dominated by spruce, with steep (1:1), bouldery, fill slopes associated with the highway, and a willow-graminoid wetland meadow. The forest is the distal, northeastern portion of a 46-acre spruce stand that is surrounded on the south, west, and north by Ski Area parking lots and Highway 160. Southern portions (11.3 acres) of this stand are late-successional (HSS 4C) with a high density of standing and down coarse-woody debris (CWD). The remainder (35 acres) of the 46-acre stand, including portions on the USFS analysis area, is mature with closed canopies (HSS 4B [incorrectly identified as a 3B stand in Figure 3.4-1]) and low CWD densities. The meadow is part of the patchy, native meadow matrix common in this area and supports a stand of planeleaf willow (*Salix planifolia*) averaging 3-4 feet tall. The surrounding meadow is dominated by sedges (*Carex* spp.) and cornhusk lily (*Veratrum tenuipetalum*) with tufted hairgrass (*Deschampsia cespitosa*) in upland areas. A mountain willow (*S. monticola*) dominated wetland supported by an intermittent stream emerging from a culvert under the highway, extends to the toe slope of the highway fill. Additional characterization of these wetlands is provided in the Riparian Areas Section (3.1.2).

The analysis area associated with Alternative 4 is a slight modification of the combination of the Tranquility and Snow Shed – East Village access road and Utilities Corridors 1- (described above, in Section 2.5, and shown in Figure 3.4-1).

Project Area

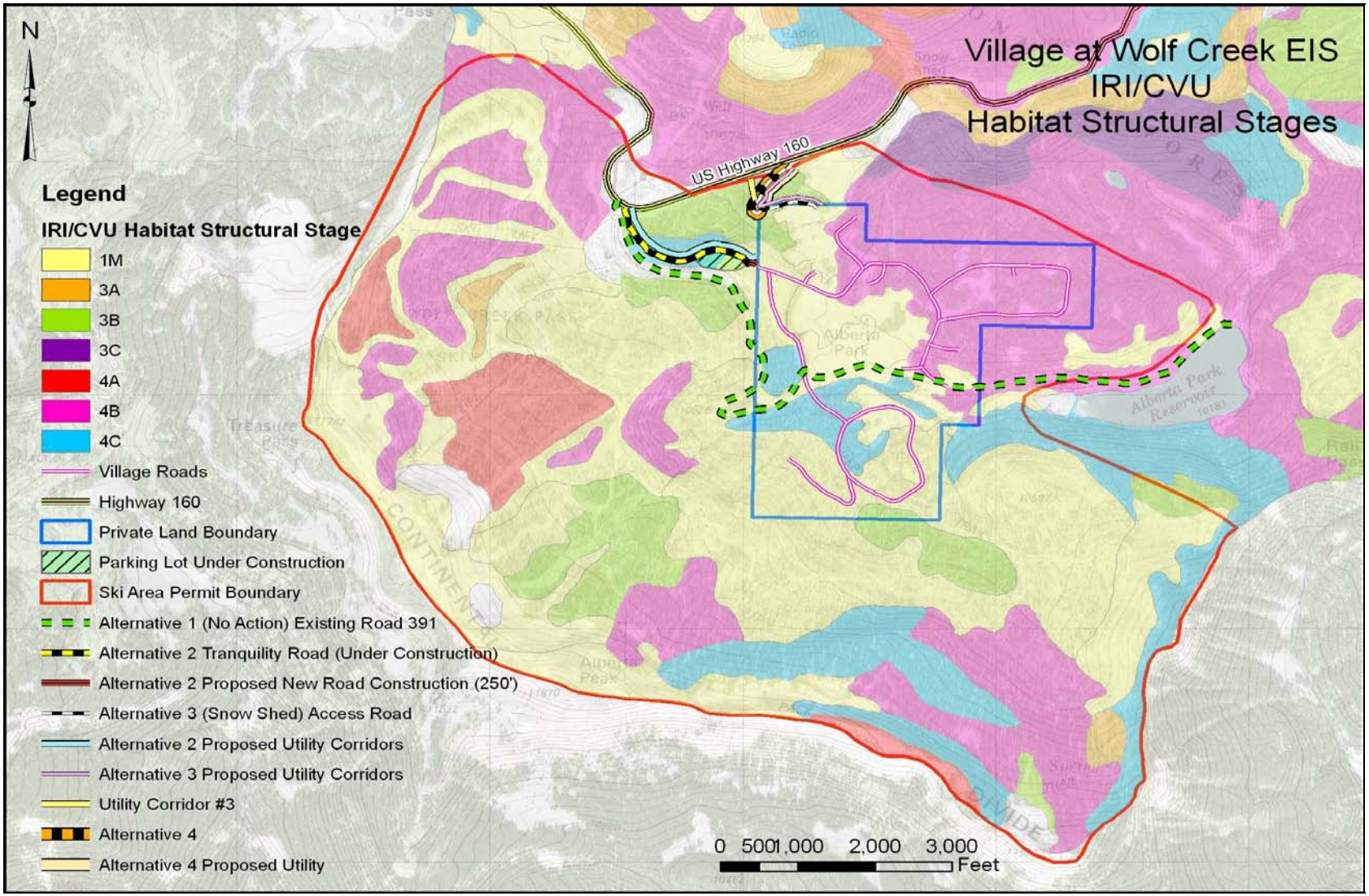
For plant community analyses, definition of the project area varies by area affected by direct and indirect project effects and the immediate area affected by cumulative project effects. For direct and indirect project effects on plants, the project area is the area that circumscribes all disturbance areas associated with Alternatives 1-4, shown in Figure 3.4-1. For cumulative project effects on plants, the project area is that 1,871-acre area within the SUP area boundary (i.e., 8.22 Management Area boundary from the 1996 Forest Plan), including the 1,583.5-acre Ski Area and the 287.5-acre private parcel, shown in Figure 3.4-2. That area, which ranges from 10,300 to 11,900 feet, is primarily in the subalpine life zone, with the highest elevations along the Continental Divide in the alpine life zone.

Mature spruce-fir forests, naturally heterogeneous and perforated by herbaceous wetlands, riparian corridors, and upland meadows, dominate the project area. The forests were further opened and thinned by ca. 1950s to 1970s era timber harvest and by Ski Area development. Mature forests total 64.8 percent of the project area. Structural Classes of forest on the project area are summarized in Table 3.4-2.

Table 3.4-2. Structure Classes of Habitat Within the 1,871-acre Wolf Creek Village Project Area.

Structural Class [a]	Acres [b]	Percent of Project Area
1 (grass/forb shrub/seedling)	659	35.2
2 (sapling-pole, canopy closure ≤ 40%)	0	0
3 (sapling-pole, canopy closure > 40%))	0	0
4 (mature)	683	36.5
5 (late-successional forest)	530	28.3
Total	**1,872**	**100**

[a] See Table 3.4-1 and Figs. 3.4-1 and 3.4-2.
[b] Numbers rounded.
Note: The project area encompasses Wolf Creek Ski Area's Special Use Permit boundary and the 287.5-acre private Village at Wolf Creek parcel.
Source: Morrison and Swift-Miller 1999.



Source: RGNF RMRIS and GIS.

Figure 3.4-2. IRI CVU Mapping Delineations with HSS Designations on NFS Land Surrounding the Private Property that are within 1,871-acre Ski Area SUP Area Boundary.

3.4.1.2 *Threatened, Endangered, and Proposed Plant Species*

No federally listed threatened, endangered, or proposed plants are known or expected to occur on the RGNF. No portion of the project area has been designated critical habitat for any plant by the Secretary of the Interior under the ESA. None of the alternatives would have any effect on listed or proposed plant species. Therefore, listed and proposed plants will not be discussed further in this document.

3.4.1.3 *Region Two Sensitive Plant Species*

Region Two (R2) has designated "sensitive species" (USFS 2003f), representing species declining in number or occurrence or whose habitat is declining, either of which could lead to Federal listing if action is not taken to reverse the trend, and species whose habitat or population is stable but limited. In December 2003, R2 culminated a nearly 2-year process and finalized an updated list of sensitive species (USFS 2003g). From the updated R2 list, a subset of sensitive species was determined to be present or potentially affected by management decisions on the RGNF after an analysis of all sensitive species on the overall updated R2 list (Table 3.4-3). All R2 sensitive species on the RGNF list associated with the Proposed Action are considered in this document. A Biological Evaluation addressing R2 sensitive plants has been prepared and placed in the administrative record for this project.

In preparing the EIS, FSM 2600 (USFS 2003f) was reviewed. Field surveys were conducted on September 25-27, 2000, February 28-March 2, March 18-21, April 6-8, 2001, July 30-August 1, 2002, and May 28, July 8, 9, and 23, 2004 to determine local habitats and plant distributions of the project area. Surveys were conducted to (1) develop an ecological understanding of the resources present on and adjacent to the project area, (2) identify and characterize habitat types and Structure Classes present relative to the habitat affinities of species considered in this document, and (3) search for evidence of the R2 species considered herein. Structural habitat characterization followed Hoover and Wills (1984), USFS (1993, 1995b), and Parks et al. (1997).

Information on species status, distribution, and ecology was derived from the scientific literature, USFS analyses, the Colorado Natural Heritage Program (CNHP) data base, USFS Ranger District information, Natural Diversity Information Source (NDIS) data for Mineral County, 2000-2004 field surveys of the project area described above, and personal communications with USFS botanists and field surveys associated with other projects in the Wolf Creek Pass area conducted by the author since 1984.

Seven species of R2 sensitive plants are known to be present on the RGNF and 15 other species might occur on the Forest (USFS 2003g, CNHP 2003, Table 3.4-3). Five of these species have been documented or might occur on the RGNF (USFS 2003h) in habitats similar to those present on the project area. These five species are discussed below. The remaining 17 RGNF plant species (Table 3.4-3) do not occur in the habitats present on the project area, do not have elevation and/or distributional ranges that overlap the project area, would not be affected by the proposed action, and do not warrant detailed consideration with respect to the Proposed Action.

Table 3.4-3. Pre-Field Checklist of USFS Region 2 (R2) Sensitive Species That are Potentially Present or That May Be Potentially Affected by Activities on the Rio Grande National Forest

Scientific name	Rationale for Occurrence/ Non-occurrence on Project Area (Habitat Affinity) [a]
Plants	
Aquilegia chrysantha var. *rydbergii*	No habitat (foothills canyons 5,500-7,000 ft.)
Astragalus missouriensis var. *humistratus*	No habitat (Gambel oak communities on shale soils <8,600 ft.)
Astragalus proximus	No habitat (Gambel oak communities on shale soils <7,000 ft.)
Astragalus ripleyi	No habitat (open ponderosa pine/ Arizona fescue 8,200-9,300 ft.) [b]
Calochortus flexuosus	No habitat (desert flats)
Carex diandra	No habitat (calcareous wetlands < 9,000 ft.)
Carex leptalea	Potential habitat present (rich fens and wetlands <10,000 ft.
Cypripedium parviflorum	No habitat (aspen/ponderosa pine/Douglas-fir forests 7,400-8,500 ft.)
Draba grayana	No habitat (gravelly alpine slopes 11,500-14,000 ft.) [b]
Draba smithii	No habitat (protected sites on talus slopes 8,000-11,000 ft.) [b]
Eriogonum brandegeei	No habitat (sagebrush/pinyon-juniper [P-J] stands <7,600 ft.)
Eriophorum altaicum* var. *neogaeum	Potential habitat present (peaty wetlands >9,600 ft.) [b]
Eriophorum chamissonis	Potential habitat present (peaty wetlands 10,500-12,500 ft.)
Eriophorum gracile	Potential habitat present (fens, wetlands, & pond edges 8,000-12,000 ft.)
Gilia sedifolia	No habitat (rocky alpine and talus slopes) [b]
Machaeranthera coloradoensis	Potential habitat present (gravelly grassland slopes 8,500-12,500 ft.) [b]
Penstemon degeneri	No habitat (P-J woodlands and grasslands 6,000-9,000 ft.)
Ranunculus karelinii *(R. gelidus* ssp. *grayi)*	No habitat (exposed alpine rock and scree slopes 12,000-14,000 ft.)
Salix arizonica	Potential habitat present (streamside meadows) [b]
Salix candida	Potential habitat present (nutrient-rich fens and pond/river edges)
Salix serissima	No habitat (wetlands 7,800-9,300 ft.)
Utricularia minor	No habitat (shallow ponds, lakes, and slow streams 6,600-8,600 ft.)

[a] For this table, the rationale for occurrence/ non-occurrence on the project area only considers NFS lands that may be directly, indirectly, or cumulatively affected by the proposed action, which R2 species determinations are based on. Where potential or occupied habitat is present on adjacent private lands that are part of the project area, additional discussion is provided in the text.

Note: Other R2 sensitive species are not listed because they have not been found on the RGNF, they have no affinities to habitats on the Village at Wolf Creek project area, the project area is outside of the species' range or elevational distribution, and the proposed action would have no impact on those species. Potential pre-field survey occurrence on associated NFS lands and habitat affinity is summarized for each species. Species in **bold** are potentially present and/or are discussed in the text. Plants are listed alphabetically by scientific name.

[b] Documented on RGNF (CNHP 2003).

Source: USFS 2003d, Spackman et al. 1997, and Erhard 2004. See text and Literature Cited for references used to assess species' habitat affinities and potential presence on the project area.

Bristle-stalk Sedge, *Carex leptalea*

This inconspicuous sedge is found in wet meadows and bogs from low elevations up to 9,000 feet (Hermann 1970). Harrington (1954) mentions one occurrence in Colorado from Lake County at 9,000 feet. Weber and Wittmann (2001a) mention this species occurring in moist foothill canyons where it is known from near Colorado Springs and the Tarryall Range. Spackman et al. (1997) list the habitat as rich fens and graminoid-dominated mineral rich wetlands at elevations from 9,000 to 10,000 feet. Ode (2001a) says, in Region 2, it is found in saturated organic substrates (peat) of rich fens, bogs, conifer swamps at 5,000 to 10,000 feet. It requires a pH > 5.4, and prefers some shade (in Minnesota). It is an obligate wetland species. CNHP (2004) records show this species occurring in Clear Creek, El Paso, Grand, and Park Counties. It has not been documented on the RGNF (Erhard 2004).

Bristle-stalk sedge was not detected on or adjacent to NFS lands associated with the Proposed Action during botanical surveys. While fens on the private parcel and adjacent NFS lands may represent potential habitat, this species is not present.

Altai Cotton-grass, *Eriophorum altaicum var. neogaeum*

Altai cotton-grass is a member of the sedge family found in high mountain bogs or fens (peat wetlands) between 9,500 and 14,000 feet in Colorado. Soils in these habitats tend to be acidic. Its name is derived from the flower cluster, which resembles a powder puff or cotton ball on a foot-long stem. The flowering period extends from late July through August. This plant grows with other sedges. Altai cotton-grass has been found above 12,000 feet on the RGNF (USFS 2003h) and in the following Colorado counties: Eagle, Gunnison, Hinsdale, La Plata, Mineral, Montezuma, Park, Pitkin, Saquache, San Juan, and San Miguel (CNHP 2004, Erhard 2004).

Altai cotton-grass was not detected on or adjacent to NFS lands associated with the Proposed Action during botanical surveys. A previously unknown population of tall cotton-grass (*E. angustifolium*) was located on September 25, 2000, in a perched fen (at approximately 10,450 feet) on NFS land just to the north of the private parcel. *E. angustifolium* is not an R2 designated sensitive species, but it has nearly identical habitat requirements as Altai cotton-grass. This fen and another fen on the private parcel may represent potential habitat for R2 cotton-grass species. Nevertheless, direct, indirect, and cumulative effects of Alternatives 1-4 would have no impact on Altai cotton-grass and it will not be discussed further in this document.

Russet Cotton-grass, *Eriophorum chamissonis*

Russet cotton-grass (formerly *E. russeolum* [Weber 1987], then *E. gracile* [Weber and Wittmann 1996]) has russet brown cottony bristles and is known in Colorado only from calcareous bogs high in the Elk Mountains. There is some taxonomic uncertainty about this species, in part because *E. gracile* is now considered to be slender cotton-grass. Harrington (1954) mentions records of this species from central and southcentral Colorado at 10,500 to 12,500 feet. The CNHP tracks this species, but it is not contained in Spackman et al. (1997). CNHP (2004) records show this species occurring in Eagle, La Plata, Pitkin, and San Juan Counties. Databases listed in USDA (2004) indicate that the species' distribution occurs in and north of Wyoming. The CU herbarium documents it from Eagle and Pitkin Counties. Two records are reported on the SJNF (south of Silverton); one from 11,560 feet in a moss carpet of a peat fen, and another record from a peat bog at 11,840 feet (D. Erhard 2004). The associated plant community was *Pedicularis groenlandica*, *Psychrophila leptosepala*, and *Deschampsia cespitosa*. Additional associated plant species were *Angustifolium* sp., *Primula parryi*, *Carex canescens*, and *C. aquatilis*. The parent material was granitic. The soil texture was peaty. Russet cotton-grass has not been detected on the RGNF, although based on habitat and elevational affinities, it could be present (Erhard 2004).

Russet cotton-grass was not detected on or adjacent to NFS lands associated with the Proposed Action during botanical surveys. A previously unknown population of tall cotton-grass (*E. angustifolium*) was located in a perched fen on NFS land just to the north of the private parcel. *E. angustifolium* is not an R2 species, but it has similar habitat requirements to Russet

cotton-grass. This fen and another fen on the private parcel may represent potential habitat for R2 cotton-grass species.

Slender Cotton-grass, *Eriophorum gracile*

Harrington (1954) mentions records of this species in swamps and bogs from northcentral, southcentral, and southwestern Colorado from 8,000 to 12,000 feet. Weber and Wittmann (2001) mention this species occurring in quaking fens at the north end of South Park. Spackman et al. (1997) list the habitat as fens, wet meadows, and pond edges at elevations from 8,100 to 12,000 feet. CNHP (2004) records show this species occurring in Grand, Gunnison, Jackson, Las Animas, Park, and Teller Counties. Slender cotton-grass has not been detected on the RGNF, although based on habitat and elevational affinities, it could be present (Erhard 2004).

Slender cotton-grass was not detected on or adjacent to NFS lands associated with the Proposed Action during botanical surveys. A previously unknown population of tall cotton-grass (*E. angustifolium*) was located in a perched fen on NFS land just to the north of the private parcel. *E. angustifolium* is not an R2 species, but it has similar habitat requirements to slender cotton-grass. This fen and another fen on the private parcel may represent potential habitat for R2 cotton-grass species.

Colorado Tansy-aster, *Machaeranthera coloradoensis*

Colorado tansy-asters grow in gravelly areas in higher mountain parks, slopes, and rock outcrops up to dry alpine tundra (Spackman et al. 1997). Their elevational range is between 8,500 and 12,500 feet where the plant flowers in July to early August. This endemic to south-central Wyoming and Colorado is known to occur in Gunnison, Hinsdale, La Plata, Lake, Mineral, Park, Pitkin, Saquache, and San Juan Counties. It has been documented on the RGNF (Table 3.4-4). While habitat within the known elevational and distributional range of this species occurs on the project area, this species was not detected during field surveys and it is considered to be absent with no potential habitat present.

Arizona Willow, *Salix arizonica*

Arizona willow is known from several widely disjunct populations between 8,300 to 10,800 feet in east-central Arizona, south-central Utah (Arizona Willow Interagency Technical Team [AWITT] 1995), and south-central Colorado (Erhard 2004). A population was found in 2001 at 10,300 feet on Colorado's RGNF (Conejos County) leading to speculation that it could also occur in other areas of southern Colorado from approximately 10,300 to 10,700 feet (Erhard 2004, Erhard and Dorn 2004). This willow requires a specific habitat of limited occurrence. It usually occurs in narrow linear strips in unshaded or partially shaded, moist (not too wet or too dry), low gradient (<9 percent) meadows, and streamsides adjacent to perennial water (AWITT 1995, Erhard 2004). It may be associated with wolf (*S. wolfii*), mountain (*S. monticola*), and planeleaf willow (*S. planifolia*).

Arizona willow was not detected during botanical surveys on the proposed project area. NFS lands on the project area do not support the specific habitat features where this species is known

to occur. Therefore, this species is considered absent with no suitable habitat present. Similarly, this species was not detected on private lands associated with the project area and no suitable habitat is present.

Silver Willow, *Salix candida*

Silver willow (also known as hoary willow) occurs on hummocks in nutrient-rich fens and thickets at the edges of ponds and on river terraces, often growing with other willows and sedges (Spackman et al. 1997). Weber and Wittmann (2001a,b) mention this species occurring in the Rawah Range and South Park. They further describe it as an inconspicuous willow growing in *Betula glandulosa* fens. Handley et al. (2002) state that this species is found on floating mats and in bogs, fens, and willow thickets around ponds on wet to saturated, histic soils, sometimes influenced by limestone. Its peatland habitat is very patchy and discontinuous on the landscape. Crook and Bacon (2002) further report that *Salix candida's* current distribution closely parallels the distribution of calcareous fens in North America. In Colorado, it has not been found on the RGNF (Erhard 2004), but occurs in Gunnison, Hinsdale, La Plata, Larimer, and Park Counties (CNHP 2004) where its elevational range extends from 8,800 to 10,600 feet. The only *Betula glandulosa* fens known to occur on the RGNF are confined to the Sangre de Cristo mountain range (Erhard 2004). This species has not been detected on the RGNF, although based on habitat and elevational affinities, it could be present (Erhard 2004).

Silver willow was not detected during botanical surveys on the proposed project area. Hummocky fens supporting silver willow associates are present on NFS lands within the project area, although they are outside of proposed access road and utility corridor disturbance areas. Similar potential habitat for this species is also present on the private parcel. While potential habitat may be present, the species is absent.

Note that this section is a formulation of the Biological Assessment.

3.5 ANIMAL COMMUNITIES

3.5.1 General Fish and Wildlife

Animals and their habitats within the project area and surrounding landscape are generally representative of those species and habitats in the RGNF's upper subalpine life zone that have adapted to chronic to acute levels of seasonal to year-round anthropogenic activities. Spruce-fir forests, naturally heterogeneous and perforated by meadows and riparian corridors and opened by ca. 1950s era timber harvest, characterize the core of the project area. Spruce-fir forests, with alpine zone ecotones at higher elevations, also surround the project area. Many of the birds and mammals only use the area during late spring and summer, and exhibit latitudinal or elevational migrations to winter ranges beyond the study area.

Common mammals associated with the spruce-fir forests include southern red-backed voles (*Clethrionomys gapperi*), least chipmunks (*Eutamias minimus*), long-tailed voles (*Microtus longicaudus*), northern pocket gophers (*Thomomys talpoides*), red squirrels (*Tamiasciurus hudsonius*), snowshoe hares (*Lepus americanus*), red fox (*Vulpes vulpes*), coyotes (*Canis latrans*), mule deer (*Odocoileus hemionus*), and elk (*Cervus elaphus*). Common birds associated with these conifer forests include dark-eyed juncos (*Junco hyemalis*), American robins (*Turdus migratorius*), ruby-crowned kinglets (*Regulus calendula*), yellow-rumped warblers (*Dendroica coronata*), pine siskins (*Carduelis pinus*), hermit thrushes (*Catharus guttatus*), Cassin's finches (*Carpodacus cassinii*), chipping sparrows (*Spizella passerina*), northern flickers (*Colaptes auratus*), hairy woodpeckers (*Picoides villosus*), brown creepers (*Certhia familiaris*), and mountain chickadees (*Parus gambeli*).

Wildlife commonly associated with meadows and riparian areas include pocket gophers, chipmunks, golden-mantled ground squirrels (*Spermophilus lateralis*), yellow-bellied marmots (*Marmota flaviventris*), juncos, robins, mountain bluebirds (*Sialia currucoides*), Wilson's warbler (*Wilsonia pusilla*), Lincoln's sparrows (*Melospiza lincolnii*), coyotes, deer, and elk.

Aquatic habitats and obligate vertebrate biota are poorly developed at these upper elevations. Habitats cannot support beavers (*Castor canadensis*) and the complex ecological communities their transformed habitats support. However, Alberta Park Reservoir supports a Rio Grande Cutthroat trout (*Oncorhynchus clarki virginalis*) and brook trout (*Salvelinus fontinalis*) fishery, and headwater streams support these species. Reptiles and amphibians are poorly represented at these high elevations, however, western terrestrial garter snakes (*Thamnophis elegans*) are present.

Wildlife use of these habitats is anthropogenically influenced by the operation of the Ski Area, Highway 160, and by seasonal roads. Unlike most Colorado ski areas, the Ski Area is a single season, day-use only resort. As such, the development is largely compatible with wildlife use, including those forest-interior and edge species that have adjusted to the fragmented spruce-fir forests composing its lower terrain. Upper terrain, more buffered from highway and base area activities, provides highly effective habitat. Intense recreational use occurs during winter days when most wildlife have seasonally left the area or are inactive. Low, intermittent levels of summer maintenance activity in the base area and on the mountain are benign. The Ski Area's SUP boundary contains the proposed access road and private parcel. One ski lift, some downhill

ski terrain, and part of the Nordic trail system extend onto/through the private parcel, but most of the developed ski area is to the south of the project area.

Highway 160 is a year-round, high-speed highway with significant variations in volume due to local, regional, and recreation use. Average annual daily traffic (AADT) in 1997 was 2,600 vehicles, with June to August peaks of 3,500 vehicles per day (VPD) and off-season ebbs to 800 VPD (ERO Resources 2001). Traffic is expected to increase about 4 percent annually, with peak, off-season, and AADT traffic in 20 years projected at around 7,560, 1,723, and 5,600 VPD, respectively (ERO Resources 2001), not considering indirect effects associated with the proposed action. This highway is contiguous to the north of the project area.

Existing FSR 391 now crosses through the private parcel from the ski area's parking lots to Alberta Park Reservoir. This road is open after spring runoff generally through the fall hunting seasons (early November). It facilitates recreational use focused at the lake, and dispersed use to the south, primarily during the hunting seasons.

3.5.2 Management Indicator Species

Section 6(g)(3)(B) of the *National Forest Management Act* (NFMA) of 1976 directed the USFS to provide for a diversity of plant and animal species based on the suitability and capability of a specific land area. The 1982 Forest Planning regulations established the process and guidelines for development and revision of the Forest Plans Act, and directed the USFS to maintain populations of existing native and desired non-native vertebrate species with the estimated numbers and distribution of reproductive individuals to insure that their continued existence is well distributed in the planning area (CFR 219.19). To estimate the effects of management activities on fish and wildlife populations, the RGNF selected Management Indicator Species (MIS, per 36 CFR 219.19) to serve as an additional planning, analysis, and evaluation tool in conjunction with other Forest Plan and program monitoring and analyses to assure that viable populations of vertebrate species are maintained on the Forest (USFS 2003b). MIS are those whose population changes are believed to indicate the effects of management activities on a larger group of species with similar habitat requirements. MIS were selected to represent the ecosystems affected by management activities on the Forest and to serve as indicators of change to those systems. For project analyses, selected MIS should be those whose change in population would be directly attributable to the management action. Other MIS definitions and selection criteria are provided in USFS (2003b).

From the list of Forest-wide MIS (USFS 2003b), brown creeper, hermit thrush, Lincoln's sparrow, Wilson's warbler, Rocky Mountain elk, mule deer, Rio Grande cutthroat trout, and brook trout were identified as project MIS, based on Forest Plan selection criteria and the presence or potential occurrence of these species and their habitats within or adjacent to the NFS portion of the project area. At the project level, MIS are selected to address issues, concerns, and opportunities for meeting overall goals, standards and guidelines of the Forest Plan (FSM 2621.1). For each of the selected MIS (listed above), this section of the DEIS provides a review of Forest-wide status, Forest Plan estimates of population and habitat trend, Forest Plan monitoring data, and a discussion of habitat and population conditions in the project area in the context of Forest Plan expectations. Other Forest Plan MIS were not selected as project MIS because their habitats are not found within the NFS portion of the affected project area, they have

no affinities to project area habitats, they have distributional ranges excluding the project area, and/or activities on NFS lands related to the proposed alternatives would not affect the species. Specifically, pygmy nuthatches (*Sitta pygmaea*) are closely associated with ponderosa pine (*Pinus ponderosa*) and vesper sparrows (*Poocetes gramineus*) are associated with grasslands. Neither of these habitats occurs on the project area and they would not be directly, indirectly, or cumulatively affected by the proposed action. Brown (*O. trutta*) and rainbow trout (*O. mykiss*) are only present relatively far downstream of the project area.

Systematic and species-specific surveys of the project area, including NFS and private lands, were conducted by Western Ecosystems, Inc. on September 25-27, 2000, February 28-March 2, March 18-21, and April 6-8, 2001, July 30-August 1, 2002, and May 28, July 8, 9, and 23, 2004, in part to identify and document MIS use. All animal species and suitable habitat detected during surveys were noted resulting in daily assessments of species presence and distribution and overall habitat suitability. When and once MIS species were detected, suitable habitat was considered to be occupied to the full extent of its local (i.e., habitat type and structural) distribution and to the full extent of its potential seasonal use (e.g., breeding, resident, summer, etc.). All MIS discussed in detail in this section have been detected on the Village at Wolf Creek project area as a result of project-specific surveys and ongoing CDOW monitoring.

3.5.2.1 *Brown Creeper*

Brown creeper, *certhia familiaris,* was selected as a MIS on the Forest due to the close relationship between its primary habitat type(s) and identified Forest management activities (USFS 2003b). Creepers are tied to complex structural forest elements, specifically large tree structure and standing and down CWD. Its intent as a project MIS is to represent the habitat components and biological community of mature and late successional spruce-fir and mixed-conifer habitats in relationship to Forest-wide Standards and Guidelines, as applied to management activities within these habitat types and to answer the monitoring question as to whether spruce-fir/mixed-conifer systems are being managed in a manner that provides for viable, well-distributed populations of brown creepers and associated species across the Forest. Brown creeper was also selected as a project MIS because it is present in mature and late successional spruce-fir stands in the project area.

Life History and Background Information

Throughout its range, brown creepers are closely associated with old forest conditions (Hejl et. al. 1995, Hutto and Young 1998). In Colorado, creepers occur in a variety of coniferous forest types but are most common in mature spruce-fir and lodgepole pine communities (Versaw 1998a). They require large-diameter green trees with older bark characteristics for foraging. The bark characteristics of older trees are a preferred foraging substrate, with creepers selecting for tree size rather than species (Franzreb 1985). Snags are selected for foraging as readily as large green trees when available in larger size classes (Franzreb 1985, Mariani 1987). Morphological adaptations concerning the bill, tail, legs, and claws permit the brown creeper to specialize on arthropods and other food resources hidden in and beneath the bark. They are secondary cavity nesters and require a specific type of snag component in the early stages of decay for nesting. Large tree structure, CWD density, dense canopy closures, and other structural attributes of old forest condition appear to be closely related to abundance and

distribution of the species (Mannan and Meslow 1984, Mariani 1987). It many cases it is considered a forest interior species that is sensitive to habitat alterations such as timber harvest. Brown creepers are permanent residents in Colorado, although short migrations to lower elevations may occur during the winter.

Forest-Level Information

Based on late successional conifer stand conditions and distributions that this species is associated with, suitable brown creeper habitat is well distributed across the RGNF and should support viable populations of this species (USFS 2002a,b). Existing potential habitat on the Forest totals approximately 634,000 acres based on current estimates of late successional conifer stages. Total historic potential habitat for brown creepers may have averaged around 487,000 acres based on estimates of the historic average in their associated spruce-fir land type association (USFS 2002a,b). It is anticipated that the quality, quantity, and distribution of brown creeper habitat will decrease from current estimates of 634,000 acres, yet remain above the historic average of 487,000 acres during the life of the Forest Plan as a result of the activities planned within their associated cover types (USFS 2002a, b). Approximately 1.4 percent of the late successional spruce-fir and white-fir/Douglas-fir cover types may be affected by timber harvest activities during the first decade. When projected out for five decades (i.e., probably beyond the life of the current Forest Plan), approximately 18 percent of these cover types may be affected.

Current population estimates for the brown creeper on the RGNF are based on the existing amount of potential habitat in LTA1, 3, 13; Structure Class 5, an average territory size per breeding pair (Gillihan 2002), and full occupancy of available acres. Based on the distribution and abundance of structurally suitable habitat and an average territory size of about one pair per five acres (Gillihan 2002), the Forest may currently be capable of supporting a relative density of about 126,800 pairs, if the quality and quantity of habitat components are spatially distributed across the spruce-fir cover type. Gillihan's (2002) estimate does not include other mature (e.g., 4B and 4C) spruce-fir HSSs that are also inhabited by this species on the RGNF, including habitats on the Village at Wolf Creek project area. It is suspected that the Forest may have been capable of supporting an average relative density of about 24,350 pairs when considering habitat availability based on natural disturbance factors.

Local brown creeper populations are expected to remain relatively stable during the first decade of the Forest Plan, but decrease over time in response to changes in their preferred habitat (USFS 2002a, b). Based on Gillihan (2002), a Forest-wide decrease of approximately 1,900 to 3,800 pairs (up to <0.03 percent loss) could occur by the end of the fifth decade under the experienced budget level if timber harvest areas result in unsuitable habitat. This could increase to about 4,260 pairs (up to <0.04 percent loss). Both budget levels would result in populations that remain above the average relative density that may have occurred under the natural disturbance regime (USFS 2002a, b).

Cumulatively, management actions in spruce-fir and mixed-conifer habitats throughout the range of the brown creeper have affected the distribution and viability of the species. Habitats in the Southern Rocky Mountains Physiographic Area (SRMPA, Area 62) are estimated to be relatively secure (USFS 2002a,b). Population trend for brown creepers in the southern SRMPA indicate a

stable or undetectable trend, while those at the Bird Conservation Region level indicate a slightly increasing trend (USFS 2002a, b).

The vast majority of potential brown creeper in the upper Rio Grande Basin occurs on NFS land. The quality and quantity of potential habitat that occurs on private land may have been altered to a less suitable condition; however, those acreages and potential species effects are most likely minor because of the limited distribution of private lands within the relatively high elevations of this species' habitat. Much of the potential habitat on NFS land occurs in areas with protective land management designations or management prescriptions. On the RGNF, for instance, approximately 244,395 acres of potential brown creeper habitat occurs in wilderness, backcountry, scenic area, or other protective areas where minimal habitat alteration is anticipated from planned management activities. Habitat conditions on the Forest are, therefore, reasonably assured to be protected and are expected to help maintain local brown creeper populations and provide source habitat on a larger scale. Current and proposed protection measures on the Forest will help ensure a high likelihood of population persistence into the future. These projections are based on planned activities only, and do not account for the resumption of unplanned natural disturbance factors, such as wildfire, or effects that may influence populations off the Forest.

Project-Level Information

Brown creepers have been detected on NFS and private lands associated with the project area. Survey effort that detected this species is described above. Suitable habitat is present and widespread on and around the project area. For this analysis, all HSS 4B, 4C, and 5 spruce-fir habitats in the project area are considered occupied or potential brown creeper habitat. Brown creepers have been detected during field surveys in all three of these structural stages on the project area, including NFS and private lands that would be affected by Alternatives 1-4, and they are assumed to be using these structural stages at an average territory size (Gillihan 2002). Based upon the 1,213 acres of HSS 4B, 4C, and 5 spruce-fir in the 1,872-acre project area (see Table 3.4.1.2-1) and full occupancy of available habitat at an average territory size of about one pair per five acres (Gillihan 2002), the project area may currently be capable of supporting about 242 pairs. Based upon qualitative field surveys, this estimate is considered higher than the density present.

3.5.2.2 *Hermit Thrush*

Hermit thrush, *Catharus guttatus*, was selected as a MIS on the Forest due to the close relationship between its primary habitat type(s) and identified Forest management activities (USFS 2003c). This species is primarily associated with spruce/fir and is commonly associated with, but not restricted to, older forest structure. It is tied to complex structural forest elements, including mature to late successional conifer forest floor characteristics (CWD). Its intent as an project MIS is to represent the habitat components and biological community of mature to late successional spruce-fir and mixed-conifer habitats in relationship to Forest-wide Standards and Guidelines as applied to management activities within these habitat types, and to answer the monitoring question as to whether spruce-fir/mixed-conifer systems are being managed in a manner that provides for viable, well-distributed populations of hermit thrushes and associated species across the Forest. Hermit thrush was also selected as a project MIS because it is present in mature and late successional spruce-fir stands in the project area.

Life History and Background Information

The hermit thrush is primarily associated with mature, dense spruce-fir stands and/or mixed-conifer forest throughout its range in Colorado (Andrews and Righter 1992, Yeager 1998). Other habitats used to various degrees include ponderosa pine, quaking aspen, pinyon-juniper and deciduous shrublands. Dense canopy closures, downed woody material, and other structural attributes of mature forest conditions appear to be closely related to the abundance and distribution of the species. In Colorado, they primarily nest in bushes, small trees and conifers within 3 to 10 feet of the ground (Yaeger 1998) and actively search ground litter, bark and foliage for insects (Holmes and Robinson 1988). They are considered sensitive to management activities that promote open canopy conditions and alter thermal properties near the forest floor.

Forest-Level Information

Based on late successional conifer stand conditions and distributions that this species is associated with, suitable hermit thrush habitat is well distributed across the RGNF and should support viable populations of this species (USFS 2002c,d). The total historic potential habitat for the hermit thrush on the Forest may have averaged around 487,000 acres, based on estimates of the historic average in their associated land type associations. Existing potential habitat on the Forest totals approximately 634,000 acres, based on current estimates of late successional conifer stages (USFS 2002c,d). It is anticipated that the quality, quantity, and distribution of hermit thrush habitat will decrease from current estimates of 634,000 acres, yet remain above the historic average of 487,000 acres during the life of the Forest Plan as a result of the activities planned within their associated cover types (USFS 2002c, d). Approximately (1.4 percent) of the late successional spruce-fir and white-fir/Douglas-fir cover types may be affected by timber harvest activities during the first decade. When projected out for five decades (i.e., probably beyond the life of the current Forest Plan), approximately (18 percent) of these cover types may be affected.

Current population estimates for the hermit thrush on the RGNF are based on the existing amount of potential habitat in LTA1, 3, and 13, Structure Class 5, an average territory size per breeding pair (Gillihan 2002), and full occupancy of available acres. Based on the distribution and abundance of structurally suitable habitat, and an average territory size of about one pair per 10 acres (Gillihan 2002), the Forest may currently be capable of supporting a relative density of about 63,400 pairs if the quality and quantity of habitat components are spatially distributed across the spruce-fir cover type. Gillihan's (2002) estimate does not include other mature (e.g., 4B and 4C) spruce-fir structural stages that are also inhabited by this species on the RGNF, including habitats on the Village at Wolf Creek project area. It is suspected that the Forest may have been capable of supporting an average relative density of about 48,700 thrush pairs when considering habitat availability based on natural disturbance factors.

Local hermit thrush populations are expected to remain relatively stable during the first decade of the Forest Plan, but decrease over time in response to changes in their preferred habitat (USFS 2002c, d). Based on Gillihan (2002), a Forest-wide decrease of approximately 3,800 pairs (up to <0.03 percent loss) could occur by the end of the fifth decade under the experienced budget level if timber harvest areas result in unsuitable habitat. This loss could increase to about 8,500 pairs (up to <0.04 percent loss). Both budget levels would result in populations that remain above the

average relative density that may have occurred under the natural disturbance regime (USFS 2002c, d).

Cumulatively, management actions in spruce-fir and mixed-conifer habitats throughout the range of the hermit thrush have affected the distribution and viability of the species. On a national scale, BBS hermit thrush data indicate that it is increasing by 50 percent or more throughout its range (USFS 2002c,d). At the scale of the local Southern Rockies-Colorado Plateau Bird Conservation Region, the species is also increasing at a rate of around 15 percent (USFS 2002c, d). At the scale of the local Southern Rocky Mountains province, however, the hermit thrush shows a slight decreasing trend of up to 15 percent (USFS 2002c,d). Reasons for this local trend are as yet unknown.

The vast majority of potential hermit thrush in the upper Rio Grande Basin occurs on NFS land. The quality and quantity of potential habitat that occurs on private land may have been altered to a less suitable condition; however, those acreages and potential species effects are most likely minor because of the limited distribution of private lands within the relatively high elevations of this species' habitat. Much of the potential habitat on NFS land occurs in areas with protective land management designations or management prescriptions. On the RGNF, for instance, approximately 244,395 acres of potential hermit thrush habitat occurs in wilderness, backcountry, scenic area, or other protective areas where minimal habitat alteration is anticipated from planned management activities. Habitat conditions on the Forest are, therefore, reasonably assured to be protected and are expected to help maintain local hermit thrush populations and provide source habitat on a larger scale. Current and proposed protection measures on the Forest will help ensure a high likelihood of population persistence into the future. These projections are based on planned activities only, and do not account for the resumption of unplanned natural disturbance factors, such as wildfire, or effects that may influence populations off the Forest.

Project-Level Information

Hermit thrushes have been detected on NFS and private lands associated with the project area. Survey effort that detected this species is described above. Suitable habitat is present and widespread on and around the project area. For this analysis, all stage 4A, 4B, 4C, and 5 spruce-fir habitats in the project area are considered occupied or potential hermit thrush habitat. Hermit thrushes have been detected during field surveys in all three of these structural stages on the project area, including NFS and private lands that would be affected by Alternatives 1-4, and they are assumed to be using these structural stages at an average territory size (Gillihan 2002). Based upon the 1,213 acres of HSS 4B, 4C, and 5 spruce-fir in the 1,872-acre project area (see Table 3.4.1.2-1) and full occupancy of available habitat at an average territory size of about one pair per 10 acres (Gillihan 2002), the project area may currently be capable of supporting about 121 pairs. Based upon qualitative field surveys, this estimate is considered higher than the density present.

3.5.2.3 *Lincoln's Sparrow*

Lincoln's sparrow, *Melospiza lincolnii*, was selected as a MIS on the Forest because it is a riparian species tied to different structural elements susceptible to grazing and other activities within riparian areas (USFS 2003c). This species is monitored as a group with Wilson's warbler

because of close habitat associations with willow communities at various elevations. Its intent as a project MIS is to represent the habitat components and biological community of riparian willow habitats in relationship to Forest-wide Standards and Guidelines, as applied to management activities within these habitat types and to answer the monitoring question as to whether riparian willow systems are being managed in a manner that provides for viable, well-distributed populations of Lincoln's sparrows and associated species across the Forest. Lincoln's sparrow was also selected as a project MIS because it is present in local riparian willow communities that might be affected by the proposed action on NFS lands.

Life History and Background Information

In Colorado, Lincoln's sparrows are common summer residents in higher mountains and mountain parks above 8,000 feet. This species is a Neotropical migrant that winters from the southwestern U.S. south throughout Mexico to Costa Rica (Andrews and Righter 1992, National Geographic Society 1991, Versaw 1998b). They return to their breeding grounds in the higher mountains of Colorado by early May, as snowmelt allows. They breed in riparian willow shrublands, shrubby meadows, and krummholz habitats, and also use aspen groves (Ammon 1995, Andrews and Righter 1992). The vast majority of nests have been documented in willow carr communities (Versaw 1998b). They build a cup nest on the ground lined with fine grass or hair (DeGraaf et al. 1991, Cicero 1997). Usually four or five eggs are produced with hatching occurring after 12-14 days of incubation. Females incubate the eggs and brood the young. Double brooding occurs only during favorable years (Ammon 1995) and appears to occur in Colorado (Versaw 1998b). Lincoln's sparrows usually vacate their high elevation breeding grounds by late September. However, they may be common in western valleys and on the eastern plains until late October (Ammon 1995, Ehrlich et al. 1988, Versaw 1998b, Andrews and Righter 1992, Bent 1968).

Lincoln's sparrows forage on the ground in wet areas close to their nest location, which is often in dense foliage. The young are fed insects. The diet of adults consists of spiders, millipedes, and grass and forb seeds. However, their slow feeding style tends to include slower and more hidden arthropods (Ammon 1995, Versaw 1998b, Bent 1968, Ehrlich et al. 1988). This foraging strategy reduces direct competition with Wilson's warblers, which are often found in the same habitat, but which consume different types of insects (Raley and Anderson 1990).

In Colorado, Lincoln's sparrows are riparian obligates strongly associated with mid- to high elevation willow riparian communities. They have also been documented nesting at moderately high densities in aspen stands on the RGNF in larger (>25 ha), older (HSS 4 and 5) aspen stands, in willow carr habitats associated with alpine tundra, and in areas with a mosaic of wet meadows dominated by shrubby cinquefoil (Gillihan 2001, RGNFnd). Regardless of the community, these birds typically build their nests at the base of a shrub or in a thick growth of sedges (Cicero 1997, Versaw 1998b). In Oregon and California, Cicero (1997) noted that singing males were strongly associated with particular habitat features, with the most important attribute being the presence of nearby surface water. Approximately 93 percent of the males observed were in either boggy or flooded sites that contained tussocks of sedges or grasses, while about 84 percent occurred near clumps of willows.

Forest-Level Information

Lincoln's sparrows are a fairly common, widely distributed summer resident in the higher mountains and mountain parks of Colorado (Andrews and Righter 1992). Rawinski (2001) reported a patchy, but widely distributed occurrence of this sparrow on the RGNF, indicative of the distribution of its primary habitat, willow riparian and willow carr wet meadows. This sparrow is relatively common on the RGNF where suitable habitat exists. Lincoln's sparrows have been located in suitable habitat on all ranger districts of the RGNF (RGNF nd). The Colorado Breeding Bird Atlas documented Lincoln's sparrows as confirmed breeders in a high percentage of the survey blocks in the mountainous areas of the state, including many blocks on the RGNF (Versaw 1998b). Primary habitat for Lincoln's sparrow on the RGNF occurs in Land Type Association (LTA) 10 - Willows and Sedges on Floodplains (USFS 2002e,f). LTA 10 represents approximately 54,000 acres (3 percent) of the Forest and is generally confined to narrow bands of vegetation associated with riparian zones from about 8,600 to 11,600 feet. However, about 11,365 (0.6 percent of the Forest) acres of primary habitat may be available on the RGNF based on a GIS query of riparian willow types that occur on slopes of 20 percent or less (USFS 2002 e,f). This figure represents the current baseline estimate of potential habitat on the RGNF, although adjustments may be needed as additional habitat relationship information becomes known and more mapping iterations are produced. This figure does not include aspen and willow carr habitats associated with alpine tundra on the RGNF, where this species also occurs at moderately high densities (Gillihan 2001, RGNF nd). Future LTA 10 habitat conditions are expected to remain stable, with no known threats to both breeding and non-breeding Lincoln's sparrow populations (unpubl. internal RGNF data). However, because of the vulnerability of riparian willow communities that these species are primarily associated with, careful management is required to maintain the structural components and hydrologic processes that promote habitat quality and quantity over time (Johnson and Anderson 2003).

Lincoln's sparrow has a moderate relative abundance throughout its global range and occurs in high relative abundance in the Southern Rocky Mountains (unpubl. internal USFS data). It is one of the most common breeding birds in montane and subalpine willow carrs in Colorado (Toolen 1998, Versaw 1998b), with mid-point densities estimated at over 487,000 breeding pairs (Kingery et al. 1998).

Current population estimates for the Lincoln's sparrow on the RGNF are based on the existing amount of potential habitat in LTA 10, an average territory size per breeding pair (Gillihan 2002), and full occupancy of available acres. Gillihan (2002) suggests that a reasonable baseline density estimate for Lincoln's sparrow on the RGNF is about 40 breeding territories per 40 hectare (1 territory per ha.) of suitable willow carr habitat. This equates to an average territory size of about two breeding pairs per acre and suggests that the RGNF may be capable of supporting a relative density of about 23,360 pairs of Lincoln's sparrows based on the current estimates of primary habitat. This figure does not include aspen and willow carr habitats associated with alpine tundra on the RGNF, where this species also occurs at moderately high densities (Gillihan 2001, RGNFnd). If Lincoln's sparrow use of aspen and willow carr habitats were considered, Forest-wide distributions and populations would be even higher. Information is unavailable on historic populations, although plant composition changes have occurred due to historic grazing impacts.

Lincoln's sparrow population trend data show consistent increases at Continental to local scales (Sauer 2003, unpubl. internal USFS data). The CNHP (1999) ranking for this species is G5 (demonstrably secure globally). Continent-wide BBS data indicate an increasing population trend (1.93 percent) from 1996-2002 (Sauer 2003). The trend for this period in the western BBS Region is 3.31 percent. This local trend is also positive for the Four Corners Region (1.9 percent), the Southern Rockies (1.83 percent), and Colorado (1.68 percent, Sauer 2003), which includes the RGNF.

Lincoln's sparrow populations on the RGNF are expected to remain relatively unchanged during the first decade. During the first decade, an increased management focus on riparian areas is expected to occur that will include the completion of Allotment Management Plans. These Allotment Management Plans will evaluate the relationship between upland areas, riparian areas, forage utilization, and livestock distribution, and will result in improvements to riparian willow habitat where needed. These improvements may also occur prior to completion of Allotment Management Plans by incorporating changes into the Annual Operating Instructions. Effects from travel management are also expected to lessen due to a reduction in open road densities on the RGNF. By the end of the fifth decade, a potential population response to these habitat improvements is expected that may result in slightly increased populations of Lincoln's sparrow. The potential population response is expected to be relatively similar under all alternatives due to the rangeland improvement and travel management projections in the Final EIS.

The vast majority of potential Lincoln's sparrow habitat in the upper Rio Grande Basin occurs on NFS land. The quality and quantity of potential habitat that occurs on private land may have been altered to a less suitable condition; however, those acreages and potential species effects are most likely minor because of the limited distribution of private lands within the relatively high elevations of this species' habitat. Much of the potential habitat on NFS land occurs in areas with protective land management designations or management prescriptions. The RGNF Forest Plan contains several goals, objectives, desired conditions, and standards and guidelines intended to maintain and promote healthy riparian zones and willow communities. Provisions of the CWA also restrict project-level impacts to these habitats. Conditions of these habitats on the Forest are, therefore, reasonably assured to be protected and are expected to help maintain local Lincoln's sparrow populations and provide source habitat on a larger scale. Current protection measures on the Forest will help ensure a high likelihood of population persistence into the future. These projections are based on planned activities only, and do not account for the resumption of unplanned natural disturbance factors, such as wildfire, or effects that may influence populations off the Forest.

Project-Level Information

Lincoln's sparrows have been detected breeding in the stunted planeleaf willow (*Salix planifolia*) stands in the subalpine meadows on NFS and private lands associated with the project area. Survey effort that detected this species is described above. For this analysis, all riparian willow communities in the project area ≥0.5 acre (this includes all willow stands) are considered occupied or potential Lincoln's sparrow habitat at an average territory size (Gillihan 2002).

3.5.2.4 *Wilson's Warbler*

Wilson's warbler, *Wilsonia pusilla*, was selected as a MIS on the Forest because it is a riparian species tied to different structural elements susceptible to grazing and other activities within riparian areas (USFS 2003b). This species is monitored as a group with Lincoln's sparrow because of close habitat associations with willow communities at various elevations. Its intent as a project MIS is to represent the habitat components and biological community of riparian willow habitats in relationship to Forest-wide Standards and Guidelines as applied to management activities within these habitat types, and to answer the monitoring question as to whether riparian willow systems are being managed in a manner that provides for viable, well-distributed populations of Wilson's warblers and associated species across the Forest. Wilson's warbler was also selected as a project MIS because it is present in local riparian willow communities that might be affected by the proposed action on NFS lands.

Life History and Background Information

In Colorado, Wilson's warblers are fairly common summer residents in higher mountains and mountain parks (Toolen 1998). Andrews and Righter (1992) reported a summer elevation range for this species as 10,000 to 13,000 feet. Toolen (1998) reported Wilson's warblers most frequently from 9,000 to 10,500 feet. Wilson's warblers are migratory and winter from northern Mexico to Central America and the Caribbean. Small numbers also winter along the Pacific Coast and the Gulf-states (Toolen 1998). Toolen (1998) reported Wilson's warbler as a confirmed breeder in the San Juan Mountains and Sangre de Cristo Range, both of which comprise the Rio Grande National Forest. Rawinski (2001) listed this warbler as a fairly common breeder in the San Luis Valley and adjacent mountains.

Wilson's warblers return to the higher mountains of Colorado by late May, as snowmelt allows. In Colorado, they breed in willow shrublands associated with lake and stream riparian areas and wet meadows, particularly at mid-elevations (Andrews and Righter 1992, Toolen 1998). Nest cups are usually placed on the ground, frequently at the base of a small tree or shrub, often well concealed in a grass hummock, and occasionally are reused for up to 10 years (DeGraaf et al. 1991, Ammon and Gilbert 1999). Ground level at the nest sites is higher than average, avoiding high water levels (Ammon and Gilbert 1999). However, they also occasionally place the nest above ground in low, dense tangles of vegetation. Four to six eggs are produced usually with hatching occurring after 10-13 days of incubation. The female incubates the eggs and broods the young. One brood is produced per nesting season. Wilson's warblers are migratory with most leaving their high elevation breeding grounds by mid-October. This warbler is common in western valleys and on the eastern plains from mid-August to late October (Ehrlich et al. 1988, Toolen 1998, Andrews and Righter 1992).

Wilson's warblers mostly eat insects (about 93 percent) gleaned from the ground and twigs or caught by fly catching (DeGraaf et al. 1991, Hutto 1981, Stewart et al. 1977). Ehrlich et al. (1988) reported that their diet also consists of some berries. Wilson's warblers are frequently found in close association with Lincoln's Sparrows (Toolen 1998, Bent 1953).

Wilson's warblers prefer to breed in boggy habitats throughout their range (Ehrlich et al. 1988). In Colorado, they are strongly associated with mid- to high elevation willow carrs, with more

than 90 percent of the documented nests in the Colorado Breeding Bird Atlas occurring in these habitat types (Toolen 1998). Thick willow-shrubs appear to be an important component of the breeding habitat for this species (Andrews and Righter 1992, Toolen 1998). Nests were closer to willow thickets and closer toward willow patch interiors than unused sites (Ammon and Gilbert 1999). On the RGNF, this species is observed most frequently in willows below five feet in height (Ghormley 2004, Rawinski 2001). These observations are consistent with low foraging heights in willows observed in other applicable studies (Stewart 1973, Hutto 1981, Cody and Smallwood 1996). During migration Wilson's warblers are reported to utilize a broader range of habitats including thickets, shrubs, parks and gardens (Bison-M 2001). The quality of migratory stopover habitat might significantly influence survival (Young et al. 1998). In spring, males appear on the breeding grounds earlier than females and are generally in healthier condition due to higher fat reserves (Francis and Cooke 1986, Young et al. 1998).

Forest-Level Information

Wilson's warblers are a fairly common, widely distributed summer resident in the higher mountains and mountain parks of Colorado (Andrews and Righter 1992). This warbler is relatively common on the RGNF where suitable habitat exists. Wilson's warblers have been located in suitable habitat on all ranger districts of the RGNF (unpubl. internal RGNF data). The Colorado Breeding Bird Atlas documented Wilson's warblers as confirmed breeders in a high percentage of the survey blocks in the mountainous areas of the state that contained willow communities above 9,000 feet elevation, including many blocks on the RGNF (Toolen 1998). Primary habitat for Wilson's warbler on the RGNF occurs in Land Type Association (LTA) 10 - Willows and Sedges on Floodplains (USFS 2002g, h). LTA 10 represents approximately 54,000 acres (3 percent) of the Forest and is generally confined to narrow bands of vegetation associated with riparian zones from about 8,600 to 11,600 feet. However, about 11,365 (0.6 percent of the Forest) acres of primary habitat may be available on the RGNF, based on a GIS query of riparian willow types that occur on slopes of 20 percent or less (USFS 2002g, h). This figure represents the current baseline estimate of potential habitat on the RGNF although adjustments may be needed as additional habitat relationship information becomes known and more mapping iterations are produced. This figure does not include willow carr habitats associated with alpine tundra on the RGNF, where this species also occurs at moderately high densities (Gillihan 2001, USFSnd). Future LTA 10 habitat conditions are expected to remain stable, with no known threats to both breeding and non-breeding Wilson's warbler populations (RGNFnd). However, because of the vulnerability of riparian willow communities that these species are primarily associated with, careful management is required to maintain the structural components and hydrologic processes that promote habitat quality and quantity over time (Johnson and Anderson 2003). Managing domestic livestock use of willow communities is an important management consideration for this species.

Wilson's warbler has a moderate relative abundance throughout its global range and occurs in high relative abundance in the Southern Rocky Mountains where suitable habitat exists (USFSnd). It is one of the most common breeding birds in montane and subalpine willow carrs in Colorado (Toolen 1998), with mid-point densities estimated at over 206,000 breeding pairs (Kingery et al. 1998).

Current population estimates for the Wilson's warbler on the RGNF are based on the existing amount of potential habitat in LTA 10, an average territory size per breeding pair (Gillihan 2002), and full occupancy of available acres. Gillihan (2002) suggests that a reasonable baseline density estimate for Wilson's warblers on the RGNF is about 100 breeding territories per 40 ha (1 territory per 2.5 hectares) of suitable willow carr habitat. This equates to an average territory size of about one breeding pair per acre and suggests that the RGNF may be capable of supporting a relative density of about 11,300 pairs of Wilson's warblers, based on the current estimates of potential primary habitat. Wilson's warblers have also been found in low densities in aspen stands on the RGNF (where they appear to prefer larger-sized stands [>25 ha] in the older structural stages [HSS 4 and 5; Gillihan 2001]) and at higher densities in alpine willow carrs on the Forest (where they have been detected on point counts [Schultz 2004, RGNF nd]). If Wilson's warbler use of aspen and willow carr habitats were considered, Forest-wide distributions and populations would be even higher. Information is unavailable on historic populations, although plant composition changes have occurred due to historic grazing impacts.

The CNHP (1999) ranking for this Wilson's warbler is G5 (demonstrably secure globally). The Partners In Flight Total Score (Rocky Mountain Bird Observatory 2001) is 20 for this species' global rank, indicating a significant decrease in population trend. Wilson's warbler population trend data show consistent decreases Continent-wide, with steeper declines at the local scale (Sauer 2003, unpubl. internal RGNF data). Continent-wide BBS data indicate a decreasing population trend (-1.2 percent) from 1996-2002 (Sauer 2003). The trend for this period in the western BBS Region is -1.4 percent. This local trend is also negative for the Four Corners Region (-4.33 percent), the Southern Rockies (-4.4 percent), and Colorado (-4.9 percent, Sauer 2003), which include the RGNF. These declines may have nothing to do with habitat availability and effectiveness on breeding ranges.

Wilson's warbler populations on the RGNF are expected to remain relatively unchanged during the first decade. During the first decade, an increased management focus on riparian areas is expected to occur that will include the completion of Allotment Management Plans. These Allotment Management Plans will evaluate the relationship between upland areas, riparian areas, forage utilization, and livestock distribution and result in improvements to riparian willow habitat where needed. These improvements may also occur prior to completion of Allotment Management Plans by incorporating changes into the Annual Operating Instructions. Effects from travel management are also expected to lessen due to a reduction in open road densities on the RGNF. By the end of the fifth decade, a potential population response to these habitat improvements is expected that may result in slightly increased populations of Wilson's warbler. The potential population response is expected to be relatively similar under all alternatives due to the rangeland improvement and travel management projections in the Final EIS.

The vast majority of potential Wilson's warbler habitat in the upper Rio Grande Basin occurs on NFS land. The quality and quantity of potential habitat that occurs on private land may have been altered to a less suitable condition; however, those acreages and potential species effects are most likely minor because of the limited distribution of private lands within the relatively high elevations of this species' habitat. Much of the potential habitat on NFS land occurs in areas with protective land management designations or management prescriptions. The RGNF Forest Plan contains several goals, objectives, desired conditions, and standards and guidelines intended to maintain and promote healthy riparian zones and willow communities. Provisions of the

Clean Water Act also restrict project-level impacts to these habitats. Conditions of these habitats on the Forest are, therefore, reasonably assured to be protected and are expected to help maintain local Wilson's warbler populations and provide source habitat on a larger scale. Current protection measures on the Forest will help ensure a high likelihood of population persistence into the future. These projections are based on planned activities only, and do not account for the resumption of unplanned natural disturbance factors, such as wildfire, or effects that may influence populations off the Forest.

Project-Level Information

Wilson's warblers have been detected breeding in the stunted planeleaf willow (*Salix planifolia*) stands in the subalpine meadows on NFS and private lands associated with the project area. Survey effort that detected this species is described above. For this analysis, all riparian willow communities in the project area ≥1 acre (this includes all willow stands) are considered occupied or potential Wilson's warbler habitat at an average territory size (Gillihan 2002).

3.5.2.5 *Rocky Mountain Elk*

Rocky Mountain Elk, *Cervus elaphus*, was selected as a MIS on the Forest because while it is a habitat generalist, it is of special interest from economic and recreational perspectives (USFS 2003b). It is also a species sensitive to road use and may compete with other ungulates and livestock. Elk was selected as a project MIS to answer the monitoring question as to whether elk habitat is being managed in a manner that provides for a viable and well-distributed population across the Forest during all seasons. Use of elk will assist in monitoring whether Forest Plan standards and guidelines are being met for wildlife, with an emphasis on road densities and providing adequate cover to maintain screening along roads. Elk was selected as a project MIS because local habitats used by elk might be affected by the proposed action on NFS lands.

Life History and Background Information

Rocky Mountain Elk inhabit the central and northern Rocky Mountains, including western Canada, south through eastern Oregon and Washington, Idaho, western Montana, Wyoming, Colorado, Utah, Nevada, New Mexico, and Arizona. Colorado supports the largest elk population of any state or province where they range over much of the western two-thirds of the state. Elk range over most of the Rio Grande Forest and use essentially all habitats.

In Colorado, the breeding season for elk begins in early September, peaks during the last week of September and first week of October, and is over by late October (Boyd and Ryland 1971, Fitzgerald et al. 1994). Mature bulls compete for females and gather harems of adult cows and calves. Most of the breeding is done by bulls three years of age or older (Freddy 1987). Other bulls continually attempt to usurp cows in the harem. As a result of this constant activity of protecting the harem, herd bulls lose considerable weight during this time of the year. Harem size typically ranges between 15 and 20 cows (Boyd 1978, Thomas and Towell 1982). Elk have a 240-255-day gestation period and most calves are born in late May or early June, with the peak of calving from June 4-6. Yearling cows can breed in Colorado, but less than one third of them are successful at producing offspring that survive into the fall, compared to about three fourths of adult cows (Freddy 1987).

Calving grounds are carefully selected by the cows and are generally in locations where cover, forage, and water are in close proximity (Seidel 1977). Calving sites occur in the middle to upper portions of summer range and often occur in the same general area each year. Although selected sites are used for a brief period in the spring there are some key characteristics required for optimum reproductive success. Sites must provide security from harassment and be within or adjacent to high-quality summer range. They can occur in any forest type on gentle slopes, given that cover, food, and water are nearby. The aspen habitat association is often regarded as the most productive type for elk reproduction in Colorado and in the San Juan Mountains. Cows with calves isolate themselves from the herd for two to three weeks or until the calves are large enough to travel. Then they begin to gather up into nursery groups. By mid-July, herds of several hundred animals are common on some summer ranges.

Hiking and other recreational activities in or near elk calving areas can have a significant impact on reproductive success. Phillips and Alldredge (2000) studied reproductive success of elk following disturbance by humans during calving seasons in central Colorado. They reported a significant drop in reproductive success below an undisturbed control group.

During the winter, spring, and summer adult bulls usually segregate from cows, calves and younger bulls and remain alone or form small herds of five or six animals. Younger bulls are usually mixed with cow-calf herds (Fitzgerald et al. 1994). While the bulls may control the harem, the older cows are the true leaders of the herd. Cows usually give the alarm and lead the rest of the herd away from real or imagined danger (Boyd 1978).

Elk inhabit higher elevations during spring and summer and migrate to lower elevations for winter range. The length of seasonal migration varies from just a few miles to nearly 50 miles in some cases. When early winter snows begin to accumulate, cows, calves, and younger bulls begin to move down to winter ranges, where they usually remain from December through March (Boyd 1978). During winter, elk form large, mixed herds on favored winter range and more than 1,000 animals may be observed together. Mature bulls typically winter at higher elevations than cows and are found in small bachelor groups. As winter moderates in late March, elk start a gradual movement back up to their summer ranges and the cycle begins again (Boyd 1978). Winter range availability and habitat effectiveness may be the most critical seasonal range for elk survival. Chronic wasting disease has been discovered in elk herds various parts of the state, including a captive herd in the San Luis Valley, and could be a threat to elk populations and recreational hunting on the RGNF.

Elk studies have consistently demonstrated that they avoid roads (Lyon 1979, 1983, Thomas et al. 1979, Christensen et al. 1993, Rowland et al. 2000, and Lyon and Jensen 1980). The amount of vehicular travel on roads appears to be the key factor that causes avoidance. A study by Lyon (1983) demonstrated that elk habitat effectiveness decreases by approximately 25 percent with a density of one mile of road per square mile of land, and by at least 50 percent with a density of 2 miles of road per square mile. The same research concluded that the best method of maximizing elk habitat effectiveness is by closing and obliterating roads. Road closure needs should be assessed on a site-specific basis to determine the limiting habitat conditions in each area.

The CDOW manages elk to provide healthy populations capable of supporting both significant harvests and opportunities for nonconsumptive uses (Freddy 1993, CDOW 2002). Elk license

sales account for a large percentage of all license revenue, indicating the importance of elk herd management and population viability in the state.

Forest-Level Information

Elk formerly occupied much of central and western North America (Fitzgerald et. al. 1994). Elk were almost extirpated from Colorado in the early 1900s when market hunting caused populations to decline to 500 to 1,000 individuals (Armstrong 1972). A successful restoration program (using elk from Wyoming) and careful management have led to the current high elk populations in Colorado (Fitzgerald et. al. 1994). In 1990, Colorado's elk population was estimated at 185,000 (Freddy et al. 1993), probably the highest in the United States. Today, 'Colorado has the largest elk herd in the world' at over 300,000 individuals, distributed mainly through the mountainous part of the State (Fitzgerald. et. al. 1994). CDOW biologists consider this number too high and would like it lowered to 240,000 (CDOW 2002).

Elk are widely distributed across the RGNF and inhabit all 13 LTAs. They are more abundant at higher elevations during summer and at lower elevations during winter.

Population trends throughout the species range are generally increasing. The trend throughout most of the Forest is stable to decreasing in response to management objectives. There are seven Game Management Units (GMUs) on the Forest (681, 68, 76, 79, 80, 81 and 82) contained within four Data Analysis Units (DAUs), as follows:

1. Upper Rio Grande Elk Herd, DAU E-34, GMUs 76/79

2. Lower Rio Grande Elk Herd, DAU E-32, GMUs 80/81

3. Saguache Elk Herd, DAU E-26, GMUs 68/681

4. Sand Dunes Elk Herd, DAU E-11, GMU 82

DAUs are used to manage herds of big game animals, are generally geographically discrete, and, for the most part, contain discrete big game populations. DAUs are designed to support and accomplish the objective of the CDOW's Long Range Plan and meet the public's objectives for big game.

Population estimates obtained from the CDOW indicate that there are currently 23,127 elk within the four DAUs on the RGNF, quite near the 23,410 animals representing the 20-year average (Table 3.5-1). The total combined herd management objective is 13,950. Herd management objectives have been over objective since the late 1980s and are now over objective by approximately 9,950 animals (66 percent). Increased impacts to private agricultural lands, displacement of deer from winter range, and increased highway mortality (i.e., resulting in injury to people and damage to private property) are just a few of the consequences of elevated populations. Elk populations and trends are influenced by a host of natural factors (e.g., habitat availability, winter severity, and over-winter survival, etc.), but can be profoundly controlled over time by CDOW objectives and their ability to manage populations via hunter harvest. All DAUs experienced increasing elk populations into the early 1990s when management objectives sought to reduce populations (USFS 2002i, j). The CDOW effectively reduced herd numbers in

all DAUs from peak early 1990s populations. Elk populations on the Forest are expected to stabilize at lower, more desirable management levels over time, in response mainly to more aggressive hunting strategies. Habitat improvement projects, including vegetative treatments such as timber harvest, prescribed fire, and mechanical treatments, are expected to increase.

Table 3.5-1. Post-Hunt Elk Population Estimates for Data Analysis Units E-34, E-32, E-26, and E-11

	Post-Hunt (Winter) Elk Population Estimate				
Year	**E-34**	**E-32**	**E-26**	**E-11**	**Total**
1983		9,657	4,675	1,655	15,987
1984		7,137	4,017	1,459	12,613
1985		7,170	4,167	1,536	12,873
1986	4,538	7,596	3,885	1,665	17,684
1987	5,054	8,396	4,572	1,857	19,879
1988	5,475	9,152	5,444	2,192	22,263
1989	5,787	9,839	6,001	2,575	24,202
1990	5,644	9,651	6,159	2,901	24,355
1991	5,774	10,126	6,879	3,344	26,123
1992	6,132	9,133	6,804	2,883	24,952
1993	5,675	8,992	5,584	3,172	23,423
1994	5,419	8,850	4,939	3,397	22,605
1995	5,748	9,711	5,589	3,821	24,869
1996	5,110	9,484	5,518	4,342	24,454
1997	5,286	10,123	5,692	4,624	25,725
1998	5,214	10,016	5,810	4,788	25,828
1999	5,468	10,175	6,367	4,877	26,887
2000	4,791	10,246	6,454	5,287	26,778
2001	4,793	10,694	5,351	5,603	26,441
2002	4,520	9,713	5,134	5,424	24,791
2003	4,203	8,628	4,600	5,696	23,127
Mean	**5,257**	**9,261**	**5,411**	**3,481**	**23,410**
High	**6,132**	**10,694**	**6,879**	**5,696**	
Low	**4,203**	**7,137**	**3,885**	**1,459**	
Herd Objective	**3,700**	**5,000**	**3,750**	**1,500**	**13,950**

Note: Note that the CDOW publishes a disclaimer with the information stating "estimating numbers of wild animals over large geographic areas is an inexact science".
Source: from USFS 2002i,j and unpublished CDOW data obtained from Chuck Wagner, CDOW Biologist, Monte Vista (2004). Additional data are contained in the project file.

There is approximately 300,000 acres of winter range habitat on the RGNF (USFS 2002i,j). Winter range occurs at lower-elevations, primarily in the non-forested LTAs that are generally in poorer condition than upland areas due to historic livestock use (USFS 1996a). Elk use of these areas is widely distributed with isolated areas of concentrated use. With population estimates demonstrating an ability of the resource to support larger herd numbers in the past (e.g., the early 1990s) and the CDOW's current objective to further reduce herd sizes from currently lower populations, the trend in winter range habitat availability and condition on the Forest should only improve. This assumes maintaining the status quo with respect to stocking levels on active grazing allotments and restrictions on new road development, but does not include the beneficial effects of habitat enhancement practices and the Million Acres Fire.

Approximately 39 percent of the winter range may be considered highly effective based on estimated open road densities (< 1 mile/sq. mile, USFS 2003d). Another 46 percent of this may

be considered moderately effective due to road densities within the 2-mile per square mile range, while 15 percent may be considered ineffective. The actual influence of these road density categories will vary depending upon the type and frequency of vehicle use during the winter period. Elk winter range Management-Area Prescriptions (5.41) are in place that emphasize the habitat needs of wintering big game. Road closures on winter range areas are a key factor in this Management-Area Prescription.

The geographic area for cumulative analysis for both elk and mule deer is the Rio Grande River Headwaters, which includes the RGNF, adjacent Bureau of Land Management lands, and private lands within the San Luis Valley. This boundary contains most, if not all, of the area used by both the elk and deer herds occurring on the RGNF.

Cumulatively, local elk populations are expected to decrease slightly during the first decade of Forest Plan implementation under all FEIS alternatives due to more aggressive hunting strategies developed by the CDOW. For the purposes of this analysis, it is assumed that elk population objectives will be met sometime after or during the first decade and that populations will have stabilized by the fifth decade. This is due to more effective hunting strategies developed by the CDOW, as well as increased habitat improvement on the RGNF.

From a cumulative perspective, Forest-wide elk habitats are projected to remain secure, with the forest management activities projected by the Forest Plan expected to have both positive and negative effects, but continue to supply the quantity and quality of habitat needed to meet CDOW population objectives over time.

Project-Level Information

Elk are present in the vicinity of the project area from June through October. They begin drifting into the area in early June (i.e., following snowmelt and spring green-up) as they move to the highest elevation summer ranges from lower elevation winter and transitional ranges. The project area and its concentrated (as opposed to dispersed) indirect effects zone of influence do not contain effective winter range, transitional range, calving habitat, or highway crossings because of the relatively high elevation, habitat types and landforms present, and proximity to chronic anthropogenic disturbances (NDIS maps). The project area represents an extremely small portion of the year-round home range used by animals present on-site during summer.

The project area's spruce-fir forests are fragmented by native meadows, ski trails, and glades. Ski trail development has increased forage availability and much of it is effective because of limited human disturbance on the ski area. However, while these more open habitats have increased foraging values, associated cover and security values are suboptimal because of chronic summer disturbances that closely surround (Ski Area and Highway 160) and permeate (FSR 391) the project area. Highway 160 physically and behaviorally results in some elk avoidance of adjacent habitats. The Ski Area's base area and parking lots and FSR 391, also results in some displacement during the summer maintenance/recreation season. Elk have adapted to this context by using the project area and local surrounding habitats nocturnally and moving into larger, secure forest blocks outside the project area during the day.

Elk movements in the vicinity of the project area are primarily east-west, although they don't cross through the developed base area and parking lots (i.e., the west end of the project area is a dead end, bounded on the north by Highway 160 and on the west and south by based area parking lots, retaining walls and facilities). Movements also occur north-south (i.e., over the Continental Divide), as Rio Grande elk mix with San Juan elk in the East Fork Valley (Thompson 1985, USFS 1987). However, elk rarely cross Highway 160 adjacent to the project area (i.e., between the ski area entrance and about 0.5 mile below the snow shed) because of (1) adjacent local facilities (e.g., the CDOT maintenance buildings, ski area entrance road, parking lots, and base area facilities, snow shed, parking area downhill of snow shed) that deflect elk from their approach to the area, (2) the steep canyon below the snow shed, (3) broad, boulder-covered fill slopes along the highway, and (4) the location of this area in the larger landscape (i.e., there are no compellingly important adjacent habitats and it is simply easier to avoid this cluster of development in an otherwise undeveloped landscape).

NDIS maps indicate that the only polygon of seasonal elk habitat overlapping the project area is a relatively large block of "summer concentration area". This polygon extends north of the Continental Divide, south of Highway 160, and south of FSR 390 up Pass Creek. It includes most of the Ski Area and most of the project area, including the private parcel and portions of the Alternative 2 and 3 access roads. Summer concentration areas are defined as "those areas where elk concentrate from mid-June through mid-August. High quality forage, security, and lack of disturbance are characteristics of these areas to meet the high energy demands of lactation, calf rearing, antler growth, and general preparation for the rigors of fall and winter." This designation is a subset of "summer range", defined, in part, as "that part of the range of elk where 90 percent of the individuals are located between spring green-up and the first heavy snowfall or during a site-specific period of summer". While portions of the project area are adjacent to human use areas where roads and human disturbance locally reduce elk habitat effectiveness, many of these disturbances are so benign, chronic, brief, and adequately buffered from disturbances that habitat use does not appear to be adversely affected. Indeed, a low number of elk and deer exhibit concentrated use in the northwestern corner of the private parcel and adjacent NFS lands as a result of relatively lush forb/willow communities. Based on detailed field surveys throughout the project area and corroboration by the CDOW (Pacheco 2004), the NDIS summer concentration designation is considered valid.

The closest block of important elk habitat that should be considered from a cumulative effects perspective is in the East Fork Valley, south of the Ski Area on the opposite side of the Continental Divide (Thompson 1985, USFS 1987, NDIS maps). That approximately 60-square mile valley is presently undeveloped, although, 3.5-mi.^{2} of the valley bottom is privately owned by one party. The valley supports hundreds of elk in the summer and even several dozen wintering animals. Calving values are of particular importance because of the large area of high quality habitat isolated from human disturbances. Currently, there is no access or dispersed recreational use into that valley originating from the Wolf Creek Pass area.

NDIS maps indicate that there are no elk highway crossings (defined as where ≥ 6 elk are killed along a one mile stretch of highway per year) along Highway 160 over Wolf Creek Pass, although such a crossing occurs near the confluence of the East and West Forks of the San Juan River between the western base of the pass and Pagosa Springs. Elk do cross Highway 160 over

Wolf Creek Pass, although road-kill density might not meet the above highway-crossing criterion.

3.5.2.6 *Mule Deer*

Mule deer, *Odocoileus heminonus*, were selected as a project MIS to answer the monitoring question as to whether mule deer habitat is being managed in a manner that provides for a viable and well-distributed population across the Forest during all seasons (USFS 2002k, l). Use of the mule deer will assist in monitoring whether Forest Plan standards and guidelines are being met for wildlife, as an indicator for forest management issues that influence the early successional stages of plant communities in relation to foraging and other habitat attributes. This species is a habitat generalist and is of special interest from economic and recreational perspectives (USFS 2003b). Mule deer were also selected as a project MIS because local habitats used by deer might be affected by the proposed action on NFS lands. Most information below is after USFS (2002k,l).

Life History and Background Information

Mule Deer are widely distributed in western North America. They inhabit every major vegetation type in western North America and every climatic zone except the arctic and tropic. Rocky Mountain mule deer is the subspecies found in Colorado and they occur throughout the state in all ecosystems (Fitzgerald 1994). Mule deer range over most of the RGNF and use essentially all habitats. Like elk, mule deer inhabit higher elevations during spring and summer and migrate to lower elevations for winter range. Winter range availability and habitat effectiveness may be the most critical seasonal range for deer survival.

Mule deer are a big-game species and the Colorado Wildlife Commission regulates seasons and bag limits. Hunting and fishing license fees are expected to continue to be the major source of revenue for wildlife programs in Colorado (CDOW 2002). Deer license sales account for a large percentage of all license revenue, indicating the importance of deer herd management and population viability in the state.

In Colorado, mule deer breed in November and December. A variety of factors stimulate the complex endocrine system that manipulates the physiological processes involved in the timing of reproduction. In males these factors cause growth of antlers and neck swelling prior the rut. At the time of ovulation, the peak of estrus, females are receptive for breeding for only a few hours to less than a day. If not bred, however, they recycle until fertilized (Wallmo 1980). A Colorado study (Anderson and Medin 1967) documented that 70 percent of the breeding occurred in a 20-day period. The mean length of gestation is 203 days, with individual variance of up to 30 days (Anderson and Medin 1967, Robinette et al. 1973). With the breakup of winter, the inclination of the fertile doe is to drift off alone a week or two before she drops her fawn. Most fawns are born from early to mid-morning. Fawns are precocious and weigh 8 to 10 pounds at birth. In Colorado, fawns are normally born from June 15 to July 15 (Einarson 1969). Yearling females typically produce a single fawn, while older females in good condition normally produce twins (Fitzgerald et al. 1994). Family groups are usually made up of mature and young does, young bucks, and yearling fawns (Einarson 1969). When not in rut, adult males often form pairs or

small groups of three to five individuals (Fitzgerald et al. 1994). The males shed their antlers from late December to late February (Einarson 1969).

Mule deer eat a wide variety of plant species (Bison M 2001). The seasonal use of foods may change quickly and within a few weeks a highly palatable plant may fall into complete disuse. During the spring months, grasses may make up a high percentage of the diet in some areas. This early growth is high in protein. During the summer when the variety of plants available reaches their maximum, grasses may drop as a percent of the total diet. Forb use and new growth of shrubs is high during this period (Einarson 1969). Autumn frosts bring great changes to mule deer diets. A high portion of the diet is comprised of grasses, leaves and forbs, but this period marks the transition to shrubby vegetation. In winter, succulent vegetation is at a minimum and in many areas snow covers herbaceous plants and many shrubs, leaving only taller browse (Einarson 1969).

Cover may be a key factor that determines the amount of use deer will make of foraging areas. In optimal deer range 40 percent of an area will be in cover type habitat. Ideally, cover habitat is comprised of 50 percent hiding cover and 50 percent thermal cover. Hiding cover generally is any vegetation that will hide 90 percent of a deer at 200 feet or less. Optimal hiding cover will be in patches at least 800-1,600 feet wide. Optimal winter range contains thermal cover consisting of evergreen trees with 75 percent or greater canopy closure. Spring and summer thermal cover may be as important as winter thermal cover for protection from high temperatures. Spring and summer thermal cover may be provided by coniferous or deciduous trees, which provide at least 75 percent canopy closure. Escape cover used by deer may include thermal or hiding cover. Broken terrain or topographic features are also used as escape cover (Hoover and Wills 1984, Thomas et al. 1979). Loft et al. (1991) documented that deer prefer meadow-riparian habitats in the absence of domestic livestock grazing.

Fawning may occur in any habitat type found on the forest. However, fawns are most often found on sites with slopes of less than 15 percent that have good ground cover in the form of herbaceous vegetation mixed with low shrubs or small trees 2 to 6 feet in height. Normally these areas are within 600 yards of a water source and in areas that have quality forage for the doe that assures adequate milk production. Fawning areas are normally 1 to 5 acres in size if located on sites with characteristics different from the surrounding habitats (Hoover and Wills 1984). Fawns are relatively inactive during the first few days of their lives, but gradually become more active and begin to explore their surroundings. They begin to consume solid foods at 15 to 20 days of age (Einarson 1969). In a Colorado study, Geduling (1981) reported that of 11 fawns he studied from early June through August, the average home range was 321 acres and the average home range expanded throughout the summer. Riley and Dood (1984) reported an average summer home range of 456 acres for fawns in a Montana study. They found that fawns selected habitat types with dense vegetative cover and typically used the mid- and lower one-third of slopes, possibly to minimize encounters with coyotes.

Deer are thought to experience less reduced habitat effectiveness compared to elk with respect to road effects, however, they are still adversely influenced by the presence of roads that are open to vehicular traffic. Some level of reduced use of areas adjacent to roads extended for distances ranging from ¼ to ½ mile (Thomas et al. 1979). Road type, its location, and its degree of use influenced mule deer habitat effectiveness (Rost and Bailey 1979). Roads also provide access

for hunters and poachers alike, leading to increased deer mortality. Mule deer are sympatric with elk across large areas of western North America, where populations of mule deer have declined while elk populations have increased (Johnson et al. 2000). While more study is needed to specifically determine if elk population increases are the direct cause of mule deer population declines, Johnson et al. (2000) documented mule deer avoidance of areas used by elk. Consequently increasing elk populations are suspected to be a causative factor in the decline of mule deer populations in some areas.

Winter range conditions are most critical for mule deer survival. Pressures are increasing on most winter range from human developments such as reservoirs, housing developments, access roads, highways, and cultivated fields. Overgrazing of mule deer winter range by domestic livestock can have significant impacts on deer populations. The communal life of the deer in mid-winter concentrations brings a critical period in the life of the young deer. In habitats with adequate forage, and during mild weather, no crisis occurs, but where growing conditions are poor and where overpopulations of domestic livestock and deer both use the range, the winter months of excessive cold and deep snow often become critical for the younger deer. Yearlings and fawns may have been in excellent condition as winter approaches, but larger and more mature animals press forage back, often standing up on hind legs to reach the remaining browse, the smaller deer fail to secure adequate nourishment. Immature deer make up from 60 to 80 percent of the mortality in critical winter conditions (Einarson 1969). In a study in northwest Colorado, White and Bartmann (1998) documented significant increases in fawn survival rates after wintering densities of mule deer were lowered.

Chronic wasting disease is a potential threat to mule deer populations and recreational hunting on the Rio Grande National Forest. This disease has been found in wild deer and elk in northeastern Colorado and southeastern Wyoming for more than 30 years and in captive elk for more than a decade, but was recently detected in commercial herds in the San Luis Valley and North Park (CDOW 2002, Gross and Miller 2001).

Forest-Level Information

Around the turn of the century, mule deer populations were greatly depleted in Colorado due to market hunting. The rise of a conservation ethic and establishment of the CDOW led to the recovery of this species in the state. Mule deer populations declined again over much of the western United States in the 1950s due to overhunting, habitat loss, habitat alteration, and deterioration of winter range (Einarson 1969). At the present time, most mule deer herds in the state are below population objective levels.

Mule deer are widely distributed across the RGNF and inhabit all 13 LTAs. They are more abundant at higher elevations during summer and at lower elevations during winter. There are 300,000 acres of elk/deer winter range on the Forest. Winter range consists of the following LTAs: Ponderosa Pine, Pinyon, Gambel Oak, Arizona Fescue, and Western Wheatgrass. The winter range is bunch grass dominated with isolated pockets of mountain mahogany, winter fat, and oak browse. Winter range studies on the Forest to help determine winter range condition and trend of have been undertaken, but the data have been inconclusive. Overall winter range productivity on the Forest is more the result of soil type and moisture regimes. Grass and forb productivity is generally good. Shrub trend is stable to declining in most areas of the Forest.

The RGNF has completed several winter range improvement projects for big game. Opportunities for partnership projects between the Forest, CDOW, and the Mule Deer Foundation are excellent.

There are seven GMUs on the Forest (681, 68, 76, 79, 80, 81 and 82) contained within four DAUs, as follows:

1. Upper Rio Grande Mule Deer Herd, DAU D-36, GMUs 76/79
2. Lower Rio Grande Mule Deer Herd, DAU D-35, GMUs 80/81
3. Saguache Mule Deer Herd, DAU D-26, GMUs 68/681
4. Sand Dunes Mule Deer Herd, DAU D-37, GMU 82

DAUs are used to manage herds of big game animals, are generally geographically discrete, and, for the most part, contain discrete big game populations. DAUs are designed to support and accomplish the objective of the CDOW's Long Range Plan and meet the public's objectives for big game (see Table 3.5-2).

Table 3.5-2. Post-hunt Mule Deer Population Estimates for Data Analysis Units D-36, D-35, D-26, and D-37 on the RGNF.

	Post-Hunt (Winter) Mule Deer Population Estimate				
Year	**D-36**	**D-35**	**D-26**	**D-37**	**Total**
1983	2,498	7,428			9,926
1984	2,802	8,744	7,110	4,327	22,983
1985	3,643	8,453	7,744	4,979	24,819
1986	4,535	9,197	8,526	5,280	27,538
1987	3,061	7,142	9,937	5,490	25,630
1988	3,831	7,457	12,613	6,433	30,334
1989	4,096	8,995	12,290	6,385	31,766
1990	3,847	10,465	11,990	5,996	32,298
1991	3,499	10,649	13,667	7,246	35,061
1992	3,209	8,654	9,351	4,599	25,813
1993	3,275	7,891	10,192	4,635	25,993
1994	3,514	8,045	8,714	4,056	24,329
1995	4,257	7,527	10,253	3,988	26,025
1996	4,523	8,310	9,188	3,915	25,936
1997	4,192	8,363	8,751	3,921	25,227
1998	4,160	7,694	7,316	3,109	22,279
1999	3,534	7,412	7,735	3,359	22,040
2000	3,996	8,494	8,404	3,639	24,533
2001	4,126	7,516	8,644	3,784	24,070
2002	3,769	7,742	7,352	3,280	22,143
2003	3,828	8,577	8,508	4,001	24,914
Mean	**3,724**	**8,322**	**9,414**	**4,621**	**26,081**
High	**4,535**	**10,649**	**13,667**	**7,246**	
Low	**2,498**	**7,142**	**7,110**	**3,109**	
Herd Objective	**4,000**	**8,500**	**8,500**	**4,500**	**25,500**

Note: the CDOW publishes a disclaimer with the information stating "estimating numbers of wild animals over large geographic areas is an inexact science".
Source: USFS (2002k,l) and unpublished CDOW data obtained from Chuck Wagner, CDOW Biologist, Monte Vista (2004). Additional data are contained in the project file.

Population estimates obtained from the CDOW indicate that there are currently (winter 2003) 24,914 mule deer within the four DAUs on the RGNF, virtually at the total combined herd management objective of 25,500 deer and slightly below the 20-year population mean (Table 3.5-2). The Forest-wide population has been fluctuating slightly over and under objective since 1992 and is now under objective by approximately 586 animals (2.3 percent). Two of the four DAUs on the RGNF are at or are slightly above herd management objectives, while the remainder is slightly below objectives.

Population trends throughout the species range are considered stable. The trend throughout most of the RGNF has fluctuated somewhat since the early 1980s (Table 3.5-2). The Forest-wide population peaked in the late 1980s and early 1990s, then declined slightly and has been relatively stable since 1992.

Mule deer populations and trends are influenced by a host of natural factors (e.g., winter range conditions, winter range availability, winter severity, winter range competition with elk, etc.), but can also be influenced over time by CDOW's ability to manage populations via hunter harvest. The CDOW effectively reduced elk population numbers in all DAUs from peak early 1990s populations. Mule deer populations on the Forest are expected to increase over time in response to changes in hunting structure and improvement in the quality, quantity, and distribution of foraging habitat (USFS 2002k,l). Reduced elk populations and habitat improvement projects, including vegetative treatments such as timber harvest, prescribed fire, and mechanical treatments, are expected to benefit deer.

Project-Level Information

Mule deer are present in the vicinity of the project area from June through October and use the area in much the same way as elk (i.e., as summer range). Deer begin drifting into the area in mid- to late June (i.e., following snowmelt and spring green-up) as they move to the highest elevation summer ranges from lower elevation winter and transitional ranges. Field surveys indicate that some fawning occurs on the project area. The project area and its concentrated (as opposed to dispersed) indirect effects zone of influence do not contain effective winter range, transitional range, or highway crossings (as defined by the CDOW) because of the relatively high elevation, habitat types and landforms present, and proximity to chronic anthropogenic disturbances (NDIS maps). The project area represents an extremely small portion of the year-round home range used by animals present on-site during summer.

The project area's spruce-fir forests are fragmented by native meadows, ski trails, and glades. Ski trail development has increased forage availability and much of it is effective because of limited human disturbance on the ski area. These increased foraging values are largely effective despite chronic summer disturbances that closely surround (Ski Area and Highway 160) and permeate (FSR 391) the project area. U.S. Highway 160 physically and behaviorally results in some deer avoidance of adjacent habitats. The Ski Area's base area and parking lots and FSR 391, also results in some displacement during the summer maintenance/recreation season. Deer have adapted to this context by using the project area and local surrounding habitats nocturnally and moving into forest blocks during the day.

Deer movements in the vicinity of the project area are primarily east-west, including some nocturnal movements across and through portions of the developed base area and parking lots. Movements also occur north-south (i.e., over the Continental Divide), as Rio Grande deer mix with San Juan deer in the East Fork Valley (Thompson 1985, USFS 1987). Deer also cross Highway 160 in the vicinity of the project area, although no evidence of highway crossings has been found in areas immediately adjacent to the project area (i.e., between the Ski Area entrance and about 0.5 mi. below the snow shed) because of (1) adjacent local facilities (e.g., the CDOW maintenance buildings, Ski Area entrance road, parking lots, and base area facilities, snow shed, parking area downhill of snow shed) that deflect deer from their approach to the highway, (2) the steep canyon below the snow shed, (3) broad, coarse, boulder-covered fill slopes along the highway, and (4) the location of this area in the larger landscape (i.e., there are no compellingly important adjacent habitats and it is simply easier to avoid this cluster of development in an otherwise undeveloped landscape).

NDIS maps indicate that the only polygon of seasonal mule deer habitat overlapping the project area is a widespread block of summer range that extends between the towns of South Fork and Pagosa Springs. Based on field surveys throughout the project area, the NDIS designation is considered valid.

The closest NDIS blocks of mule deer winter range designations occur at lower elevations relatively distant from the project area, located along the Continental Divide. The closest winter range to the east begins in Rio Grande County around Fun Valley, and extends east down valley. The closest winter range to the west begins at the confluence of the East and West Forks of the San Juan River and extends west down valley. The closest severe winter range or winter concentration areas to the east begin in Rio Grande County around the junction of Highways 160 and 149 (South Fork) on private lands. The closest severe winter range or winter concentration areas to the west begin several miles west and south of Pagosa Springs, also on mostly private lands.

No other seasonal mule deer ranges occur closer to the project area than the towns of South Fork and Pagosa Springs. As indicated above, there is a limited amount of fawning that occurs on the project area, based on field surveys. NDIS mapping does not map deer fawning areas (largely because they are so widespread).

NDIS maps indicate that there are no mule deer highway crossings (defined as where ≥ 6 deer are killed along a 1 mile stretch of highway per year) along Highway 160 over Wolf Creek Pass, although such a crossing occurs near the confluence of the East and West Forks of the San Juan River between the western base of the pass and Pagosa Springs. Mule deer do cross Highway 160 over Wolf Creek Pass, although roadkill density might not meet the above highway-crossing criterion.

3.5.2.7 *Rio Grande Cutthroat Trout*

Rio Grande Cutthroat Trout, *Oncorhynchus clarki virginalis*, were selected as a project MIS of the health of montane aquatic ecosystems and to answer the monitoring question as to whether the Forest is being managed in a manner that provides for viable, well-distributed populations of aquatic species across the Forest (USFS 2003b). While Rio Grande Cutthroat Trout are

relatively rare in high elevation streams, significant habitat restoration efforts have occurred and a range-wide conservation agreement has been recently signed (CDOW et al. 2003). Rio Grande Cutthroat Trout are spring spawners sensitive to management activities that increase sediment, reduce stream cover, create barriers to movement, or impact stream flows or water quality. Rio Grande Cutthroat Trout were also selected as a project MIS because they are present in the project area and may be affected by the proposed action.

Life History and Background Information

Rio Grande Cutthroat Trout are the southernmost of 14 subspecies of cutthroat trout (Behnke 1992) and one of four subspecies of cutthroat trout native to Colorado's coldwater streams and lakes (Calamusso and Rinne 1999). Rio Grande Cutthroat Trout are endemic to the Rio Grande basin in Colorado. They were once widespread throughout the upper Rio Grande, Canadian, and Pecos River basins of New Mexico and may have occurred as far south as Chihuahua, Mexico. They have been extirpated from large portions of their historic range, and currently occupy approximately 14 percent of their historical habitat in Colorado (CDOW 2000). Approximately 60 self-sustaining, refugia populations exist in Colorado (including historic and transplanted populations). However, only 20 (33 percent) of these are considered stable and secure or expanding. The remaining refugia populations (40, 67 percent) are at risk from co-occurring non-natives (72 percent), habitat degradation (14 percent), or potential risk from non-natives due to failed barriers (14 percent). In addition, about 60 sites are considered "management" waters, which are stocked with Rio Grande cutthroat trout and are not considered self-sustaining (Zuckerman 1984, Swift-Miller 2001).

Current Rio Grande Cutthroat Trout populations are often restricted to small, high elevation headwater streams above natural or manmade barriers that prevent invasion by downstream populations of nonnative salmonids (USFS 2002m, n). These first and second order streams generally lack the habitat diversity that larger third and fourth order steams occupied historically. Dispersal capability from such disjunct populations is likely very low. Additionally, habitat perforation has resulted in smaller habitat units that can support only small populations of Rio Grande Cutthroat Trout, which are at greater risk of extirpation from demographic change, loss of genetic heterozygosity, fixation of rare detrimental alleles, environmental catastrophes, and human disturbance (USFWS 2002).

Rio Grande Cutthroat Trout are a spring-spawning species with specific substrate and temperature requirements (USFS 2002m,n). They generally build redds in cold, well oxygenated, gravel-bottom streams because their incubating eggs require constant water flow to deliver oxygen and remove waste products (Hunter 1991). Spawning habitat is typically found at the top of riffles or the downstream edge of a pool where clean, silt-free gravel, predominantly <4 cm in diameter, can be found (Rinne 1980, Thurow and King 1994). Fine sediment in a redd can lead to low fry emergence success, possibly from lack of dissolved oxygen (Weaver and Fraley 1993), which may ultimately reduce juvenile recruitment and influence adult population levels (Scrivener and Brownlee 1989, Beard and Carline 1991). Sedimentation is greatest during spring runoff, so streams with high sediment loads may inadvertently favor fall-spawning brook (*Salvelinus fontinalis*) and brown trout (*Salmo trutta*) over the spring-spawning cutthroat trout (Behnke 1992).

Appropriate water temperatures are also critical for reproduction (USFS 2002m,n). Temperatures below a daily maximum of 4-8 ^{o}C can delay spawning (Rinne 1980, Thurow and King 1994) and prolong egg incubation, lowering embryo survival and increasing time to hatching (Hubert et al. 1994, Stonecypher et al. 1994). Embryos that hatch late may not be able to attain a body size needed to survive the winter energy deficit (Hunt 1969, Cunjak and Power 1987). Streams with cold summer water temperatures may not have successful recruitment or reproduction in most years.

Winter survival depends on having adequate refugia from low temperature and low flow (USFS 2002m,n). Salmonids tend to aggregate in deep pools with low flow velocities and areas of cover (Bustard and Narver 1975, Chisholm et al. 1987, Griffith and Smith 1993) or near sources of groundwater discharge (Cunjak and Power 1986). Thick surface ice resulting from severe winter temperatures threatens salmonid survival if few deep pools are present (Chisholm et al. 1987, Harig and Fausch 2002). Cutthroat trout at high elevations may also be subject to rapid winter temperature acclimation and overwinter starvation, so survival depends on their ability to attain a body size large enough to withstand metabolic deficits (Hunt 1969, Cunjak and Power 1987). This is particularly important for young cutthroat trout because most metabolic functions are limited by body size (Shuter and Post 1990).

Streamside vegetation is important role stream channel morphology and establishment of quality aquatic habitat (Wesche 1993). Riparian plants stabilize streambanks, produce leaf litter energy inputs, filter sediments and nutrients, and provide shade and cover in the form of large and small woody debris (Orth and White 1993). Streamside plants have dense root biomasses that help stabilize erosive streambanks, while the above ground portion of the plant increases floodplain roughness which slows overbank flows and encourages infiltration to promote recharge of the alluvial aquifer. Slowing of the overbank flows allows sediment to be deposited to help build streambanks and filters fine sediments which impact spawning areas and macroinvertebrates.

Rio Grande Cutthroat Trout readily hybridize with other spring spawners, including rainbow trout (*O. mykiss*) and other non-native cutthroat trout, resulting in a loss of their genetic integrity and unique phenotypic characteristics. Genetic purity is graded from A (most pure) to F (least pure), designating various degrees of hybridization. Populations with high levels of rainbow and other cutthroat trout genes are no longer considered pure Rio Grande Cutthroat Trout in management decisions. As a result of competition, non-native trout replace Rio Grande Cutthroat Trout where they co-occur. Rio Grande Cutthroat Trout are very susceptible to angling pressure and from whirling disease (Behnke 1979, 1992, Rinne 1995, Calamusso and Rinne 1999, Swift-Miller 2001). Interactions with nonnative salmonids usually lead to partial or total displacement of Rio Grande Cutthroat Trout populations, often within a relatively short time period (i.e., less than 10 years), because Rio Grande Cutthroat Trout evolved apart from other salmonids and lack isolating mechanisms that would allow co-existence. Invasions of nonnative salmonids are difficult or impossible to reverse even with persistent management efforts. Traditional methods for controlling nonnative salmonids (i.e., application of chemical toxicants and removal of nonnative salmonids with a backpack electroshocker) often result in reinvasion because of incomplete removal in complex habitats, failed artificial barriers, or deliberate reintroduction by anglers (Harig et al. 2000, Kulp and Moore 2000).

Cutthroat trout are also vulnerable to over-exploitation if human access is readily available and fishing pressure is not controlled (BISON-M 2001). Thus, forest management activities that increase or improve access to Rio Grande Cutthroat Trout waters may indirectly impact these populations. Increased stress and mortality can occur even in waters designated catch and release, as a result of the stress associated with being played and handled.

Several studies (Clark and Gibbons 1991, Norris et al. 1991, Bolton and Shellberg 2001) have noted that recreational and construction activities contributing nutrients, bacteria, petrochemicals, pesticides, fertilizers, pathogens, and refuse to adjacent waters can directly and indirectly impact trout populations and vegetation within riparian areas. Such activities can increase sedimentation, alter stream flows, and impact riparian vegetation. Water diversions and stream crossings can impact stream morphology, timing and duration of water flows, and water quantity and quality. Effects on riparian soils, including trampling by foot, animal, and/or vehicles, can lead to compaction, destruction of soil biota, and increased erosion that could adversely affect local and downstream fisheries. Additional Rio Grande Cutthroat Trout life history information is contained in USFS (2002m,n).

Rio Grande Cutthroat Trout were listed as threatened in Colorado in 1973. Recovery objectives were achieved and the species was delisted in 1984 to their current status as a species of special concern. State status as a special concern species remains in effect beyond the 5-year delisting criterion while the potential whirling disease threat is evaluated (CDOW et al. 2003). The CNHP (1999) considered the Rio Grande Cutthroat Trout vulnerable (rank of G4T3 S3). Rio Grande Cutthroat Trout are considered a game species in Colorado, so populations are subject to state game fish regulations and management. For example, in Colorado, 22 streams and 3 reservoirs are protected by catch and release regulations with fly and lure tackle only (CDOW 2002). In the remaining Colorado Rio Grande Cutthroat Trout waters, a four fish daily limit applies (CDOW Fishing Regulations 2002).

Forest-Level Information

Based on USFWS (2002) criteria, there are currently 161 waters in Colorado and 106 waters in New Mexico that contain Rio Grande Cutthroat Trout. Not all of these waters support naturally reproducing, stable populations of genetically pure Rio Grande cutthroat trout that are free of nonnative salmonids. Only 13 waters have been designated with "core" conservation populations of Rio Grande Cutthroat Trout, 3 in Colorado and 10 in New Mexico. A core conservation population supports at least 2,500 Rio Grande Cutthroat Trout, has a genetic purity of less than 1 percent introgression, has no nonnative salmonids, and is deemed likely to persist through time. An additional five Colorado populations may also be core populations, but are awaiting genetic analysis of purity. Core populations, which are used to create new pure populations, are present in every hydrologic unit in the Rio Grande basin (Alves 2004). There are 36 additional waters that support genetically pure Rio Grande Cutthroat Trout with no nonnative salmonids present, but they each have less than 2,500 individuals. The remaining 213 waters support Rio Grande Cutthroat Trout of hybrid origin, contain nonnative salmonids, or are developed only for recreational purposes.

Although Rio Grande Cutthroat Trout populations have been reduced from their historical levels, trout habitat and Rio Grande Cutthroat Trout population levels have shown improvement since

the late 1980s (USFS 2003a). Population estimates reported by CDOW (Alves et al. 2002) to the USFWS for the 2002 Candidate Status Review (USFWS 2002) indicate that there are over 80,000 Rio Grande Cutthroat Trout (in core and conservation populations) in 37 streams on the RGNF (recreation waters were not included in this estimate). The USFWS determined in their Status Review that Rio Grande Cutthroat Trout were not endangered and are not likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

Rio Grande Cutthroat Trout populations on the RGNF are heavily influenced by CDOW management actions oriented at securing, stabilizing, and increasing the status and distribution of populations within their historic range (Ghormley et al. 2003). To that end, a range-wide conservation agreement (CDOW et al. 2003) has been recently signed that would, in part, incorporate conservation measures into RGNF planning documents (Hilliard 2004) and improve the overall status and distribution of the subspecies throughout its range.

Potential Rio Grande Cutthroat Trout habitat occurs across the RGNF in virtually all LTAs. On the Forest, approximately 1,050 miles of streams and over 1,200 lake surface acres provide trout habitat (USFS 2002m, n). Core and conservation populations of Rio Grande Cutthroat Trout are typically restricted to smaller 6th to 7th-level streams and currently occupy less than 220 stream miles. The CDOW has stocked Rio Grande Cutthroat Trout in an additional 150 miles of stream and 59 high mountain lakes for the purposes of providing sport fishing opportunities and maintaining genetic refugia for pure historic populations. While it is unlikely that many non-core and conservation populations support natural reproduction, all populations contribute in some way to the overall security of the range-wide population (USFWS 2002, Alves 2004).

The CDOW conducted extensive surveys from 1982 to 1987 and identified most of the existing Rio Grande Cutthroat Trout populations in the state. Since that time, population monitoring has been annual and on-going. Populations are systematically sampled for purposes of assessing reproductive success, standing crop, biomass, population estimation, and length distribution. Currently, trout populations on the RGNF are monitored by electrofishing in streams, gill nets in lakes and/or reservoirs, and angler surveys at recreation areas. Future surveys will also focus on surveying streams that are identified as potential cutthroat trout habitat. The RGNF will continue to cooperate with the CDOW in monitoring and recovery efforts (CDOW 2002). Recovery efforts focus on habitat restoration, securing populations with the establishment of barriers, reestablishing Rio Grande Cutthroat Trout populations, and increasing genetic purity by removing hybrids and reintroducing genetically pure fish (Alves 2004).

Habitat condition trend is at least stable range wide (Alves 2002). Habitat is vulnerable to modification from stream dewatering, spring development, perforation, and habitat degradation from grazing, road construction, dewatering, logging, etc. (Harig and Fausch 1997, Swift-Miller 2001). Some of these modifications are still occurring in many places. Drought conditions (e.g., 2002) adversely affected habitat of some populations, however, 2003 recruitment was good with good 2003-04 overwinter survival and affected populations are expected to fully rebound (Alves 2004). Some habitats are improving on public land as a result of improved management practices and restricted use as compared to historic use levels. Several populations occur on large private ranches. Overall condition of watersheds where Rio Grande Cutthroat Trout occur is reported as either good or fair (Swift-Miller 2001). Current direction (RGNF Forest Plan

standards and guidelines) is reasonably protective of Rio Grande Cutthroat Trout habitats, when adhered to (Swift-Miller 2001). Managing forest activities (such as domestic livestock use, timber harvest activities, and roads) to maintain or improve stream and riparian health is an important consideration for maintaining viable populations of this species across the Forest.

Forest-wide Rio Grande Cutthroat Trout cumulative effects analysis is summarized from information presented above and in Ghormley et al. (2003). Historically, Rio Grande Cutthroat Trout were widely distributed throughout the Rio Grande basin of Colorado. Cumulative impacts that that led to their decline included livestock grazing, logging, mining, irrigation, de-watering of streams, siltation, fish culture and stocking of non-native trout (Alves 2002). By 1973, Rio Grande Cutthroat Trout population and distributions had declined to the point that the species was listed as a threatened species by the Colorado Wildlife Commission. Cooperative efforts between the CDOW, Federal agencies, and private landowners resulted in the successful completion of the recovery plan objectives by 1984 and the species status was upgraded to a species of special concern. Presently, Rio Grande cutthroat trout can be found in more than 100 locations of the Rio Grande drainage in Colorado, principally as a result of CDOW recovery efforts.

The primary management activities on the Forest that may affect trout habitat include travel management and associated human uses, livestock grazing, timber harvest, and mining. Most of these activities also occur to some extent on other land ownerships within the Rio Grande Headwaters area. Over-harvest by humans, non-native fish introductions, and transmission of whirling disease also influences the distribution and population levels of Rio Grande Cutthroat Trout (Alves 2002). The single biggest source of sediment affecting RGNF streams comes from roads constructed too close to streams with poorly designed stream crossings. Stream bank damage is also a sediment contributor, and is primarily due to grazing impacts by livestock and elk. The RGNF is continually identifying road restoration needs and identifying roads suitable for relocation, or closure, to help reduce resource damage. Problems associated with livestock grazing are identified through routine monitoring with any needed changes made through annual operating plans.

The USFS works closely with CDOW to manage the aquatic resources on the RGNF. The Forest Service is responsible for managing the habitat and CDOW is responsible for regulating and managing fish populations. The RGNF is addressing the affects of management activities on streams and the influence of travel management (i.e., increased angler access) on Rio Grande Cutthroat Trout populations. The CDOW is addressing the effects of nonnative trout stockings on native fish species, effects of hatchery-based disease transmissions (whirling disease), and over-utilization of Rio Grande Cutthroat Trout. With current protection measures identified in the Forest Plan (i.e., standards and guidelines), the USFS will manage the total amount of use and disturbance within a watershed to sustain quality habitat and help ensure a high likelihood of Rio Grande Cutthroat Trout population persistence into the future. The USFS considers all streams on the Forest that are capable of supporting self-sustaining populations of non-native trout as potential Rio Grande Cutthroat Trout waters (Wiley 2004). By maintaining quality habitat, future opportunities will remain to expand the distribution of Rio Grande Cutthroat Trout on the Forest.

Most streams on the RGNF now provide excellent water quality and improved aquatic habitat conditions. Although still designated as a species of special concern, Rio Grande Cutthroat Trout populations have increased to a point that the State of Colorado no longer considers it a threatened species. Several stream and riparian protection measures are in place to evaluate special watersheds of concern, prevent further impacts, and restore aquatic conditions where necessary.

From a cumulative perspective, it is anticipated that the habitats and populations of Rio Grande Cutthroat Trout on the RGNF will remain secure and continue to improve with the forest management activities projected by the Forest Plan due to resource protection measures and additional measures identified in the Legal Framework. However, it is unlikely that Rio Grande Cutthroat Trout will reoccupy historic habitat on lower elevation private land due to non-native fish introductions and stream conditions. Implementation of the current Forest Plan should allow the continued recovery of the Rio Grande Cutthroat Trout through collaborative efforts to reintroduce populations back into their historical waters and implement protection measures that ensure long-term viable populations free of nonnative influences.

Project-Level Information

The Village at Wolf Creek project area occurs in the headwaters of Pass Creek, a second order tributary to the South Fork Rio Grande River and an historic Rio Grande Cutthroat Trout water (Alves 1997). A first order tributary to Pass Creek flows through the project area. East Fork Pass Creek is the main tributary paralleling Highway 160, mostly along its south side, from its sources south of Lobo Overlook. Approximately 1,200 feet of the perennial main stem of this creek flows across the northwest corner of the private parcel after crossing through a long culvert under Highway 160. The lower 200 feet of an intermittent/perennial tributary draining the Ski Area enters the main stem on the private parcel. Approximately 1.9 miles of East Fork Pass Creek occur between the private parcel and Pass Creek. A tributary to East Fork Pass Creek, generally referred to as West Fork Pass Creek, also flows through the project area, into Alberta Park Reservoir, then 3,700 feet to the confluence with East Fork Pass Creek. Above the reservoir, this headwater stream is composed of three tributaries draining the Ski Area. Most of the main stem and generally perennial reaches of this stream (approximately 4,000 feet), as well as most intermittent tributaries, cross through the private parcel and most of that parcel is within the hydrologic basin of this stream.

Rio Grande Cutthroat Trout are present in the vicinity of the project area. Alberta Park Reservoir (40 surface acre at 10,183 feet), a State Wildlife Area managed by the CDOW specifically as a Rio Grande Cutthroat Trout conservation water and fishery, occurs approximately 1,230 feet downstream from the private parcel. This fishery is unique in that it is the only Rio Grande cutthroat fishery in the state being managed to produce trophy class (>14 in.) Rio Grande Cutthroat Trout at a drive-to destination. The reservoir is maintained at maximum level by the CDOW at most times and is annually monitored and stocked with Rio Grande Cutthroat Trout. Fishing is by artificial flies and lures only and all cutthroats caught must be immediately released. Brook trout (*Salvelinus fontinalis*) have "taken over" the lake and represent 90 percent of the 94 fish sampled and 94 percent of the fish biomass sampled in 2003, even with their removal encouraged by the CDOW at maximum limits (Alves 2003a). Few Rio Grande Cutthroat Trout are now present with low size (4.3-8.8 inches, n=9), survival, and

recruitment despite annual stocking of 6,000 fingerlings annually since 1996. The CDOW will reevaluate (2004-05) the purpose of the lake, including its present function as a trophy class fishery and backup brood lake (Alves 2004).

West Fork Pass Creek was previously managed as a brook trout fishery after numerous colonizing transplants in Alberta Park Reservoir (Alves 1999a). After draining the reservoir in 1996 to repair the outlet structure, 4,200 Grade A Rio Grande Cutthroat Trout were stocked to create a quality cutthroat trout water and backup brood lake (Alves 1996). Cutthroats were expected to move up out of the reservoir and utilize West Fork Pass Creek as spawning habitat (Alves 1999a).

Rio Grande Cutthroat Trout are present in West Fork Pass Creek, upstream from the reservoir, largely as a result of stocking (Alves 1999b). Minimum instream flows have been established on this creek. The fishery value is considered average with steep gradient and low temperature limiting the fishery (Alves 2003). This stream was stocked with Rio Grande Cutthroat Trout in 1999 and it is monitored annually at two sites (0.5 [Stn. #1] and 1.5 [Stn. #2] miles upstream of the reservoir) when sufficient habitat is present. Sampling in 1999 (presumably before stocking) identified a robust brook trout population at Station #1 with a small Rio Grande Cutthroat Trout population and no evidence of reproduction (Alves 1999a). The cutthroats sampled had apparently moved up out of the reservoir. The upper station contained only a small brook trout population. Approximately 3,700 Rio Grande Cutthroat Trout fingerlings were stocked in the creek in 2002 (Alves 2003b). Drought conditions in 2003 reduced stream flows and only brook trout were detected at both sampling stations (Alves 2003b). It was concluded that Rio Grande Cutthroat Trout had not established a population in West Fork Pass Creek, brook trout continue to be the dominant species, and the status of this Rio Grande Cutthroat Trout population remains "unknown" (Alves 2003b). Overwintering habitat in West Fork Pass Creek is limited, with virtually no viable habitat during drought years. For Rio Grande Cutthroat Trout, it is used by stocked fingerlings and a few individuals that may irregularly move up out of the reservoir during suitable spring and summer flows. Based upon flow regimes, substrata, and gradients, during non-drought years the perennial channels may support potential spring (Rio Grande Cutthroat Trout) spawning habitat and inconsistently viable fall (brook trout) spawning habitat, because of unsuitable post-runoff flows. The 3,700-foot reach of West Fork Pass Creek below the reservoir does not contain Rio Grande Cutthroat Trout.

Rio Grande Cutthroat Trout are not present in East Fork Pass Creek, which flows along the south side of Highway 160 through the project area (Alves 2004). Minimum instream flows have been established on this creek. East Fork Pass Creek was sampled in the 1980s and contained only brook trout. Rio Grande Cutthroat Trout apparently do not move up out of the main stem of Pass Creek (see below) into East Fork or West Fork Pass Creeks. Because of greater year-round flows, this reach through (and below) the project area may be capable of supporting viable cutthroat spawning habitat (i.e., the highest possible in this tributary), although the headwaters would be unlikely to support overwintering habitat. The absence of Rio Grande Cutthroat Trout in this creek is likely due to competition, hybridization, and other factors that have lead to the decline of this subspecies elsewhere in its range. Because of the proximity of this reach and upstream waters to Highway 160, sanding and liquid deicer runoff may influence the aquatic biota in this reach. While portions of East Fork Pass Creek above Pass Creek could possibly

represent Rio Grande Cutthroat Trout habitat, there are no plans to reintroduce the species in this creek.

Pass Creek, a medium-sized creek downstream from the project area, supports a remnant Rio Grande Cutthroat Trout population and above average recreational fishery value (Alves 1997, 2003b). Brook trout were stocked in the South Fork Rio Grande in 1956 and gradually spread throughout the Pass Creek drainage displacing Rio Grande Cutthroat Trout (Alves 2003). Pass Creek was stocked with catchable rainbow trout from 1956 to 1982. Tucker Park Ponds and Pass Creek Pond are connected to Pass Creek and are stocked annually with catchable rainbow trout. Sampling conducted between 1986 and 1997 indicated the Rio Grande Cutthroat Trout population showed no evidence of reproduction and was at risk of extinction from brook trout competition. Fishing regulations were changed to benefit Rio Grande Cutthroat Trout in 1997. In 2002, 10,670 genetically pure Rio Grande Cutthroat Trout fingerlings were stocked. Lower, middle, and upper reaches of Pass Creek were sampled in 2003. Rio Grande Cutthroat Trout were collected in low abundance at all stations (i.e., representing 0.5-3.2 percent of all fish and 0.7-6.2 percent of the biomass/acre) and their status is considered "at risk and declining" with an estimated population size of 237 (Alves 2003b).

The Pass Creek reach occupied by Rio Grande Cutthroat Trout extends from the headwaters downstream to just north (downstream) of the turnoff to Tucker Ponds (NDIS maps). There is no downstream barrier isolating this occupied reach (Wiley 2004) and these cutthroats share the reach with other trout. This population exhibits evidence of introgression with rainbow trout and non-native cutthroats and has been assigned a B+ genetic purity (Morrison and Swift-Miller 1999, Alves 1997, 2003b). Installation of a fish movement barrier to provide 4.5 miles of secure Rio Grande Cutthroat Trout habitat in Pass Creek is under evaluation (Alves 2003b). Without this habitat enhancement or annual stocking the Pass Creek Rio Grande Cutthroat Trout population is destined for extirpation (Alves 2003b). Minimum instream flows have been established on this creek.

Lastly, as a project MIS for the health of montane aquatic ecosystems (USFS 2002m,n), Rio Grande Cutthroat Trout also represent the habitat needs of non-native fish (e.g., brown, rainbow, and brook trout) that are important for recreational fishing opportunities on the Forest. Fishing in Pass Creek and the South Fork Rio Grande is important to many businesses and anglers within the San Luis Valley.

3.5.2.8 *Brook Trout*

Brook trout, *Salvelinus fontinalis*, were selected as a management indicator of the health of montane aquatic ecosystems and to answer the monitoring question as to whether the Forest is being managed in a manner that provides for viable, well-distributed populations of aquatic species across the Forest (USFS 2003b). They are a recreationally important local species and are a fall spawner found mostly in high elevation stream reaches. Brook trout are sensitive to management activities that increase sediment, reduce stream cover, create barriers to movement, or impact stream flows or water quality. Brook trout were also selected as a project MIS because they are present in the project area and may be affected by the proposed action. Most information below is after USFS (2003d).

Life History and Background Information

Brook trout are native to eastern Canada and northeastern United States and have been extensively transplanted over most of the United States, Canada, and around the world (Sublette et al. 1990). They have adapted well to the western United States and occur in many high elevation lakes and streams (Lusch 1988). They were introduced into Colorado during the late 1800s and are now well established in high elevation streams and lakes above 6,000 feet (Woodling 1980).

Brook trout life history can vary considerably to match the environmental conditions of particular streams at different latitudes and elevations (Raleigh 1982, Kennedy et al. 2001, Power 1980, Reimers 1979, Peterson and Fausch 2001). Raleigh (1982) separated brook trout life histories into two basic ecological forms: a relatively short-lived (3-4 years), small (200-250 mm) form, typical of small, cold lakes and streams; and a larger (4-6 kg), long-lived (8-10 years) predaceous form associated with larger lakes and rivers. These two life history forms are also seen in populations at different stream elevations.

In mid-elevation streams, with typically warmer water temperatures, brook trout tend to grow faster, mature earlier, and have shorter life spans when compared to those in high-elevation streams (Kennedy et al. 2001, Peterson and Fausch 2001). Early maturation and fast growth maximizes fitness and may lead to rapid establishment and high population growth rates in mid-elevation streams. In high-elevation streams slow growth, later maturity, and a long reproductive life span may allow brook trout to successfully establish populations in marginal habitats where recruitment is often poor (Kennedy et al. 2001). Kennedy et al. (2001) found the average life span in brook trout from high-elevation streams to be two to three times longer than from mid-elevation streams. They found many trout to be ages 8 to 10 (up to 14) in high-elevation streams and only age 2 to 3 (up to 5) in mid-elevation streams.

Brook trout spawn in the fall when day length and temperature are decreasing. Spawning occurs at temperatures ranging from 4.5-10°C. Depending upon the water temperature, spawning may begin from mid-September to late December or early January (White 1930; Hazzard 1932, McAfee 1966). Brook trout are very prolific and may attain sexual maturity at an early age. Typically, female brook trout reach sexual maturity during their second year whereas male brook trout attain sexual maturity during their first year (McAfee 1966, Becker 1983), although mature males have been reported as early as age 0+ (Buss and McCreary 1960, Hunt 1966) and as small as 8.9 cm long (McFadden 1961).

Brook trout require areas of current, such as stream riffles, areas of ground water upwellings, or wave swept shorelines for spawning (Raleigh 1982). Preferred spawning substrate ranges from buckshot size to golf ball size gravel in streams (Lusch 1988) to sandy or silty-sand bottoms in lakes (Meehan and Bjornn 1991). Areas of ground water upwellings appear to be highly preferred spawning sites (Webster and Eiriksdottier 1976, Carline and Brynildson 1977) and tend to override substrate size as a site selection factor (Mullen 1958, McAfee 1966).

Spawning occurs in shallows where the females dig out typical salmonid redds by displacing gravel and small rocks with sweeping movements of their tails (Smith 1947). After the redd is completed, the female will drop into the depression with the male alongside. Eggs and milt are

released simultaneously with several nests completed in the same fashion. The eggs are covered with gravel after they are laid and are protected by the male (Lusch 1988). Spawning success is reduced as the amount of fine sediments is increased and the intergravel oxygen concentration is reduced (McFadden 1961, Peters 1965, Harshbarger 1975).

Brook trout are opportunistic sight feeders and feed on invertebrates, terrestrial and aquatic insects, and planktonic crustaceans (Raleigh 1982). Fish are an important food item in lake populations (Webster 1975). Sight feeding habits make them susceptible to moderate turbidity levels, which can reduce their ability to locate food (Bachman 1958, Herbert and Merkens 1961). The optimum temperature for feeding is about 19°C and occurs primarily in the early morning and evening hours (Becker 1983).

Brook trout movement in streams is minimal, with most migrations limited to short spawning runs into headwater streams (Brasch et al 1958) or relatively short seasonal migrations to avoid temperature extremes (Powers 1929, Scott and Crossman 1973). Power (1980) reported two and three year old brook trout migrating from streams to lakes when they reached lengths of 80-150 mm. Peterson and Fausch (2001) found that brook trout movement was most common during early summer and coincided with the descending hydrograph limb, and also identified increased activity in the fall, which likely represented spawning-related movements. Their study showed that the proportion of brook trout moving upstream was significantly greater than the proportion moving downstream. Hunt (1966) observed upstream and downstream movement following fry emergence from the redd.

Raleigh (1982) reported brook trout in their native range being sensitive to introduced brown and rainbow trout and actually being displaced by them. Webster (1975) reported brook trout displacing native cutthroat trout in the headwaters and tributaries of western streams. Brook trout can naturally hybridize with brown trout (*Salmo trutta*) and such hybrids are called "tiger trout (Sublette et al. 1990). Brook trout can also be artificially hybridized with rainbow trout (Buss and Wright 1957).

Five habitat factors affect the distribution and abundance of stream fish: streamflow, water quality, energy source, physical habitat structure, and biotic interactions (Karr et al. 1986). Orth and White (1993) recommends managing these habitat factors with the riparian zone and adjacent uplands as a single riparian-stream ecosystem. Brook trout require four specific types of habitat during the various stages of their life history: spawning habitat, rearing habitat, adult habitat, and over-wintering habitat. Deficiencies in any one of the four habitat types can limit populations (Behnke 1992).

Brook trout are the most generalized and adaptable of all *Salvelinus* species. They are typically found in cold, clear, high elevation streams and lakes that maintain very cool year-round temperatures with an absolute upper limit of 24°C or less (Raleigh 1982). This trout fares poorly in waters that rarely drop below 18°C, or do not offer below 18°C temperatures via springs or tributaries. Warm water temperatures appear to be the most important factor limiting brook trout distribution and production (McCormick et al. 1972; Creaser 1930; Mullen 1958). Spring fed headwater streams and high mountain lakes provide the conditions necessary for this species' survival and propagation in the West (Lusch 1988). The normal range of water temperature found in brook trout habitat is 0-20°C, with preferred water temperatures ranging from 10-12°C

(Meehan and Bjornn 1991). Power (1980) reported the upper lethal temperature for yearling brook trout to be 25.3°C.

Optimal stream habitat consists of silt-free cobble substrate, an approximate 1:1 pool-riffle ratio with areas of slow, deep water; well-vegetated stream banks; and relatively stable water flow, temperature regimes, and stream banks. Optimal lacustrine habitat is characterized by clear, cold lakes that are typically oligotrophic (Raleigh 1982). Raleigh (1982) reported a definite relationship between annual stream flow regime and the quality of trout habitat, with the most critical period being during base flow which is usually during late summer or winter. A base flow ≥55 percent of the average annual daily flow is considered excellent for maintaining quality brook trout habitat, a base flow of 25 to 50 percent is considered fair, and a base flow less than 25 percent is considered poor (Wesche 1974, 1980, Binns and Eiserman 1979).

Where spawning gravels are extensive enough, trout typically produce more young than the habitat can absorb. Brook trout typically produce 1,800 to 2,200 eggs per kilogram of female body weight. Egg development is similar to that of other salmonids. Development depends on water temperature and ranges from 47 days in 10°C water to 165 days in 3°C water. About 80 percent of the eggs normally hatch. After absorbing the yolk sac, the fry are about 2 centimeters long. At that point, they emerge from the gravel to start feeding on plankton and other minute food items. During this stage, they quickly disperse from the redd site and seek out water only a few inches deep (Stolz and Schnell 1991).

The survival of brook trout varies greatly with environmental factors, including competition from other species and water temperature. Various studies have shown that only one to two percent of fry normally survive to become nine-month-old fingerlings (Stolz and Schnell 1991). Stable populations can be maintained if only two progeny from each pair of spawning parents survive to reproduce. This leaves a tremendous surplus of young fish expendable to natural mortality. Before any effort is made to improve spawning habitat, an assessment should be made to be sure that spawning success truly is limiting populations (Behnke 1992).

Resting habitat requirements for adults and juveniles are similar. Both life stages require areas of low water velocity such as typically found behind large rocks or woody debris and deep pools. These areas provide both feeding and resting cover (Bison-M 2001). Brook trout can be found in the smallest of spring-fed streams, especially where cover is available. In streams, they prefer substrates of gravel or cobble up to 25 centimeters in diameter and prefer water about 41 centimeters deep (Stolz and Schnell 1991).

Overwintering habitat is crucial for long-term trout survival in stream environments. Winter survival is related to the amount of low velocity, deep water habitats with adequate amounts of protective cover. Deep pools with large boulders and woody vegetation (e.g., root wads) or areas with deep beaver ponds are ideal overwintering habitat (Bjornn 1971; Bustard and Narver 1975).

Stream habitat essential for trout survival is strongly influenced by the riparian area. The riparian area serves as a transition zone between terrestrial and aquatic environments and helps shape stream channel morphology (Wesche 1993). This area includes portions of the terrestrial ecosystem that significantly influence exchanges of energy and matter with aquatic ecosystems

(i.e., water influence zone) and are adjacent to perennial, intermittent, and ephemeral streams, lakes, and reservoirs (National Research Council 2002).

Streamside vegetation plays an important role in stream channel morphology and establishment of quality aquatic habitat (Wesche 1993). Riparian plants stabilize streambanks, produce leaf litter energy inputs, filter sediments and nutrients, and provide shade and cover in the form of large and small woody debris (Orth and White 1993). Streamside plants have dense root biomasses that help stabilize erosive streambanks, while the above-ground portion of the plant increases floodplain roughness which slows overbank flows and encourages infiltration to promote recharge of the alluvial aquifer. Slowing of the overbank flows allows sediment to be deposited to help build streambanks and filters fine sediments which impact spawning areas and macroinvertebrates.

Riparian vegetation also helps control nonpoint-source pollution by filtering out sediments delivered from upland slopes by overland flow. Burroughs and King (1985, 1989) concluded that non-channelized sediment flow rarely travels more than 300 feet and that 200-300 foot riparian "filter strips" are generally effective at protecting streams from sediment from non-channelized flow. Raleigh (1982) recommended a "buffer strip" about 30 meters wide, 80 percent of which should be either well vegetated or have stable rocky stream banks, to provide erosion control and to help maintain undercut stream banks. Buffer (filter) strips reduce the amount of fines entering a stream and reduce the impacts on spawning areas, pool depths, food production (invertebrate fauna), and cover for juvenile fish (Raleigh et al. 1986).

Riparian vegetation provides shade that helps maintain cooler water temperatures in the summer, warmer temperatures in the winter, and contributes large woody debris, which is an important structural and functional component of stream ecosystems (Richmond and Fausch 1995). Large woody debris provides cover and food for a variety of fish, insects, and wildlife; helps stabilize stream channels by absorbing the force of high flows, effectively reducing bank erosion; traps sediment and organic matter which helps create bars and islands; and redirects flow that scours streambeds and in turn creates pool habitat (O'Neal et al. 2000). Sedell et al. (1985) found that raising the amount of large woody debris in streams could increase salmonid production.

Whatever the size of the stream, riparian areas are critical for maintaining the ecological health of the stream (Bolton and Shellberg 2001). The water quantity and quality in streams reflects the conditions in the watershed including the riparian and upland areas (Naiman et al. 1992). Maintaining healthy, productive, and diverse riparian areas is important for flood control, channel morphology, clean water, fish/wildlife/livestock habitat, and recreational opportunities (Bolton and Shellberg 2001).

The Natural Heritage Ranking for brook trout is G5 (demonstrably secure globally). Brook trout are considered a game species in Colorado, so populations are subject to state game fish regulations and management. The CDOW is responsible for regulating and managing brook trout as a sport fish and is responsible for setting fishing regulations, bag and possession limits. Many angling opportunities for brook trout in Colorado occur on lands administered by the U. S. Forest Service. The Forest Service is responsible for managing trout habitat within Forest boundaries and works closely with CDOW to monitor trout populations, and to maintain or improve fish habitat.

The Colorado Department of Public Health and Environment, Water Quality Control Commission (No. 31), establishes state water quality classifications and numeric standards for specific water quality parameters pertaining to aquatic life (Water Quality Control Commission [WQCC] Regulation 2001). Regulation No. 36 (WQCC 2002) establishes classifications and standards specific to the Rio Grande Basin. Most streams on the Forest are classified as Cold Water Aquatic Life Class 1. Class 1 waters are capable of sustaining a wide variety of cold water biota, including sensitive species. Waters are considered capable when the physical habitat, water flows or levels, and water quality conditions result in no substantial impairment of the abundance and diversity of species. Class 2 waters are not capable of sustaining a wide variety of biota due to physical habitat, inadequate water flows or levels, or uncorrectable water quality conditions that result in substantial impairment of the abundance and diversity of species (WQCC Regulation No. 31).

Forest-Level Information

Brook trout are common and widely distributed in suitable waters throughout the state, including self-sustaining populations found on all districts of the RGNF. There are approximately 11,160 miles of stream channel on the Forest, including 1,810 perennial stream miles with 1,050 miles suitable for trout. The Forest also has 75 lakes totaling over 1,220 surface acres (USFS 1996a). Brook trout are found primarily in the higher elevation streams and lakes.

The CDOW manages brook trout as a sport fish and maintains a brook trout hatchery-stocking program within the Upper Rio Grande Drainage. The CDOW is responsible for monitoring sport fish populations, including brook trout, on the RGNF. The Forest is responsible for monitoring the habitat, but works closely with the CDOW to develop management strategies, monitor fish populations and habitat conditions, and conduct surveys and inventories.

Considerable survey and fish stocking information is available for streams on the RGNF (e.g., Alves 2003b). Stream surveys are conducted annually and data dating back to the late 1960s and 1970s is available for some of the Forest streams. Older survey data are useful for historical reference, but current, standardized information is needed for the species to be used as an indicator for management activities. Current information establishes baseline information, population parameters, trends, and species distribution. By utilizing standardized protocols established by CDOW and the Forest Service, data are collected on brook trout populations that can identify changes in population parameters that may be the result of specific management activities. Most of CDOW brook trout population surveys are conducted in streams and lakes that receive high angler use. The purpose of the surveys is to ensure quality fishing experiences for anglers and to assess fish populations and habitat conditions. Most brook trout populations are found in smaller streams that receive less angling pressure or where CDOW does not conduct their creel surveys. Nevertheless, brook trout accounted for 15 percent of the fish reported in the 2003 CDOW District Wildlife Manager Creel Surveys (Wiley 2004).

Brook trout populations can be affected by a wide variety of management activities on the RGNF. Although management activities may differ, the environmental effects upon fish habitat are similar (Meehan 1991). Timber harvest, roads, grazing, mining, and recreation all impact sedimentation, flows, water quality, canopy and instream cover, and channel morphology. There are also other factors, man-made and natural processes that can impact stream habitat and brook

trout populations, and they also tend to share these common environmental effects. Maintaining productive aquatic habitats on the forest can be accomplished through a combination of protection, rehabilitation, and enhancement.

Timber harvest and silviculture practices can impact the quantity, quality, and timing of runoff and may impact stream habitat, not only in the immediate action area, but also downstream of the action area (Chamberlin et al. 1991). The effects of timber harvest and silviculture can influence snow accumulation and melt rates, evapotranspiration and soil water, and influence soil structure that affect infiltration and water transmission rates (Chamberlin et al. 1991). These effects may impact fish habitat by changing the timing and/or magnitude of runoff events; changing stream bank stability; changing the supply of sediment to channels; changing sediment storage and channel structure, especially large woody debris; and changing energy relationships involving water temperature, snowmelt, and freezing (Meehan and Bjornn 1991, Chamberlin et al. 1991, Rinne and Platania 1995). Activities associated with timber harvest such as road building, yarding, burning, and scarification can cause water to run off, rather than through the soil, resulting in higher peak flows and increased sediment transportation (Chamberlin et al. 1991).

Roads can affect streams and fish habitats by directly accelerating erosion and sediment loading, by altering channel morphology, and by changing the runoff characteristics of watersheds. These processes interact to cause secondary changes in channel morphology (Furniss et. al. 1991). Improper placement and size of road culverts can impact stream channel morphology and create barriers to fish movement that could lead to population fragmentation and have negative impacts on spawning activities.

Riparian zones receive considerable recreational use on the RGNF. Activities associated with recreational use can have adverse impacts on fish production, but they are likely to be minor when compared to the influence of timber harvest, roads, grazing, and mining (Clark and Gibbons 1991). The biggest recreational impact to brook trout is the direct harvesting of fish, although indirect impacts to fish habitat can result from loss of riparian vegetation and increase sedimentation, especially at stream crossings and at areas receiving high visitor use. Recreational activities can also contribute nutrients, bacteria, petrochemicals, pesticides, pathogens, and refuse to adjacent waters (Clark and Gibbons 1991). Effects on riparian soils include trampling by foot, animal, and/or vehicles and leads to compaction, destruction of soil biota, and increased erosion. Damage to riparian vegetation can occur from trampling, construction of facilities, and collection of firewood (National Research Council 2002).

Additional activities on the Forest, or adjacent to the Forest, can directly and indirectly impact brook trout populations. Activities such as the application of chemicals, including pesticides, fertilizers, and fire retardants, can have direct impacts on trout populations and vegetation within riparian areas (Norris et al. 1991); construction activities (buildings, private developments, storage facilities, etc.) can increase sedimentation, alter stream flows, and impact riparian vegetation (Clark and Gibbons 1991); water diversions can impact stream morphology, timing and duration of water flows, and water quantity and quality (Bolton and Shellberg 2002); and supplemental fish stockings can directly impact brook trout populations by increasing competition for limited resources, increasing predation, cross-breeding, and introducing diseases (Li and Moyle 1993).

Brook trout are not as adversely impacted by whirling disease as rainbow trout, but they are carriers of the spores that cause the disease. The whirling disease parasite has a two-host lifecycle that involves trout and an alternate host, a bottom-dwelling tubifex worm. Forest management activities can contribute to the impact and spread of whirling disease by conducting activities that increase stream sediment, which creates habitat for the intermediate host, and by direct transfer of spores in mud and water that may be on vehicles and equipment that have crossed or have been used in infected waters. Although whirling disease appears to be limited to the main Rio Grande drainages, once it is established it can be easily transferred from one stream to another and can persist indefinitely and have tremendous impacts on wild trout populations. Currently, there is no practical cure to treat wild trout infected with the disease.

All of these risk factors can impact brook trout populations and the habitat they live in. These impacts can lead to loss of age classes, reduction in stream biomass, creation of habitats more suitable for other fish species, or impacting streams so severely that it renders the stream unsuitable for aquatic life.

In summary, brook trout are a common and widely distributed fish across suitable, upper elevation habitats on the RGNF. Habitat quality across the Forest is considered stable to slightly improving (Wiley 2004, Alves 2004). The CDOW database, derived from annual CDOW and USFS monitoring across the Forest, indicates a stable to slightly increasing population trend (Wiley 2004, Alves 2004).

Project-Level Information

The Village at Wolf Creek project area occurs in the headwaters of Pass Creek, a second order tributary to the South Fork Rio Grande. Characteristics of Pass Creek watershed, including east Fork Pass Creek and West Fork Pass Creek, and downstream water bodies, including Alberta Park Reservoir, lower reaches of East and West Fork Pass Creek, and Pass Creek, are described above under Rio Grande Cutthroat Trout. Brook trout are present in all local creeks and Alberta Park Reservoir.

Alberta Park Reservoir is a State Wildlife Area managed by the CDOW specifically as a Rio Grande Cutthroat Trout conservation water and fishery. The reservoir is maintained at maximum level by the CDOW at most times and is annually monitored and stocked with Rio Grande Cutthroat Trout. Fishing is by artificial flies and lures only and all cutthroats caught must be immediately released. Brook trout have "taken over" the lake and represent 90.4 percent of the fish sampled, even with their removal encouraged by the CDOW at maximum limits (Alves 2003a). Brook trout were last stocked in the reservoir in 1995 (before it was drained, Alves 2003). The present population is derived from remnant fish in the reservoir and those that entered the lake from upstream reaches of West Fork Pass Creek. Based on gillnetting results from the reservoir from 1998-2003, the brook trout population declined from 41 fish/night in 1997 to 9 fish/night in 1998, then increased to 42 fish/night in 2003 (Alves 2003b).

West Fork Pass Creek (above the reservoir) was previously managed as a brook trout fishery after numerous colonizing transplants in Alberta Park Reservoir (Alves 1999a). After draining the reservoir in 1996 to repair the outlet structure, Grade A, Rio Grande Cutthroat Trout were stocked to create a quality cutthroat trout water and backup brood lake (Alves 1996). Minimum

instream flows have been established on this creek. West Fork Pass Creek is monitored at two sites (0.5 [Stn. #1] and 1.5 [Stn. #2] mi. upstream of the reservoir) when sufficient habitat is present. Sampling in 1999 (presumably before Rio Grande Cutthroat Trout stocking) identified a robust brook trout population (Alves 1999). The upper station contained only a small brook trout population. Drought conditions in 2003 reduced stream flows and only brook trout were detected at both sampling stations (Alves 2003b). It was concluded that Rio Grande Cutthroat Trout had not established a population in West Fork Pass Creek, and brook trout continue to be the dominant species (Alves 2003b). Sampling data (1999-2003) identified a decline in brook trout density (from approximately 215 to 130 fish/mile), but increasing biomass (from approximately 215 to 130 lbs/acre), indicating fewer but larger fish (Alves 2003b). Overwintering habitat in West Fork Pass Creek is limited, with virtually no viable habitat during drought years. Based upon flow regimes, substrata, and gradients, during non-drought years the perennial channels inconsistently support viable fall (brook trout) spawning habitat, because of unsuitable post-runoff flows.

Minimum instream flows have been established on East Fork Pass Creek, which flows along the south side of Highway 160 through the project area (Alves 2004). This creek was sampled in the 1980s and contained only brook trout. Because of greater year-round flows, this reach through (and below) the project area may support viable year-round brook trout habitat (i.e., the highest possible in this tributary), although the headwaters would be unlikely to support overwintering habitat. No Rio Grande Cutthroat Trout are present in this creek, likely due to competition with brook trout, hybridization, and other factors that have lead to the decline of this subspecies elsewhere in its range. Because of the proximity of this reach and upstream waters to Highway 160, sanding and liquid deicer runoff may influence the aquatic biota in this reach.

Pass Creek, a medium-sized creek downstream from the project area, supports an above average recreational fishery value including brook trout, rainbow trout, brown trout, and a remnant Rio Grande Cutthroat Trout population (Alves 1997, 2003). Brook trout currently (2003) compose 82.3 and 99.0 percent of the fish in the creek at stations 1 and 2, respectively (Alves 2003). Station #1 sampling data identified a brook trout density increase (from approximately 20 to 1,320 fish/mile) and biomass increase (from approximately 0 to 68 lbs/acre) over the 1976-2003 time period (Alves 2003b). Station #2 sampling data identified a brook trout density increase (from approximately 510 to 1,990 fish/mile) and biomass increase (from approximately 30 to 92 lbs/acre) over the 1986-2003 time period (Alves 2003b). Minimum instream flows have been established on this creek. Fishing in Pass Creek and the South Fork Rio Grande is important to many businesses and anglers within the San Luis Valley. Brook trout were stocked in the South Fork Rio Grande in 1956 and gradually spread throughout the Pass Creek drainage displacing Rio Grande Cutthroat Trout (Alves 2003b).

3.5.3 Region 2 Sensitive Animal Species

R2 sensitive species background is provided in the corresponding vegetation section, above. From the R2 list of sensitive species (USFS 2003f), 1 insect species, 3 fish species, 2 amphibian species, 18 bird species, and 5 mammal species potentially occur, or may be affected by management decisions, on the RGNF (Table 3.5-3). All of these species are considered in this document. The proposed action would have no impact on any R2 species not on the RGNF list (USFS 2003f).

Table 3.5-3. Pre-Field Checklist Of USFS Region 2 (R2) Sensitive Animal Species That Occur Or That May Be Affected By Activities On The Rio Grande National Forest (RGNF).

Common name, *Scientific name*	Rationale for Occurrence on Project Area [a] (Habitat Affinity)
INSECTS	
Nokomis fritillary, *Speyeria nokomis nokomis*	No habitat (wet meadows with violet populations < 7,500 ft.)
FISH	
Rio Grande chub, *Gila pandora*	Potential hydrologic effects (Rio Grande tributaries)
Rio Grande sucker, *Catostomus plebeius*	Potential hydrologic effects (Rio Grande tributaries)
Rio Grande cutthroat trout, *Oncorhynchus clarki virginalis*	Present (isolated high mountain streams)
AMPHIBIANS	
Boreal western toad, *Bufo boreas boreas*	Potential habitat (ponds with willow wetlands)
Northern leopard frog, *Rana pipiens*	Potential habitat (permanent wetlands)
BIRDS	
Northern goshawk, *Accipiter gentilis*	Potential (Pot.) habitat (closed montane forests)
Northern harrier, *Circus cyaneus*	Potential habitat (grasslands, agricultural lands, and marshes)
Ferruginous hawk, *Buteo regalis*	No habitat (plains, grasslands)
American peregrine falcon, *Falco peregrinus anatum*	Potential habitat (cliffs, open habitats concentrating vulnerable prey)
White-tailed ptarmigan, *Lagopus leucurus*	Potential habitat (alpine habitat and upper elevation willow stands)
Gunnison sage grouse, *Centrocercus minimus*	No habitat (sagebrush and mountain shrub)
Mountain plover, *Charadrius montanus*	No habitat (short grass grasslands, prairies)
Yellow-billed cuckoo, *Coccyzus americanus*	No habitat (lowland riparian forests)
Burrowing owl, *Athene cunicularia*	No habitat (grasslands & semi-desert shrublands)
Flammulated owl, *Otus flammeolus*	No habitat (old-growth ponderosa pine and aspen)
Boreal owl, *Aegolius funereus*	Potential habitat (mature spruce-fir & mixed conifer)
Black swift, *Cypseloides niger*	No nearby nesting habitat (waterfalls, cliffs)
Lewis's woodpecker, *Melanerpes lewis*	No habitat (riparian forests)
Three-toed woodpecker, *Picoides tridactylus*	Present (mature-decadent conifer forests)
Olive-sided flycatcher, *Contopus cooperi*	Present (open, upper elev. conifer forests)
Loggerhead shrike, *Lanius ludovicianus*	No habitat (plains, low valleys, shrublands)
Brewer's sparrow, *Spizella breweri*	No habitat (sagebrush and other struct. similar shrublands)
Sage sparrow, *Amphispiza belli*	No habitat (low elevation big sagebrush and sage/greasewood)
MAMMALS	
Fringed myotis, *Myotis thysanodes*	No habitat (forests/woodlands to 7,500 ft.)
Townsend's big-eared bat, *Corynorhinus townsendii pallescens*	No habitat (structures, tree cavities <9,500 ft.)
Gunnison's prairie dog, *Cynomys gunnisoni*	No habitat (grasslands & semi-desert and montane shrublands)
American marten, *Martes americana*	Present (conifer forests)
North American wolverine, *Gulo gulo luscus*	Potential habitat/ historic range (mountains)

[a] For this table, the rationale for occurrence on the project area only considers NFS lands that may be directly, indirectly, or cumulatively affected by the proposed action, which R2 species determinations are based on. Where potential or occupied habitat is present on adjacent private lands that are part of the project area, additional discussion is provided in the text.

Note: Other R2 sensitive species are not listed because they have not been found on the RGNF, they have no affinities to habitats on the Wolf Creek Village project area, the project area is outside of the species' range or elevational distribution, and the proposed action would have no impact on those species. Potential pre-field survey occurrence on associated National Forest System (NFS) lands and habitat affinity is summarized for each species. Species in **bold** are potentially present and/or are discussed in the text. Animals are listed phylogenetically.

Source: USFS (2003e) and Western Ecosystems, Inc. See text and Literature Cited for references used to assess species' habitat affinities and potential presence on the project area.

Based on (1) biological surveys of the project area and similar surrounding habitats, (2) habitat suitability on and around the area, (3) records of sensitive species from the area of influence, and (4) species' habitat affinities, R2 animal species that are known or expected to occur, or are potentially present in or adjacent to the project area, include the Nokomis fritillary (*Speyeria*

nokomis nokomis), Rio Grande chub (*Gila pandora*), Rio Grande sucker (*Catostomus plebeius*), Rio Grande cutthroat trout, boreal western toad (*Bufo boreas boreas*), northern leopard frog (*Rana pipiens*), northern goshawk (*Accipiter gentilis*), northern harrier (*Circus cyaneus*), American peregrine falcon (*Falco peregrinus anatum*), White-tailed ptarmigan (*Lagopus leucurus*), boreal owl (*Aegolius funereus*), three-toed woodpecker (*Picoides tridactylus*), olive-sided flycatcher (*Contopus cooperi*), American marten (*Martes americana*), North American wolverine (*Gulo gulo luscus*). These species are addressed below. Alternatives 1-4 would have no impact on any other R2 animal species known to occur in Region 2 or on the RGNF because their habitats (Table 3.5-3) are not found within the NFS portion of the affected project area, they have no affinities to project area habitats, they have distributional ranges excluding the project area, and activities on NFS lands related to the proposed alternatives would not affect the species. Other RGNF R2 sensitive wildlife species will not be considered further in this document.

3.5.3.1 *Nokomis Fritillary*

The Nokomis fritillary, *Speyeria Nokomis nokomis* (also known as Great Basin silverspot and western seep fritillary) is a butterfly that occurs in Colorado, New Mexico, Arizona, Utah, Nevada, and California where its distribution is extremely local and restricted in habitat (Ferris and Brown 1981). It inhabits wet meadows and seeps and only occurs where there is permanent moisture sufficient to sustain a healthy violet (*Viola* spp.) population, the larval host plant (Ferris and Brown 1981, Scott 1986). Thistles are also a popular nectar source for adults. This fritillary has been confirmed in Moffat, Mesa, Delta, La Plata, Archuleta, and Conejos Counties in Colorado (Ferris and Brown 1981, USFS 2003e). It has not been confirmed on the RGNF, but the species or its habitat is suspected of occurring on the RGNF (USFS 2003f). Based upon confirmed locations of this species in Colorado, it would not be expected above 7,500 feet (Bovin and Wiley 2003).

The Village at Wolf Creek project area occurs well above the maximum elevational ranges of this species and along the outer edge of the species' known distributional range. Although several species of fritillary were detected on and near the project area during field surveys, the Nokomis fritillary was not among them. Suitable habitat for this butterfly is not present on NFS lands that would be affected by the proposed action. The small, forested fen on NFS lands that could be affected by the connected private land development does not support the type of vegetative communities that could represent potential host plants or nectar sources for this species. Direct, indirect, and cumulative effects associated with Alternatives 1-4 would have no impact on this species and it will not be considered further in this document. Similarly, the fen and other wetlands on private lands do not support suitable habitat for this species.

3.5.3.2 *Rio Grande Chub*

Rio Grande chubs, *Gila Pandora*, are native to Colorado and are restricted to scattered, lower elevation drainages of the Rio Grande Basin in south-central Colorado (Jordan 1891, Koster 1957, Woodling 1985). They occur naturally in the Rio Grande and Pecos River drainages south through New Mexico and Texas. These chubs occur in pools of small to moderate streams near areas of current in association with undercut banks, overhanging bank vegetation and aquatic plants (Woodling 1985). They have also been collected in streams and impoundments in the San Luis Valley, including the Alamosa drainage from French Creek to Terrace Reservoir and Hot

Creek and Swale Lake in the Rio Grande Basin (Alves 2003). Swale Lake, where this chub was stocked in the mid-1990s, is located approximately 5 miles northeast of Alberta Park. Follow-up 1996 sampling failed to document their persistence and no sampling has been conducted since (Wiley 2004).

Suitable habitat for this species does not occur at the high elevations of the project area and hydrologic effects of the project would not extend downstream to affect any occupied or potential habitat for this species. Direct, indirect, and cumulative effects associated with Alternatives 1-4 would have no impact on this species and it will not be considered further in this document.

3.5.3.3 *Rio Grande Sucker*

Rio Grande suckers, *Catostomus plebeius*, are native to Colorado and are restricted to the Rio Grande drainage south through Mexico (Woodling 1985). This species was reported as common in the Rio Grande in Colorado (Ellis 1914). They have disappeared from the mainstem of the Rio Grande and have been replaced by the white sucker (*C. commersoni,* Woodling 1985). They occur in areas near rapidly flowing water. They move from backwaters during the day to swifter water at night (Minckley 1973) where they feed on diatoms, detritus, and aquatic invertebrates. Currently, they are restricted to two to three streams in the Closed, Conejos, and Rio Grande Basins; no populations are known from the South Fork Rio Grande drainage containing the project area (Zuckerman 1983, Wiley 2004). Suitable habitat for this species does not occur at the high elevations of the project area and hydrologic effects of the project would not extend downstream to affect any occupied or potential habitat for this species. Direct, indirect, and cumulative effects associated with Alternatives 1-4 would have no impact on this species and it will not be considered further in this document.

3.5.3.4 *Rio Grande Cutthroat Trout*

Rio Grande Cutthroat Trout is present in water bodies near the project area. This species is being used as a MIS to evaluate effects of the proposed action on local aquatic ecosystems. The interested reader is referred to that section (above) for the discussion of this species.

3.5.3.5 *Boreal Western Toad*

The boreal western toad inhabits marshes, wet meadows, and the margins of streams, beaver ponds, lakes, and glacial kettle ponds between 7,000 and 11,860 feet in Colorado (Hammerson 1999). They may be active both day and night, hiding beneath rocks, logs, or in rodent burrows when inactive. These toads emerge from winter chambers during May and begin moving back to the hibernaculum in late August and early September. By October, most toads have entered hibernation. Breeding begins in late spring as the winter snow pack recedes. Strings of eggs are usually deposited in shallow pools or along pond margins in late May to early June. Tadpoles metamorphose their first or second summer depending on elevation and water temperature. Post-breeding dispersal of adult toads may extend considerable distances into upland habitats from breeding sites. While males appear to have home ranges within an approximate 300-meter radius of breeding sites, females generally disperse farther (up to 2.5 miles) and into drier habitats than males. The CDOW annually monitors known boreal toad populations statewide. Although this

toad was once widespread in Colorado's mountains, and while suitable habitat is still widespread, this species has declined in recent years, with Chytrid fungus thought to be a primary agent (Jones 2004). Reference is hereby made to Goettl and Boreal Toad Recovery Team (1997), the Boreal Toad Conservation Strategy Team (1997), and Loeffler (1998) for more detailed boreal toad life history information.

Boreal toad habitat suitability surveys were conducted on and around NFS and private lands associated with the proposed action in 2000, 2002, and 2004. Breeding habitat surveys were conducted in 2004 focusing on two sites, Alberta Park Reservoir and an ephemeral pond bisected by the northern property line of the private parcel. This species and suitable breeding habitat was not detected during field surveys on and around NFS and private lands associated with the proposed action.

Alberta Park Reservoir, which occurs on NFS land downstream of the private lands proposed for development, does not represent potential breeding habitat due to a combination of factors, including its large size, depth, and wave action on the northern shoreline, its cold water from springs on the Ski Area (which also retard the West Fork Pass Creek fishery [Alves 2003]), unsuitable shoreline slope and vegetation, except along its inlet and northwest shoreline, and shoreline trampling due to fishing pressure. Boreal toads were previously considered to be absent on the Ski Area project area (Morrison and Miller 1999). As such, this water body is considered unsuitable breeding habitat.

The shallow, ephemeral pond straddling the private/NFS property line was not previously thought to represent potential breeding habitat because it dries up each summer. The pond is annually filled by spring runoff from a relatively small hydrologic basin. During a July 8, 2004 survey (following a winter of "normal" snowfall and runoff) chorus frog (*Pseudacris triseriata*) and tiger salamander (*Ambystoma tigrinum*) larvae were located in the pond. Although the pond had already lost approximately 80 percent of its maximum 2004 spring volume and had a high surface area (0.21 acre) to depth (<6 inches) ratio, growth stages of the amphibian larvae suggested that this pond could persist long enough each summer to represent viable breeding habitat in "normal" and above average runoff years. Nevertheless, boreal toads were not present and this pond will be considered potential, but unoccupied breeding habitat. There are no known, extant breeding populations within the dispersal distance of toads (Jungwirth 2004, Wiley 2004) such that toads could colonize this potentially suitable breeding habitat. There are also no plans to reestablish boreal toad populations within the Village at Wolf Creek action area.

3.5.3.6 *Northern Leopard Frog*

Northern leopard frogs are widespread across North America, inhabiting the banks and shallow portions of marshes, ponds, lakes, reservoirs, beaver ponds, streams and other bodies of permanent water, especially those having rooted aquatic vegetation (Stebbins 1966, Hammerson 1999). After hibernation, leopard frogs become active in April or May. Breeding occurs in the shallow, non-flowing portions of permanent water bodies and seasonally flooded areas adjacent to permanent pools. Breeding pools typically support fairly clear water with vegetation and algal mats. Eggs are attached to submerged vegetation. Metamorphosis occurs during the first summer, with tadpoles transforming in August or September, depending on elevation. The diet consists of insects,

spiders, grubs, and larvae. Their Colorado distribution extends throughout most riparian habitats to above 11,000 feet. They avoid overgrazed habitats.

Northern leopard frogs and suitable breeding habitat were not detected during field surveys on and around NFS and private lands associated with the proposed action. However, as described above in the boreal toad section, the ephemeral pond straddling the private/NFS property line could persist long enough each summer to represent viable breeding habitat in "normal" and above average runoff years. As such, this pond will be considered potential, but unoccupied breeding habitat. Northern leopard frogs were previously considered to be absent on the WCSA project area (Morrison and Miller 1999). There are no known, extant breeding populations within the dispersal distance of leopard frogs (Hammerson 1999) such that frogs could colonize potentially suitable breeding habitats elsewhere around the project area.

3.5.3.7 *Northern Goshawk*

Goshawks are a forest-interior species generally associated with aspen and conifer forests between 7,500 and 11,300 feet. Goshawks nest in mature to old-growth aspen and mixed aspen and coniferous forests with a depauperate understory on gently sloping north or east aspects near the bottom of stream courses (Shuster 1980, Andrews and Righter 1992). Nests are typically composed of a branch and twig platform 2-4 feet in diameter, located in a fork along the main trunk, two-thirds to three-quarters of the way up the tree. Nests may be reused in subsequent years. Goshawk territory size averages 640-2,560 acres with a diameter of 1-3 miles in the western U.S. (Call 1978). In Colorado, Towry (1984) estimated that a nest territory required 3,264-6,784 acres (5.1-10.6 square miles). Hoover and Wills (1984) estimate mean territory size for a pair at 3,300-6,800 acres. Within the territory, goshawks require at least 30 acres of unbroken forest for a nest site, with desired forest conditions providing three suitable and three replacement nest sites, totaling 180 acres (Reynolds et al. 1992). Colorado goshawks forage in the forest understory and forest openings for rabbits, hares, squirrels, and blue grouse (Towry 1984).

Partners in Flight (PIF/Breeding Bird Survey [BBS]) monitoring data for Bird Conservation Region (BCR) 16, Southern Rockies/Colorado Plateau (Carter et al. 2000), and Colorado Partners in Flight (CPIF) monitoring data (Beidleman 2000) for Physiographic Area 62, Southern Rocky Mountains, indicate that this physiographic area contains the highest relative abundance of goshawks throughout its range and has the highest importance ranking for the conservation of this species (AI=5/5 breeding, 4/5 winter). Recent and predicted threats to breeding habitat are ranked 3 out of 5, indicating that 50-99 percent of past habitat conditions remain today and that 50-100 percent of present habitat conditions will remain in the future (Carter et al. 2000). The population trend for goshawks in the region is ranked 3 out of 5, indicating that the trend is uncertain. Based on recent bird atlas work, Kingery (1998) estimates the number of goshawks in Colorado at 1,249 breeding pairs.

The USFS monitors known goshawk nest sites on the RGNF, including the Divide Ranger District containing the project area. An active goshawk nest (last active in 2002) is present several miles from the project area such that the edge of that nest territory, though not the territory's core area (i.e., ± 1 miles of the nest), could overlap a portion of the project area (Ferland 2004).

Portions of the Alternatives 2-4 access road ROWs on NFS lands would cut through a mature, closed-canopy (RMRIS Stage 4C and 4B) spruce-fir stand. While this stand, located between Highway 160, the entrance to the Ski Area, and the Ski Area's base area parking lots, is affected by chronic human activity, it is large enough to accommodate a goshawk flying through and opportunistically foraging in the area. Located near the top of Wolf Creek Pass in an area fragmented by highway, ski area, and historic logging effects, as well as native meadows, this stand's most valuable asset is that it may facilitate habitat connectivity for this forest-interior species. This stand does not represent suitable nesting habitat (no nests are present), but supports limited foraging values (primarily red squirrel, but hares are also present). The regenerating ca. 1950s clearcut at the distal end of the Alternative 2 access road could provide opportunistic goshawk foraging opportunities, but at present this habitat is generally unsuitable for this species.

The 287-5 acre private parcel is mostly forested with 4B spruce-fir stands. Areas south of Alberta Park's grasslands/wetlands are partly fragmented with existing ski trails descending to the Alberta Lift base terminal on the south side of Alberta Park. Areas northeast of Alberta Park are part of a larger patch of closed forest extending to the east and north. While these stands are also located between Highway 160 and developed portions of the Ski Area, they still provide effective goshawk foraging habitat. Goshawks have been detected occasionally hunting developed portions of Breckenridge (Thompson 1991), Vail (Thompson 1994a), Ski Cooper (Thompson 1999a), and Powderhorn Ski Areas (Thompson 2001a), so it is possible that they could utilize portions of WCSA as part of a local pair's large range. No nests were located on or adjacent to this private parcel and it is less likely that goshawk nesting would occur at this elevation and in this spruce-fir habitat because of superior nesting and foraging habitat in the surrounding area. Of all goshawk nests located in Colorado, only three have been in spruce-fir forest, although all occur on the RGNF. However, the limited presumed use of the spruce-fir zone for nesting is at least partially due to survey bias (Ferland 2004).

3.5.3.8 *Northern Harrier*

In Colorado, northern harriers, *circus cyaneus,* are considered residents, most numerous in migration and least numerous in summer (Andrews and Righter 1992). They are relatively rare breeders that nest in a variety of habitats, including native and non-native grasslands, agricultural lands, emergent wetlands, and tall desert shrublands, with the only requirement being abundant cover, such as that provided by tall reeds, cattails, and grasses (Andrews and Righter 1992, Kingery et al. 1998). In the early 1990s there were 10-13 documented breeding pairs in Colorado (Andrews and Righter 1992). More recently, Atlas surveys confirmed breeding in 19 of 1,745 priority blocks, with probable nesting in another 52 blocks (Kingery et al. 1998). They have not been documented in Mineral or Archuleta Counties, although they are confirmed breeders in the extensive wetlands associated with San Luis Valley (Kingery et al. 1998). In the vicinity of the project area (and higher mountains), harriers are considered rare to locally uncommon (Andrews and Righter 1992). During late summer and fall migration, harriers may wander or range (i.e., considered accidental and rare [Andrews and Righter 1992]) above treeline (Bailey and Niedrach 1965, Andrews and Righter 1992, Kingery et al. 1998). Harriers find prey (primarily rodents) by flying low over fields listening and watching for prey (Kingery et al. 1998). Upon detecting something, they flap their wings accelerating them toward the ground and pouncing on the potential meal. Territory sizes are 1-1.5 $mi.^2$, although they may be linear and up to one mile long. Their numbers declined in the 1970s due to DDT, but they continue to

decline due to habitat loss (Ehrlich et al. 1992). In Colorado, the loss of extensive wetland habitat probably poses the greatest threat to the species. This species was not detected on the project area, NFS land, and private lands are unsuitable as breeding habitat. However, during late summer and fall migration, harriers could wander through the project area and opportunistically hunt the clearcut, wetlands, and mountain grassland.

3.5.3.9 *American Peregrine*

Peregrine falcons, *Falco peregrinus anatum*, occur in Colorado as rare breeders and, more commonly, as uncommon, non-nesting migrants. With reduced pesticide use and reintroduction efforts, the number of peregrines nesting and summering in Colorado has been increasing. Based on recent bird atlas work, Kingery (1998) estimated that the number of peregrines in Colorado at 236 breeding pairs. Viable peregrine nesting sites possess two components: (1) adequate nesting habitat, and (2) extensive hunting habitat with an adequate prey base to support the adults and their offspring (Craig 1978). Nesting sites are located on precipitous cliffs ranging in height from 40 to 2,100 feet, averaging 200 to 400 feet tall. Several ledges, potholes, or small caves must be present in the cliff face to function as a suitable nest site. A breeding pair will frequently alternate their nesting activities to different ledges on a cliff face between years, and they will often relocate to adjacent cliff faces. As a result, protective measures must address an entire cliff complex rather than an individual cliff.

In Colorado, peregrines usually return to nesting cliffs in late February or early March and initiate courtship activities, which continue to mid- or late April when eggs are laid. The young hatch from mid- to late May and fledge (i.e., leave the eyrie) in mid- to late June. The young and adults remain near the nesting cliff up to several months after fledging.

Nesting peregrines will not tolerate excessive human encroachment or prolonged disturbance near the nesting cliff. Any activity or development above the nesting cliff will likely cause abandonment. Breeding peregrines become extremely agitated and may abandon the site if disturbance occurs during courtship, before initiation of egg laying. One explanation regarding why some sites are occupied in spite of excessive human activity in the vicinity of the nesting cliff is that the falcons occupied the site early in the nesting season prior to spring increases in human activity and had eggs or young when the disturbance occurred. The birds were, therefore, attached to the site and would not abandon it even when exposed to increased disturbance.

Extensive hunting habitat is a second key component of a viable peregrine nest site. Peregrines will frequently travel at least 10 miles from their eyrie to procure prey. They have been documented hunting up to 30 miles away from nest sites (Craig 2004). It is, therefore, important to maintain the integrity of important hunting areas within at least 10 miles of the nesting cliff. Not all habitats within the 10-mile radius need be considered essential habitat, since only those areas that attract or support peregrine prey need be protected or enhanced. The primary prey captured by nesting Colorado peregrines are small to moderately-sized birds, such as blackbirds, doves, robins, flickers, jays, nutcrackers, meadowlarks, and pigeons. Any habitat that supports or concentrates birds should be considered essential to locally nesting peregrines.

Key hunting areas fall into two categories: (1) those habitats that concentrate or support important prey species, and (2) those habitats that expose prey and make them vulnerable to peregrine attack.

Peregrines capture their prey through precipitous dives from considerable height above their quarry. Peregrines must, therefore, frequent habitats permitting this type of pursuit. Peregrines do not hunt below the forest canopy, but capture birds flying above forests or across open expanses. Nesting cliffs are generally situated at considerable heights above the surrounding terrain, so peregrines have a broad panorama from favorite hunting perches near the cliff top.

The CDOW and USFS annually monitor active eyries throughout the state and investigate reports of "new" eyries resulting from hacking and an increasing population. An active peregrine falcon eyrie is present in the San Juan River Valley to the west of the project area such that the project area could be considered to be within a hunting territory. However, birds from this eyrie forage along the major tributaries and main stem of the San Juan River, not up toward Wolf Creek Pass (Thompson 1991, Craig 2004). Similarly, nesting behavior was observed at a site in the East Fork Valley in 1991, but follow-up surveys by the CDOW did not identify a nesting pair. That site remains a viable eyrie, adequately separated from the active eyrie in an adjacent valley. Birds from that eyrie would also likely concentrate foraging along that broad valley bottom and high quality riparian habitats, which support prey concentrations in settings exposing them to peregrine predation.

3.5.3.10 *White-tailed Ptarmigan*

White-tailed ptarmigan, *Lagopus lecurus*, are residents of the alpine, although they (especially females) may vertically migrate to winter in willow stands in subalpine basins and along water courses (Braun et al. 1976, Hoffman and Braun 1977, Andrews and Righter 1992, Kingery et al. 1998). They inhabit all alpine regions of Colorado except the Wet Mountains and Spanish Peaks (Kingery et al. 1998). Males generally winter above treeline in areas of short, exposed willow thickets, while females often winter below treeline in taller, denser willow thickets. Pair formation begins in late April when females return to breeding grounds. Areas mostly snow free early in spring are used for breeding. Females select nest sites among rock fields or alpine grasses adjacent to sheltering and concealing rocks. Egg-laying begins in early June. Young hatch in early to mid-July and leave the nest shortly thereafter, but remain in a brood with the hen through September. Many of the state's alpine areas are protected by wilderness designations and most summer ptarmigan habitat is inaccessible to substantive human impacts. Impacts to this species have largely come from winter habitat losses, attributable to high-altitude reservoir development, livestock grazing, an expanded elk population, road construction along stream courses, ski area development, and snowmobiling.

No evidence of ptarmigan was detected on or around the Village at Wolf Creek project area during field surveys and it is unlikely that this species is even seasonally present. While willow stands present NFS and private lands may appear in summer to represent potential wintering habitat, these stands are relatively small and distant from wintering areas, making it less likely that females would locate and occupy them, and, more importantly, they are quickly bent over and covered by deep winter snows making this habitat unavailable and ineffective. Direct, indirect, and cumulative effects associated with Alternatives 1-4 would have no impact on this species and it will not be considered further in this document.

3.5.3.11 *Boreal Owl*

Boreal owls, *Aegolius funereus*, are rare to locally uncommon residents of Colorado's mountains, mainly above 9,000 feet (Andrews and Richter 1994, Kingery 1998). They inhabit mature and late-successional spruce-fir and spruce-fir/lodgepole pine forests interspersed with small meadows, streams, and wetlands. The forest structure provides nest cavities and the more mesic communities generally support higher small rodent populations. Red-backed voles are their principal prey species and owl populations may fluctuate considerably in response to prey availability (Kingery 1998). Recent surveys in Colorado have shown that the species is widely distributed in suitable habitats, with records from most of the higher mountain ranges in the state (Webb 1982, Palmer 1984, Ryder et al. 1987, Stahlecker and Rawinski 1990, Ryder 1991, Thompson 1994). The recent increase in records has been due to intensive and more knowledgeable searching (Andrews and Righter 1992).

PIF data for BCR 16 indicate that this physiographic area is moderately important for the conservation of boreal owls and contains a relatively low abundance of this species (AI=3/5 breeding, 3/5 winter). Recent and predicted threats to breeding habitat are ranked 2 out of 5, indicating that 50-100 percent of past habitat conditions remain today and that 75-99 percent of present habitat conditions will remain in the future (Carter et al. 2000). The population trend for boreal owls in the region is ranked 3 out of 5, indicating that the trend is uncertain because of inadequate data. Based on recent bird atlas work, Kingery (1998) estimates the number of boreal owls in Colorado at 238 breeding pairs. Hayward and Verner (1994) consider the species widespread across a large geographic range in a largely unexploited forest type and not in any immediate peril.

There have been no surveys conducted on the project area that were adequate to detect boreal owls. The USFS (Wiley 2004) has recommended that boreal owl surveys be conducted on NFS lands associated with the project area in fall, 2004. However, based on habitats and structural conditions present, it is possible that this owl may forage and nest in the Stage 4C and 4B spruce stands on the NFS and private lands associated with the project area. Boreal owls have been detected on developed portions of Vail Ski Area (Thompson 1994) using similar structural stages of spruce-fir as those present on the project area. Boreal owl use of the insular spruce-fir stand (on NFS land) surrounded by Highway 160 and the Ski Area's parking lots is less likely because of small patch size, surrounding unsuitable habitat, and chronic disturbances. Nesting would be unlikely in this stand, but it could be used for occasional foraging as part of a larger home range.

3.5.3.12 *Three-toed Woodpecker*

Three-toed woodpeckers, *Picoides tridactylus*, are rare or locally uncommon residents of higher mountains (Andrews and Righter 1992). This species is most common in years and areas where trees have high insect populations due to disease or fire (Koplin 1969, Crockett and Hansley 1978). Elsewhere, they occur at low densities, even in old-growth stands. Reported densities range from one pair per 35-106 acres (Thomas 1979). The highest densities occur in areas with forest insect infestations, often following fires. This primary cavity nester is generally associated with spruce-fir forests, but they may also occur in ponderosa pine, Douglas-fir, and lodgepole pine forests supporting high insect populations. Kingery et al. (1998) speculated that fire suppression has led to forest conditions favorable to wood-boring insect infestations that this species feeds on. This

suggests that the Colorado population is fairly near historic high densities in unburned forests, but does not support an abundance of high-density populations that occur after fires, although the recent Million Acres and Missionary Ridge Fires have created substantial habitat patches for this species.

PIF three-toed woodpecker data for BCR 16 indicate that this physiographic area varies in its importance for the conservation of this species (AI=2/5 breeding, 5/5 winter). It regularly supports an uncommon abundance of breeding birds. The high winter values are based on expert opinion, not field data (Carter 2004). There are no large influxes of these woodpeckers into the state during winter. Recent and predicted threats to breeding habitat are ranked 3 out of 5, indicating that 50-99 percent of past habitat conditions remain today and that 50-100 percent of present habitat conditions will remain in the future (Carter et al. 2000). The population trend for three-toed woodpeckers in the region is ranked 3 out of 5, indicating that the trend is uncertain. Based on recent bird atlas work, Kingery (1998) estimates the number of three-toed woodpeckers in Colorado at 3,741-24,891 breeding pairs.

Three-toed woodpeckers were detected during field surveys in the late successional spruce-fir stand bordering the Tranquility Parking lots, on the private parcel to the East of Alberta Park, and on a developed portion of WCSA, near the southwest corner of the private parcel. Based on habitats and structural conditions present, it is likely that this woodpecker forages and nests in most mature spruce stands on the project area.

3.5.3.13 *Olive-sided Flycatcher*

Olive-sided flycatchers are uncommon summer residents of higher Colorado mountains, and migrants through lower elevations (Andrews and Righter 1992). This flycatcher preys almost exclusively on flying insects, particularly bees, flies, moths, grasshoppers, and dragonflies (Bent 1942), which they spot from snag perches. Requisite habitat components for this species are snags and conifers (Kingery 1998). In Colorado, they breed from 7,000 to 11,000 feet, primarily in dense, mature spruce-fir and Douglas-fir forests, especially on steep slopes or near cliffs, and less often in other coniferous forests, montane and foothill riparian forests, and aspen forests (Andrews and Righter 1992). An analysis of summer (boreal forests) and winter (tropical rain forests) habitat suggests that this flycatcher depends more on forest structure than on tree species composition (Kingery 1998). Within these habitats they are often associated with forest openings and forest edge habitat where they sally for flying insects from the tops of uncommonly tall snags and trees (Finch 1992, Kotliar and Melcher 1997). They may occupy early successional forests (i.e., those resulting from fires and logging), provided that snags and/or residual tall trees are available for foraging and singing perches (Scott et al. 1982, Hutto 1995). This flycatcher's affinity to such forest structure may limit its local abundance or distribution (Finch 1992, Kotliar and Melcher 1997).

Olive-sided flycatchers were detected on NFS and private lands associated with the project area during field surveys. Flycatcher use was concentrated along the interface of the private land and developed ski terrain, south of FSR 391. A bird was also heard calling from the spruce stand north of the Tranquility Parking lots. No birds were detected on the private parcel north of FSR 391. However, that mature habitat is suitable and similar to that occupied in the surrounding area and those stands are considered occupied or potential habitat.

3.5.3.14 *American Marten*

Martens, *Martes americana,* are boreal weasels closely associated with dense, late-successional, spruce-fir forests in Colorado, although their seasonal distribution also extends upward into the alpine and down into lodgepole pine forests and coniferous riparian corridors (Armstrong 1972, Towry 1984, Fitzgerald et al. 1994, Buskirk and Ruggiero 1994). Complex physical habitat structure, particularly on the forest floor, provides three important microhabitat functions: access to subnivian space for foraging and resting, escape cover, and thermal protection (Buskirk and Ruggiero 1994). Such structure might be in the form of logs, rock piles/outcrops, stumps, windthrown trees, slash, boulder fields, and squirrel middens.

Martens generally avoid habitats lacking overhead cover, including large clearcuts, burns, and meadows (Buskirk and Ruggiero 1994). Excluding marten use of talus (Streeter and Braun 1968) and alpine boulder fields (Thompson unpubl. data), openings in the range of 100-300 m wide are the largest that martens are known to cross (Koehler and Hornocker 1977, Buskirk 1983). Marten also avoided traveling >23 m from forest edges in Colorado (Robinson 1953).

Marten primarily eat red-backed voles, other voles (*Microtus* spp. and *Phenacomys intermedius*), pine and ground squirrels (*Spermophilus* spp.), and other small mammals, but will opportunistically eat insects, birds, fruits, and nuts (Fitzgerald et al. 1994, Buskirk and Ruggiero 1994). Martens are mainly crepuscular and nocturnal, are active year-round, and may forage on the ground or in trees, except during periods of severe winter weather. Their movements respond to prey availability, but they do not exhibit seasonal or altitudinal migrations (Towry 1984).

Martens are generally solitary except during the breeding season. They mate during July to early September (Fitzgerald et al. 1994) and give birth from mid-March to late April (Strickland et al. 1982). Natal and maternal dens are located in large snags and down CWD, squirrel nests and middens, and burrows, which are most common in late-successional forests (Towry 1984, Buskirk and Ruggiero 1994). Marten populations can fluctuate widely because of variations in reproductive success, resident mortality, and large numbers of highly mobile transients (Fitzgerald et al. 1994).

Home range size varies widely among reported studies, due to sex, geographic area, prey abundance, and habitat characteristics, including type and degree of forest perforation. Home ranges are larger for males (Strickland et al. 1982), larger in areas of reduced prey availability or abundance (Thompson and Colgan 1987), and larger in more fragmented landscapes (Thompson and Colgan 1987, Soutiere 1979). In Wyoming, the closest study area to Colorado in which marten home ranges were measured, males averaged 494-791 acres and females 198 acres (Clark et al. 1989, Clark and Campbell 1997).

Marten were detected on and surrounding the project area during field surveys, but they are certainly more common than what the track indices indicate. They use conifer habitats on NFS and private lands for foraging and travel, and may use suitable structure on these lands for denning. Based on habitats, structural conditions, and land uses present, it is unlikely that marten would den in the insular spruce-fir stand (on NFS land) surrounded by Highway 160, the Ski Area's parking lots, and clearcut because of small patch size, surrounding unsuitable habitat, and chronic disturbances. While denning would be unlikely in this stand, it is used for occasional

foraging as part of a larger home range, and it could be used for landscape connectivity over Wolf Creek Pass without requiring animals to cross Highway 160. Mature spruce forest on the private parcel, contiguous with large tracts of similar forest, represents effective foraging, travel, and denning habitat, although denning might not occur on the parcel.

3.5.3.15 *North American Wolverine*

Wolverines, *Gulo gulo luscus*, are a circumpolar species, which reach their southern, North American distributional limits in Colorado (Wilson 1982). They are scarce in other parts of the south-central Rocky Mountains (Deems and Pursley 1978, Hall 1981, Wilson 1982, Nead et al. 1985) and were, apparently, never common in Colorado (Lechleitner 1969, Armstrong 1972). Current wolverine populations are found in Montana, western Wyoming, and Idaho (Wilson 1982, Hoak et al. 1982, Groves 1988, Copeland 1996). Populations have also been reported in Oregon, California, and Washington (Groves 1988). Relatively abundant wolverine populations occur in the Yukon, Northwest Territories, British Columbia, and Alaska (Banfield 1974, Hatler 1989). Historic wolverine range in Colorado extends the length of the Rocky Mountains and the West Slope (Bissell 1978).

Wolverines occur at low densities throughout their distribution. Animals may travel over 20 miles per day and range over large territories. Male territories are as large as 772 square miles, while those of females may be 150-190 square miles (Krott 1960, Halfpenny 1981, Nead et al. 1985). Hornocker and Hash (1981) found male home range size was approximately 150 square miles in northwestern Montana. In Idaho, Copeland (1996) found average home ranges of resident adults to be 611 and 148 square miles for males and females, respectively. Males exclude other males from their territories, but permit females to enter (Ewer 1973). Intrasexual adult home ranges show minor overlap, with male home ranges overlapping 15 percent and female home ranges overlapping 10 percent (Copeland 1996).

Wolverines are opportunistic feeders and will eat a wide variety of food items depending on their availability. They have been described as scavenging predators (Hash 1987). Much of the literature documents large animals in their diets. Although wolverines are capable of killing large animals, especially in deep, hindering snow, the large proportion of large animals in their diet is probably more reflective of the importance of carrion (Wilson 1982, Hash 1987). They are also successful predators on a variety of small mammals and birds and are known to cache surplus food items.

Wolverines are born in protected dens often associated with an uprooted tree, cave, burrow, overhanging bank, or snow tunnel (Hash 1987). Snow tunnels are the most characteristic natal dens used by wolverines in Alaska (Magoun 1985). In Montana, natal dens were most commonly associated with snow-covered tree roots, log-jams, or rocks and boulders (Hash 1987). In Idaho, Copeland (1996) found two natal dens in small boulder fields surrounded by trees in north and northeast-facing subalpine cirques. Snow-covered log piles at the bottom of avalanche runout zones also provide den sites.

The CDOW initiated a wolverine project in 1978 to summarize wolverine history in Colorado and to accumulate information about their current status (Nead et al. 1985). Although the study provided circumstantial evidence that wolverine were present in Colorado, it did not identify the

presence of viable populations (Halfpenny 1981, Nead et al. 1985). Researchers associated with the project believed the species still exists in the state (Nead et al. 1985). Circumstantial evidence accumulated during the wolverine study suggested that during May through October, wolverine primarily occur at higher elevations from the upper montane to the alpine (Halfpenny 1981). Beginning around November, some wolverine may start an elevational migration to the lower limits of treeline or into the oak brush-sagebrush zone, apparently in relation to migrating ungulate herds. Such distinct seasonal, elevational shifts were reported in Idaho by Copeland (1996) as possibly attributable to carrion from fall hunting seasons. Halfpenny (1981) speculated that management of ungulate winter range may benefit wintering wolverines and that the loss of winter range and reduced ungulate populations could have an adverse effect. More recently, aerial flights conducted on the RGNF, in part to search for evidence of wolverine, did not locate any sign indicating their presence (Byrne and Copeland 1997).

No evidence of wolverine was detected during 152.8 km of replicated winter tracking surveys covering the project area, the surrounding landscape, and straddling the Continental Divide in 2001 (see Results of Winter Tracking Surveys in the Canada Lynx section, below).

Hair snag and winter tracking surveys were conducted to detect wolverine in the East Fork Valley, south of the Village at Wolf Creek project area, in 1990 and 1991 (Thompson et al. 1992). Twenty-two hair snags distributed throughout the East Fork Valley were checked a total of 350 times between December 8, 1990 and June 28, 1991. No wolverine hair was detected in 83 hair samples collected. Animal tracks were also recorded (under non-biased, winter tracking conditions) along 1,359.7 km (849.8 mi.) of transects between hair snags. No wolverine tracks were detected. In addition, animal tracks were recorded along 543.0 km (339.2 mi.) of snow transects between January 13 and March 29, 1991 (Thompson and Halfpenny 1991). No wolverine tracks were detected.

No evidence of wolverine was detected during 1992-1995 CDOW surveys on the RGNF (Kenvin 1992, 1993, 1994, 1995).

Although the Village at Wolf Creek project area is located within the wolverine's historic range (Bissell 1978), only one positive identification of a wild wolverine has been documented in Colorado in the last 30 years (Byrne 1998); the CDOW has been unable to verify that a viable population persists (Halfpenny 1981, Byrne and Copeland 1997), and most researchers (e.g., Copland et al. 2004) now consider Colorado and the southern Rockies to be outside of the extant wolverine distribution. Since 1993, the CDOW has offered a $500 reward for any positive information on wolverine presence, but has not received any. There have been no road kills or accidental shooting or trapping of wolverines reported. The CDOW has concluded that if any wolverine remain in Colorado, their numbers are so small that they do not represent a viable population and they are not detectable by known census methods (Seidel et al. 1997). The CDOW (Byrne 1998) has speculated that it is quite possible that wolverine have been extirpated from Colorado.

At best, wolverines were apparently uncommon in Colorado's mountains even before the arrival of the white man and, if present, they are undoubtedly less common today. The San Juan Mountains may represent the most viable wolverine habitat remaining in the southern Rockies. If wolverines remain in the southern Rockies, they could occur in the vicinity of the project area,

centrally located within the broad, forested, north-south corridor crossing the Continental Divide and at the top of Wolf Creek Pass, part of a relatively broad, forested, east-west corridor over the Continental Divide. This does not consider, however, the wolverine's adversity to crossing highways (e.g., Copland et al. 2004). While elk and deer have production and rearing areas on or surrounding the project area, there are no local concentrated carrion or forage sources (such as big game winter range) in the vicinity of the project area that might attract wolverines if they were moving through this landscape. As such, affected habitats would only provide serendipitous foraging opportunities for the rare animal that might be moving through the area.

3.5.4 Threatened, Endangered, and Candidate Animal Species

The USFWS (2004) identified the Uncompahgre fritillary butterfly (*Boloria acrocnema*), Colorado pikeminnow (*Ptychocheilus lucius*), razorback sucker (*Xyrauchen texanus*), bald eagle (*Haliaeetos leucocephalus*), Mexican spotted owl (*Strix occidentalis lucida*), southwestern willow flycatcher (*Empidonax trailii extimus*), Canada lynx (*Lynx canadensis*), boreal toad (*Bufo boreas boreas*), and yellow-billed cuckoo (*Coccyzus americanus*) as the Federal-listed and candidate animal species that could be affected by the Proposed Action (Table 3.5-4). Other federally listed or candidate animal species were considered, but dropped from detailed analysis because their habitats do not occur on the Forest or in the action area, they have no affinities to project area habitats, the project area is outside of the species' range, and Alternatives 1-4 would have "no effect" on the species or on designated critical habitat. Critical habitat that is part of the Village at Wolf Creek action area has been designated for the two endangered Colorado River fishes, above. No other portion of the action area has been designated critical habitat by the Secretary of the Interior. The two Federal candidate species (toad and cuckoo) are addressed above as R2 sensitive species.

All state-listed threatened and endangered species potentially present in the action area (http://wildlife.state.co.us/species_cons/list.asp) are considered herein as federally-listed or R2 sensitive species. Other state-listed animal species were considered, but dropped from detailed analysis because they or their habitats do not occur on the Forest or in the action area, they have no affinities to project area habitats, the project area is outside of the species' range, and Alternatives 1-4 would have "no effect" on the species.

3.5.4.1 *Uncompahgre Fritillary*

The Uncompahgre fritillary, *Boloria acrocnema*, is known from 12 colonies in southwestern Colorado (Alexander and Ellingson 2004; Gunnison, Hinsdale, and Chaffee Counties). The project area is south and outside of this species' limited range. The butterfly's primary larval food source is snow willow (*Salix reticulata* spp. *nivalis*). Snow willow is found above treeline in large areas of the alpine. Potential butterfly sites occur in relatively large (>0.25 acre) snow willow patches on north, northeast, east, and southeast aspects. Snow willow stands grow downslope in moist areas fed by melting snow. The lowest elevation of known butterfly colonies occurs at 12,400 feet, however, it is possible that they occur as low as 12,200 feet in locations where terrain extends ≥12,600 feet.

3.5-4. Pre-Field Checklist of Federally Listed Species that may be Affected by the Proposed Action at Wolf Creek Village Alternatives 1-4, Rio Grande National Forest, Colorado

Common and Scientific Name	Status	Rationale for Occurrence[a] (Habitat)
Federally-Listed Species		
Uncompahgre fritillary butterfly, *Boloria acrocnema*	E	No habitat (alpine snow willow stands >12,000 ft. on peaks ≥12,600 ft.)
Colorado pikeminnow, *Ptychocheilus lucius*	E	West Slope water depletions (far downstream in Colorado River)
Razorback sucker, *Xyrauchen texanus*	E	West Slope water depletions (far downstream in Colorado River)
Bald eagle, *Haliaeetos leucocephalus*	T	No breeding or winter habitat (rivers and lakes)
Southwestern willow flycatcher, *Empidonax trailii extimus*	E	No breeding habitat (dense willows and layered riparian along rivers, streams or other wetlands)
Mexican spotted owl, *Strix occidentalis lucida*	T	No breeding habitat (steep canyons with a Douglas-fir, white fir, ponderosa pine/pinyon-juniper component)
Canada lynx, *Lynx canadensis*	T	Present in AA, potential forage/ travel habitat. (montane and subalpine forests)

[a] In Wolf Creek Village Action Area.

Note: Other listed and proposed species are not listed in this table because they have no affinities to action area habitats, the project area is outside of the species' range, and the proposed action would have no effect on the species. Species are listed phylogenetically by listed and candidate categories. Federal status, listed after species, is as follows: E = Endangered, T = Threatened. Potential pre-field survey occurrence on the project area and habitat affinity is summarized for each species.

Source: USFWS (2004), USFS (2003h), and Western Ecosystems, Inc.

No surveys that were adequate to detect adult or larval fritillaries were conducted because such surveys are not required in areas where terrain does not extend up to at least 12,600 feet, and because habitats present in and adjacent to proposed disturbance areas were unsuitable to support this species. The project area is well outside the known distribution of this species. Proposed ground disturbance areas do not exceed 10,600 feet on NFS lands or 10,880 feet on private lands, and these disturbance areas are subalpine forests and meadows that do not support this species' host plant. Direct, indirect, and cumulative effects of Alternatives 1-4 would have "no effect" on the Uncompahgre fritillary and this species is dropped from further consideration herein.

3.5.4.2 *Colorado Pikeminnow and Razorback Sucker*

The Colorado pikeminnow, *Ptychocheilus lucius*, and razorback sucker, *Xyrauchen texanus*, inhabit warm water reaches of the Colorado River and its main stem tributaries (USFWS 1999). Neither species is known to occur above Navajo Dam in New Mexico (USFWS 1999, Propst 2004). These big river fish are addressed together because they all occur far downstream from the project area and because water depletions, water quality degradation, and the effects of impoundments have been the major factors adversely affecting these species. Water depletions have been identified as a major factor contributing to the reductions in the populations of the endangered Colorado pikeminnow and razorback sucker in the Upper Colorado River basin. Water depletions reduce the ability of the river to create and maintain important habitats and reduce the frequency and duration of availability of these habitats. Water depletions also contribute to alterations in flow regimes that favor nonnative fish, resulting in increased predation and competition. In previous consultations, the USFWS has concluded that water depletions in the Upper Colorado River basin are likely to jeopardize the continued existence of these endangered fish.

The San Juan River Basin lies within the Upper Colorado River Basin, and the San Juan River Basin Recovery Implementation Program was established in 1991 to conserve populations of Colorado pikeminnow and razorback sucker. The program established principles for conducting ESA Section 7 consultations on water development and water management activities affecting endangered fish species in the San Juan River Basin. Those principles state that ESA consultation may still be required for historic depletions occurring prior to October 25, 1991, if those depletions have a Federal nexus (San Juan River Basin Recovery Implementation Program 2002).

Water required for full development of the Village at Wolf Creek would come from existing infiltration galleries in two creeks (East Fork and West Fork Pass Creek) on the private parcel. However, to avoid out of priority depletion effects to downstream Rio Grande Basin water users, these withdrawals would be augmented. This augmentation water would come from the San Luis Valley Water Conservancy District (SLVWCD) which owns and controls water provided from the Pine River Weminuche Pass Ditch, an historical transbasin diversion that delivers water from the San Juan River Basin into the Rio Grande Basin. Leavell-McCombs Joint Venture (LMJV) has a contract for the SLVWCD to supply up to 31 acre-feet (AF) of base water supply to offset the maximum annual depletions associated with the Village at Wolf Creek and WCSA under the plan for water augmentation in case 87CW7. In addition, LMJV has the right to purchase an additional quantity of water, not to exceed 300 AF of water over any 15-year period (an average of 20 AF/yr.) or 50 AF in any one year, for exchange, replacement, augmentation, and substitution in connection with the proposed Village at Wolf Creek development and associated ponds (CO District Court, Water Div. No. 3, Case 87CW7).

Village at Wolf Creek water use from SLVWCD would not cause any additional water to be depleted from the Colorado River drainage. Water that is diverted from the Colorado River drainage via the PRWPD has been diverted historically and will continue to divert its full supply with or without augmentation purchases for the Village at Wolf Creek.

Alternatives 1-4 would have no direct or indirect effects on the Colorado pikeminnow and razorback sucker or their critical habitats, because they are not present in the Rio Grande Basin. Because Colorado River water depletions via the PRWPD to SLVCWD would occur independently of the Federal action, there would be no cumulative effects from the Village at Wolf Creek water augmentation under any of the alternatives. Accordingly, Alternatives 1-4 would have "no effect" on the Colorado pikeminnow and razorback sucker and these species are dropped from further consideration herein.

3.5.4.3 *Bald Eagle*

In Colorado, bald eagles, *Haliaeetus leucocephalus*, are infrequent winter residents along upper reaches of the Rio Grande and San Juan Rivers and adjacent uplands. Most of the birds arrive in mid-November and depart between mid-February and mid-March. During early winter, when open water is more available, they feed on fish, waterfowl, rabbits and muskrats. Thereafter, they use lower elevation big game winter ranges and prairie dog towns down in the Rio Grande and San Juan Valleys where they feed more on winter- or road-killed big game carrion (Craig 2004). Bald eagles most frequently hunt from perches and they range widely, up to 10 miles, during daily hunting flights. Although 600-800 bald eagles annually winter in Colorado, because

Colorado is on the southern fringe of this species' summer range, some sporadic nesting occurs. Nesting birds are thought to be members of the northern subspecies, which wintered here and found conditions suitable for reproduction. These nesting birds tend to become year-round residents. No nests are known to occur on the RGNF, however, several nests are suspected on private lands adjacent to the Forest.

3.5.4.4 *Mexican Spotted Owl*

Mexican spotted owls, *Strix occidentalis lucida*, are one of three subspecies of spotted owls that occur in North America. Their distribution extends from the Colorado Rockies and southern Utah south to central Mexico, but they only occur in widely scattered populations within this large range (Ganey et al. 1988). In Colorado, this owl is a very rare resident in the mountains and foothills. Their patchy breeding distribution covers specific habitats in southwestern and south-central Colorado (Johnson 1997, Kingery 1998). Mexican spotted owls occupy two distinct habitats in Colorado: (1) large, steep canyons with exposed cliffs and dense old-growth forests of Douglas-fir, white fir (*Abies concolor*), and ponderosa pine (*Pinus ponderosa*); and (2) canyons of pinyon pine (*Pinus edulis*)-juniper (*Juniperus* spp.) with scattered patches of Douglas-fir (Reynolds 1990, Andrews and Righter 1994). Old-growth conifers and steep slickrock canyons not only provide requisite nesting and foraging components, but also provide cool, shady microclimates, presumably important for thermoregulation (Ganey et al. 1993). Their habitat in southwestern Colorado (Reynolds 1989, 1990, Fox and Rhea 1989) and adjacent states (Ganey and Balda 1989, Skaggs and Raitt 1988, Ganey et al. 1993) ranges in elevation from approximately 3,300 to 9,800 feet.

These owls forage mainly on small mammals (e.g., woodrats, white-footed mice, voles, rabbits, and pocket gophers), but use of bats, birds, reptiles, and insects has also been documented. Habitat selection may avoid conflicts with great horned owls. Nest site selection occurs shortly after pair formation in early March. Adults have a high fidelity to nest sites and reuse nests. Nests include tree cavities, old stick nests (from other species), debris platforms, and cliff ledges. Two to four eggs are laid in early to mid-April. After a 30-day incubation period, hatching occurs in early to mid-May. Owlets fledge after 32-36 days in early to mid-June. Reproductive success is low, averaging approximately 0.5-young/year. Outside the March through August breeding season, spotted owls become solitary. Additional life history information on this species is contained in Johnson (1997). Extremely low Colorado numbers, narrow habitat affinities, and low productivity make the state spotted owl population vulnerable to extirpation (Kingery 1998).

The USFS, BLM, and CDOW have recently conducted extensive surveys to locate Mexican spotted owls in Colorado (Wenger and LeFevre 1990, 1991, Boyle and Rogers 1991, ENSR 1991, Grother 1992, Grother et al. 1994, Johnson 1997). As of 1998, only two breeding populations had been detected and these contained 12 pairs of birds, plus additional transients (Johnson 1997, Kingery 1998). Currently, 12 Protected Activity Areas, where owls have historically or recently been detected, have been designated in Colorado (Elwood 2004). Mexican spotted owls and their habitat are not known to occur, but may occur, on the RGNF (USFS 2003h). This species was not identified for consideration on this project by the USFWS (2004). The project area is located above this species' maximum elevational distribution, and suitable habitat for it is not present on the project area. Direct, indirect, and cumulative effects of Alternatives 1-4 would have no effect on the Mexican spotted owl and this species is dropped from further consideration herein.

3.5.4.5 *Southwestern Willow Flycatcher*

In Colorado, willow flycatchers (*Empidonax traillii extimus*) breed primarily in willows along foothill streams and in middle and high altitude willow and alder carrs from 6,000 to 10,000 feet, mostly west of the Continental Divide (Bailey and Niedrach 1965, Kingery et al. 1998). Southwestern willow flycatchers (*E. t. extimus*) are one of 4-5 subspecies of the willow flycatcher recognized in North America (USFWS 1995, 1997). The breeding range of this subspecies includes southern California, Arizona, New Mexico, western Texas, southwestern and south-central Colorado, southern portions of Nevada and Utah, and extreme northwestern Mexico. This subspecies breeds in southwestern Colorado. Previously designated critical habitat for the southwestern willow flycatcher (USFWS 2002) has been withdrawn and a new designation is underway.

Southwestern willow flycatchers are insectivores that forage within and occasionally above dense riparian vegetation, taking insects on the wing and gleaning them from foliage (USFWS 1997). They generally nest in thickets of shrubs and trees 13-23 feet (minimum of 5 feet) or more in height, with dense canopy foliage (>67 percent) from 0 to 14 feet above ground (USFWS 1995). Historically, this flycatcher nested primarily in willows, with a scattered cottonwood overstory (USFWS 1997). Habitats not selected for nesting or male song perches were narrower riparian zones, with greater distances between willows stands and individual willow plants. Southwestern willow flycatchers virtually always nest near surface water or saturated soils. Stream gradient might also be an important determinant of habitat suitability. No nest sites have been found along streams with gradients >4 percent, characterized by almost continuous riffles, rapids, falls, or other cataracts (USFWS 1995). This may be due to higher gradient streams forming or supporting inadequately narrow riparian corridors. However, suitable habitat patches as small as 0.25 acres can support a breeding territory (USFWS 2002) and territories may be made up of one or more closely associated habitat patches (USFWS 2004). In Colorado, southwestern willow flycatcher habitat does not generally have a multilayered overstory, and may not have any overstory at all (Ireland 2004a). Shading may be more important to the more southern birds inhabiting hotter areas.

Water development projects, livestock grazing, recreational developments, agricultural conversions, and brood parasitism have adversely affected riparian habitats used by this subspecies for breeding. In Colorado, breeding habitat for this subspecies has been degraded and modified primarily by livestock overgrazing (Kingery et al. 1998).

Surveys to assess potential habitat suitability for the southwestern willow flycatcher were conducted in 2000 and 2001. Those surveys were conducted when there was an upper elevational restriction on this subspecies' range and before current Colorado habitat affinities were known. Based on those surveys and habitat criteria (now outdated), it was determined than suitable habitat was not present because no broad, multilayered riparian habitats were present and the project area (≥10,300 feet) was well above the species maximum elevational range.

Surveys to assess potential habitat suitability were repeated in 2004 following current habitat affinity and survey criteria (USFWS 2004, Ireland 2004b). A survey (without the use of taped calls) was conducted through the project area on May 28, 2004 to assess habitat potential. This survey occurred during the first survey period (Sogge et al. 1997, USFWS 2004), shortly after the area became snow free. No southwestern willow flycatchers were detected and it was determined that

no willows patches or stringers suitable as southwestern willow flycatcher breeding habitat would be affected on NFS lands associated with the project.

Several acres containing fragmented willow patches were present on NFS lands east of (i.e., outside and buffered from) the Alternative 3 and 4 disturbance areas. However, while those patches were of sufficient size to support this flycatcher and warrant surveys, they were composed entirely of planeleaf willows averaging 3-4 feet tall. Therefore, those stands did not represent potential breeding habitat or require surveys for section 7 consultation (USFWS 2004, Ireland 2004). Nevertheless, surveys following Sogge et al. (1997) and USFWS (2004) were conducted throughout the above NFS lands on July 10, 2004 (i.e., during the third survey period [USFWS 2004]). No southwestern willow flycatchers were detected and it was concluded that suitable nesting habitat for the southwestern willow flycatcher was not present on NFS lands associated with the Village at Wolf Creek project.

Suitable nesting habitat for the southwestern willow flycatcher would not be indirectly affected by the proposed action. Several acres containing fragmented planeleaf willow patches, composing and adjacent to the East Fork Pass Creek riparian corridor, were present in the northwest corner of the private parcel. These patches individually and collectively met the minimum size criteria to support a breeding territory. However, they did not reach the 5-foot height minimum representing potential habitat or requiring flycatcher surveys (USFWS 2004, Ireland 2004c). Nevertheless, surveys following Sogge et al. (1997) and USFWS (2004) were conducted throughout willow stands on the private Village at Wolf Creek parcel on July 10, 2004. No southwestern willow flycatchers were detected and it was concluded that suitable nesting habitat for the southwestern willow flycatcher was not present on NFS lands associated with the Village at Wolf Creek project.

At this time, it is unknown to what extent proposed Village at Wolf Creek development would affect willow stands associated with willows along East Fork Pass Creek. Constrained by provisions of the Clean Water Act, impacts would be minimized. Regardless, these willows do not represent potential southwestern willow flycatcher breeding habitat.

Southwestern willow flycatchers were not detected in the vicinity of Highway 160 construction areas east of Wolf Creek Pass (between mile markers 174 and 181) during 1996, 1997, and 2003 surveys, although potentially suitable habitat was present (ERO Resources Corp 2001, Michael 2004). Occupied habitat is present in the San Luis Valley and potential habitat extends up the Rio Grande (i.e., west of the Town of South Fork at lower elevations) toward the Village at Wolf Creek project area. The minimum 10,300-foot elevation of the Village at Wolf Creek project area is relatively high for this subspecies, although elevation alone would not preclude its presence (Ireland 2004c).

Southwestern willow flycatchers and their habitat are not present on the Village at Wolf Creek project area. Direct, indirect, and cumulative effects of Alternatives 1-4 would have no effect on the southwestern willow flycatcher and this species is dropped from further consideration herein.

3.5.4.6 *Canada Lynx*

This section briefly summarizes pertinent Canada lynx, *Lynx Canadensis*, life history information. Subsequent subsections address results of local surveys and, potential lynx use of the Trout-Handkerchief LAU, and the Wolf Creek Pass Lynx Linkage. Lynx assessment of the environmental baseline and proposed action considers not only project and cumulative effects on the current lynx population, but also how they might affect a greater number of lynx in a recovered, viable population. Although native lynx appear to have persisted in this area (Thompson and Halfpenny 1991), "the CDOW has concluded that *if* any lynx remain in Colorado their numbers are so small that they do not represent a viable population" (Seidel 1997). However, in an attempt to reestablish a viable population, the CDOW has released 166 lynx (Shenk 2004). All releases have been in the San Juan "core area", considered the best lynx habitat in the state, and most of the specific releases have occurred in the general vicinity of the Village at Wolf Creek project area.

General Natural History

Canada lynx are specialized predators that are highly dependent on snowshoe hares for food. Snowshoe hares prefer diverse, early successional forests with stands of conifers for cover and shrubby understories. Canada lynx usually concentrate their foraging in areas where hare numbers are high, but they also require late successional forests with downed logs and windfalls to provide cover for denning sites, escape, and protection from severe weather.

Home range size of lynx varies depending on sex, age, population density, prey density, reproductive period, and survey method. Home range estimates have varied from 8 to 250 km^2. Females typically have a smaller home range and less extensive daily movements than males. In Montana, preliminary data (2 yrs.) from 11 radio-collared lynx indicates minimum home ranges (90 percent MCP) of 91.89 square miles for males (n=7) and 44.4 square miles for females (n=4; Squires 2004) in habitat that, from a hare prey base perspective, was similar to, or slightly better than, lynx habitat in Colorado. The Village at Wolf Creek project area is a small portion of the Wolf Creek Ski Area SUP area (1,871 acres), which is 6.6 percent of the mean female home range size reported by Squires.

Prey selection varies with geographical location, season, and prey availability. The preferred prey is snowshoe hare, which comprises up to 97 percent of the lynx's diet. In Colorado, of 139 lynx kills detected since spring 1999 augmentation, 75 percent were snowshoe hares, 23 percent were red squirrels, and 2 percent were cottontails, with the remaining 1 percent composed of jackrabbits, mule deer (fawn), a goose, and voles (probably underrepresented).

Foraging Habitat

The general distribution and abundance of lynx is intimately associated with that of snowshoe hare, its primary prey species. Lynx/ snowshoe hare habitat in Colorado consists of mature, late-successional, and old-growth spruce-fir dominated coniferous forest and stands of dense lodgepole pine. Early successional stands are used principally for lynx foraging. As a result of historic mining, logging, and more recent forest management, young, high-density lodgepole pine stands are relatively scarce within the Colorado landscape. When coupled with the natural, perforation of

Colorado's mountains, where potential habitat often is restricted to narrow bands between alpine and valley bottom shrub zones, these anthropogenic impacts represent another significant factor limiting the occurrence and distribution of lynx and snowshoe hares. Low-density foraging habitat, typified by mature spruce-fir and lodgepole pine, or low stem-density, early successional conditions of lodgepole pine might require animals to travel farther distances between higher quality habitat patches to obtain prey, necessitating larger areas of habitat to provide a viable home range.

Denning Habitat

Suitable denning habitat for lynx consists of dense, senescent, coniferous forest on northern aspects containing large diameter woody debris in patches greater than 30 acres. The highest quality denning areas are those occurring in patches of moist, north-facing forest. In Colorado, climax forest communities in such physiographic settings are often late-successional spruce-fir stands. Such stands in the subalpine zone are thought to provide the most suitable lynx denning habitat in Colorado, although where suitable structure exists, denning habitat may also occur in lodgepole pine and Douglas-fir forests. Structurally suitable denning habitat, especially sites well interspersed with quality foraging habitats, may be a limiting factor in the Colorado landscape because a substantial portion of the mature and late-successional forests were historically logged. However, structural habitat characteristics, including rock formations in forests, may be more important in determining denning and security values than whether the habitat is old-growth. Younger forests may also provide suitable denning habitat if they contain the necessary habitat structure noted above. The security component of denning habitat may be an equally important characteristic essential to continued habitation of lynx, particularly in disturbed landscapes. The universe of structurally suitable, potential denning habitat may be reduced considerably by incompatible human disturbances within the zone of influence of otherwise suitable denning habitat. For denning habitat to be functional, it must be in close proximity to large acres of foraging habitat. Lastly, lynx may frequently move kittens from the natal den to subsequent den sites over a single denning period. This necessitates not a single, suitable den site, but a denning complex that may occur as a single habitat block or as a cluster of adjacent forest stands.

Security Habitat

Diurnal security habitat characteristics have not been well defined. Denning habitat is often used as a surrogate for security habitat, but security habitat is more widespread because it generally includes a greater variety of forest structural stages and aspects, smaller habitat patch sizes, and less isolation from risk factors. Security areas are those areas providing cover values that are also relatively isolated from, and unaffected by, human developments and their activities. These are areas where largely nocturnal and crepuscular lynx can rest during the day without being regularly displaced or harassed by humans or exposed to other risk factors. The structural cover component of security habitat is not as important as that associated with denning. It is likely that most forested habitats that provide adequate cover and diurnal seclusion from human activities, predators, and competitors support potential security habitat. The distribution of such habitat in the Trout Handkerchief LAU is likely more widespread than the combination of denning and year-round foraging habitats.

In the LCAS (Ruediger et al. 2000), diurnal security habitat is defined more narrowly as secure winter daytime bedding sites in highly disturbed or heavily used areas (such as downhill ski areas, and snowmobile play areas). It is assumed that the distribution of viable diurnal security habitat is more important in fragmented landscapes experiencing intense or widespread recreational activities. So long as effective security blocks are present and adequately distributed, and other critical habitat needs are met, lynx may be able to adapt to the presence of regular and concentrated human use during winter (Ruediger et al. 2000). Diurnal security habitat allows lynx the ability to retreat from adjacent human disturbances during winter daytime hours, and emerge at dusk to hunt and travel when most human activity ceases. "Security habitats will generally be sites that naturally discourage winter human activity because of extensive forest floor structure, or stand conditions that otherwise make human access difficult…Security habitats are likely to be most effective if they are sufficiently large to provide visual and acoustic insulation from winter human activity and to easily allow movement away from infrequent human intrusion" (Ruediger et al. 2000). However, habitat block size, buffer zone, and other variables have not been quantified relative to potentially disruptive human activities.

Travel Habitat

As a forest interior species, lynx generally confine their movements to forested or densely wooded habitats, rarely venturing far from cover, which provides not only foraging opportunities, but also concealment from potential predators. Conifer forests are of greatest year-round value in Colorado because of their year-round cover, extensive distribution, and associated prey base. Suitable travel habitat may be defined as vegetation greater than 6 feet in height that supports a closed canopy. This definition could include densely regenerating aspen, riparian corridors, and tall willow stands, as well as conifer forests. For optimum habitat effectiveness, travel habitats should connect foraging, denning, and security habitats within an animal's home range.

Lynx are thought of as an obligate, forest interior species that are unwilling to cross large openings. While this may largely be true, it may be a consequence of most lynx data coming from northern ecosystems, where forests are extensive and contiguous, and lynx uncommonly encounter non-forested habitats. Lynx in more fragmented southern latitudes may have to cross broad openings to effectively and efficiently utilize their environment. In western Wyoming (i.e., the Wyoming Range), lynx appear to routinely cross 100+ meter-wide openings in a naturally heterogeneous landscape affected by historic and contemporary clearcutting, cattle grazing, and intensive snowmobile use. Lynx recently transplanted into the San Juan Mountains have moved through broad mountain shrub habitats and crossed openings, including mountain valleys (e.g., San Luis and Eagle River valleys [not to mention the lynx that traveled to Nebraska]), and several cats may have crossed rugged alpine zones over the Continental Divide, some more than once, during their initial exploratory movements. However, the habitat use and movements of these animals, recently released in an unfamiliar landscape, are presently considered atypical. These exceptions are not to imply that forest interiors do not provide optimal lynx habitat, particularly with respect to prey availability, hunting strategy, predator avoidance, etc. However, the record also indicates that lynx do cross open areas, and such habitat use may be more common in more fragmented southern forests.

Landscape Connectivity and Lynx Movements

The best information available suggests that lynx were nearly extirpated from the Southern Rockies. The CDOW concluded that if native lynx remained in Colorado, their numbers were so small that they did not represent a viable population. Lynx augmentation in the San Juan Mountains is an attempt to reestablish a viable population. However, to reestablish and maintain a viable population, lynx will have to disperse to other areas of the state.

Because of the patchy, discontinuous distribution of lynx habitat in Colorado, maintaining landscape-level habitat connectivity may be paramount to maintaining a viable population. Landscape linkages need to connect lynx occupying adjacent mountain ranges. Colorado lynx habitats are not only constrained by broad alpine zones and non-forested valleys, but also by towns, reservoirs, highways, and other human developments that fragment and isolate montane and subalpine lynx habitats. Any continuously forested corridor between mountain ranges supporting lynx habitat that is relatively free of human development has the potential to be an important landscape linkage. Characteristics of lynx movements through a landscape linkage, relevant to the Village at Wolf Creek analysis, include movement type, frequency, landscape familiarity/movement efficiency, dispersal distances, and daily cruising distances. Lynx movements may be of four types, those associated with an established home range, those of transient or nomadic lynx that do not maintain home ranges, those of dispersing individuals, and those associated with extensive summer exploratory movements. The frequency that lynx may use a landscape linkage would theoretically decline from an area occasionally used as part of a resident's home range, to infrequent use within a nomadic range, to one-time use by dispersing and exploring individuals. Nevertheless, lynx are largely a nocturnal and crepuscular species. As a summation of lynx travel data, Ruediger et al. (2000) indicated that project planning should consider mean daily travel distances of up to 3-6 miles for resident females.

Effects of Recreational Activities on Lynx

A conclusion of Ruggiero et al. (2000) that "the effects of recreational activities on lynx populations have not been studied" cannot be overemphasized. Prediction of recreational effects is based largely on known lynx ecology, preliminary habitat use data from Colorado's reintroduction effort, ecological concepts, the cautious application of anecdotal accounts, and professional judgment. Recognizing the lack of data on lynx and the impact of recreational activities on them, Ruggiero et al. (2000) also concluded "limited anecdotal observations do not support the hypotheses that snowmobiling, ski touring, or hiking (i.e., dispersed recreation) result in significant behavioral disturbances to lynx." However, this statement is unqualified with respect to the intensity of these activities. While this conclusion may be true for the observed context, it should be considered with the same amount of caution that should be applied to all anecdotal information.

With respect to developed recreation effects on lynx (relevant to the proposed action because of the contiguous Ski Area), Ruediger et al. (2000) indicated "to date, most investigations of lynx have not shown human presence to influence how lynx use the landscape. Intuitively we assume that some threshold exists where human disturbance becomes so intense that it precludes use of an area by lynx. High intensity recreational use, such as that occurring at ski areas, may provide a level of disturbance that effectively precludes lynx use (at least temporarily) of otherwise

suitable habitat." But they go on to state that, "lynx may be able to adapt to the presence of regular and concentrated recreational use, so long as critical habitat needs are being met." Such use by a number of lynx has been demonstrated at some ski areas, including some in Colorado. The natural activity patterns of lynx (largely nocturnal) versus recreational activities (largely diurnal) provide an opportunity to maintain both uses in the same landscape. A key to providing temporal segregation of use is ensuring that effective diurnal security habitats are present and adequately distributed (Ruediger et al. 2000). While lynx and ski areas may not be incompatible, the developed ski terrain itself is a small part of their normally used areas. Larger surrounding tracts of undeveloped, effective forest facilitate lynx use of ski areas.

Results of Winter Tracking Surveys

Nine winter tracking surveys were conducted between February 28 and April 8, 2001 on and surrounding the Village at Wolf Creek project area. Surveys covered the entire area north of the Continental Divide, south of Highway 160, and west of the hydrologic divide between Alberta Park Reservoir and Pass Creek, as well as areas up to approximately 1 mile west of Treasure Pass, west of the Continental Divide and north to the highway. Approximately 30 percent of this area is composed of a landscape whose habitats have been anthropogenically modified to some extent, largely as a result of Ski Area development. Total survey distance was 152.8 kilometers (km); effective tracking totaled 144.02 km. Tracking conditions (Halfpenny et al. 1995) ranged from unacceptable to excellent, averaging 1.4 (SE=0.35, v=9: poor to acceptable) out of 4. All but two surveys were biased, particularly against nocturnal species (e.g., snowshoe hares), as a result of frequent snowfall and track deposition intervals of <24 hours (mean=16.4 hrs, SE=5.7, v=7), warm weather and associated freeze-thaw cycles, and high winds that not only suppressed animal activity, but that also obliterated tracks.

While winter tracking surveys were conducted primarily to develop predator-prey indices and a better understanding of the project area's ability to support predators, including lynx, a fresh lynx track was detected during those surveys. On March 1, 2001, a fresh lynx trail was detected moving north-northeast off the developed portion of the Ski Area, east of the base area facilities, and through the northwest corner of the private parcel toward the Highway 160 snow shed. The CDOW did not have any lynx with operating radio collars in the vicinity of the project area at that time. It is possible that the animal could have been a released lynx that slipped its collar or whose radio transmitter was no longer working. The animal could also have been a native. Thompson and Halfpenny (1991) located positive evidence of two native lynx in the East Fork Valley, approximately 4 miles south of the project area.

Snowshoe Hare Abundance

Snowshoe hares are of particular interest because they are the principal prey of lynx. Overall predator-prey indices were strongly biased by tracking conditions (as described above), although all species present in the landscape were likely detected. To allow the Village at Wolf Creek project area to be quantitatively compared to other Colorado ski area-dominated landscapes, only data collected under relatively unbiased tracking conditions were used to prepare track indices presented in Table 3.5-5. These data from March 1 and 2, 2001, when tracking conditions averaged 3.5 out of 4 (Halfpenny et al. 1995), represent one complete replication of 21 transects, totaling 31.2 km, conducted throughout the entire Village at Wolf Creek study area.

Table 3.5-5. Results of Winter Tracking Surveys on and around the Village at Wolf Creek (WCV) Project Area, and Some Other Colorado Ski Areas.

Species Recorded	Track Indices by Ski Area						
	WCV [a]	East Fork [b]	DMR [c]	Copper Mtn. [d]	Keystone [e]	Brecken-ridge [f]	Vail [g]
Snowshoe Hare	1.54	2.34	4.89	3.0	2.36	1.44	6.3
Red Squirrel	0.35	3.4	5.21	2.45	3.68	1.24	5.6
Canid [h]	0.03	0.5	0.55	0.78	0.8	0.96	0.5
Marten	0.06	0.4	0.49	0.27	0.41	0.08	0.5
Mustelids [i]	0.6	0.18	0.2	0.53	0.32	0.24	1.22
Wolverine	0	0	0	0	0	0	0
Rodents [j]	0.1	NR [k]	0.54	0.32	0.91	0.6	NR [k]
Ptarmigan	0	0	0	0.01	0	0	0
Blue Grouse	0	0.1	0	0.07	0	0	0.2
Unidentified Galliforme	0	0	0	0.03 [l]	0	0	0
Porcupine	0	0	0.01	0	0.01	0	0.09
Lynx	0.03	0 [n]	0.03 [m]	0 [o]	0	0	0.02 [p]
Bobcat	0	0	0	0	0	0	0.02
Total Indices Distance	31.2	88.3	79.92	73.94	89.77	25.0	58.0
Lynx-Wolverine Track Distance [q]	151.1	164.1	126.97	84.84	177.39	70.5	ND [r]
Total Survey Distance [s]	152.8	543	242.83	181.0	219.4	91.64	305.0
n Survey Days	9	9	11	11	10	3	13

Indices express the average number of fresh tracks (≤ 24-hrs. old) per kilometer over the course of the entire study. Village at Wolf Creek indices reflect only unbiased data collected on March 1 and 2, 2001, a subset of the nine surveys. Methodology employed (Halfpenny et al. 1995) was consistent between ski areas. See text for other methods, explanations, and disclaimers associated with track indices.

[a] Data collected Feb. 28 to Apr. 8, 2001 as part of the present study. Indices reflect only unbiased Mar. 1 and 2 data.
[b] Data collected Jan. 13 to Mar. 29, 1991 after Thompson and Halfpenny (1991).
[c] Data collected Feb. 12, 2002 to Feb. 26, 2004 after Thompson (2004).
[d] Data collected Feb. 12, 1998 to Mar. 17, 2000 after Thompson (2003).
[e] Data collected Nov. 18, 1997 to Mar. 12, 2002 after Thompson (2003).
[f] Data collected Feb. 27 to Mar. 13, 1998 after Thompson (1998g).
[g] Data collected Jan 19 to Mar. 26, 1989 after Thompson and Halfpenny (1989).
[h] Includes coyotes and red fox, unless otherwise noted.
[i] Includes long- and short-tailed weasels.
[j] Includes shrews, southern red-backed voles, chipmunks, and possibly other species.
[k] Not recorded (NR) consistently during survey.
[l] Either ptarmigan or blue grouse.
[m] 2 lynx trail segments < 24 hrs. old, plus 20 lynx trail segments that were > 24 hrs. old.
[n] Plus 3 lynx (native) trail segments that were > 24 hrs. old.
[o] 1 lynx trail segment detected during survey, but track was >24 hrs. old.
[p] 2 positive lynx (native) trail segments detected during survey, but only one was ≤24 hrs. old.
[q] Includes track count indices and other effective tracking for lynx and wolverine.
[r] Parameter not differentiated (ND) from other tracking.
[s] Includes repetitive and non-effective tracking distances.

Unbiased Village at Wolf Creek track indices for snowshoe hares were low, based on data collected using an identical methodology at other Colorado ski areas (Table 3.5-5). Mean Village at Wolf Creek snowshoe hare track indices averaged 1.54 tracks/km (Table 3.5-5). However, hares are at least modestly abundant in portions of the study area. Three habitat patches were recognized as high quality hare habitats during March 1 and 2, 2001, field surveys and transects were segregated to measure their relative indices. Hare abundance along 4.55 km of transects through these patches was 3.51 tracks/km. This index is in the low, moderate range of hare abundance measured at other ski areas.

Village at Wolf Creek snowshoe hare track indices were also below statewide indices developed by the CDOW (Byrne and Seidel 1998, Byrne 1998, Seidel et al. 1998). Byrne (1998) reported mean (¼ mi. transects) snowshoe hare densities of 4.8 (636), 4.6 (1,283), and 3.9 (94) tracks per km for lodgepole pine, Engelmann spruce, and subalpine fir habitats, respectively. Byrne's (1998)

data provide a general comparison with data collected during the present study, but are not directly comparable because of slightly different methodologies. It is unclear whether indices derived via Byrne's (1998) protocol were positively or negatively biased relative to the present study.

Four likely factors for the low hare abundance in the project area include (1) the larger proportion of natural meadows and historic timber harvest (ca. mid-1960s to early 1970s; Morrison and Swift-Miller 1999) and burn areas in the landscape, (2) the small size of intertrail islands on the Ski Area relative to snowshoe hare home range size, (3) the relatively low percentages of live conifer foliage within the year-round foraging range of hares in many spruce stands, particularly on developed portions of the Ski Area, and (4) a minimum 17.5 track deposition interval preceding the March 1 survey. Non-forested habitats and low-density stands would reduce hare, squirrel, and marten indices and increase mustelid (long-tailed weasel and ermine) indices (which is consistent with the Table 3.5-5 data). Intertrail islands on the Ski Area are small, linear, and generally without sufficient cover and forage to support individual hare home ranges. Wolf Creek is one of Colorado's oldest ski areas. Tree skiing and skier pruning does not facilitate forest regeneration on ski areas, particularly in relatively open, mature forest islands. Most of the Ski Area (including the intertrail islands) is mapped by the USFS (RGNF GIS lynx mapping) as unsuitable (below treeline) and non-lynx habitat (above treeline; USFS 2004b). While many intertrail islands that are classified as unsuitable may be more appropriately considered "other" lynx habitat (USFS 2004b), these small stands with no interiors are clearly not effective "winter foraging habitat" because of the above habitat limitations. The relatively short track deposition interval would reduce indices of diurnal species (e.g., squirrels), though indices of nocturnal species would be unaffected. Low sample size is another possible factor for the relatively low indices. These and other factors were not present at the other Colorado ski areas surveyed to the extent they were at the Ski Area.

Animal abundance indices should be interpreted with caution. While hare, squirrel, and marten abundance in the Village at Wolf Creek project area may be slightly higher that what is represented by the presented indices (Table 3.5-5), most of the project area supports suboptimal habitat for primary lynx prey species because of past timber harvest, Ski Area development and use, and natural forest heterogeneity. Nevertheless, this project area is a small part of a much larger surrounding landscape where spruce forests are largely intact and where primary lynx prey populations are some of the highest in the state.

Trout-Handkerchief Lynx Analysis Unit

The Canada Lynx Conservation Assessment and Strategy (LCAS, Ruediger et al. 2000) indicated that project planning should evaluate the effects to lynx habitat within designated Lynx Analysis Units (LAU) exceeding 25,000 acres in the southern Rocky Mountain Geographic Area. LAUs are intended to provide the smallest scale at which the effects of management actions on lynx habitat are quantitatively evaluated. LAUs do not represent actual lynx home ranges, but their scale should approximate the size of an area used by an individual lynx.

There are 20 LAUs on the RGNF. The Village at Wolf Creek project area is located within the Trout-Handkerchief LAU (THLAU; LAU #20913; USFS 2004b), the largest and most heavily impacted LAU on the Forest (USFS 2003b). THLAU boundaries extend east of the Continental Divide, north of the boundary between the Conejos and Divide Ranger Districts, south and west of the NFS boundary that is south of the towns of Del Norte and South Fork, west of the main

stem Rio Grande River drainage, and east of the Creed Ranger District. The LAU is entirely within the Divide Ranger District in Rio Grande and Mineral Counties. This LAU was heavily harvested and roaded in the 1970s and 1980s, but no large timber sales have occurred recently (USFS 2003h). Ponderosa pine, which dominates lower elevations, transitions into mixed conifer and aspen forest types at mid-elevations. Engelmann spruce and Douglas-fir forests characterize north-facing slopes. Upper elevation forests are dominated by spruce.

The USFS (2004b, Gomez 2004) provided overall statistics for the THLAU that were updated on August 9, 2004 (Table 3.5-6). Lynx habitat within state and private lands within the LAU is mapped and included in the LAU habitat acreages. The THLAU totals 176,750 acres, of which 134,216 acres (75.94 percent) are lynx habitat and 42,534 acres (24.06 percent) are non-habitat. Lynx habitat in the LAU is 80.69 percent (108,311 acres) suitable and 19.31 percent (25,905 acres) unsuitable. Denning habitat totals 51,786 acres, 38.58 percent of the total habitat. Winter foraging habitat (excluding denning) totals 14,390 acres (10.72 percent). Year-round foraging habitat (i.e., denning and winter foraging) totals 66,176 acres (49.31 percent), with an additional 42,135 acres (31.39 percent) of other (summer foraging) habitat. Snow compacting activity areas (e.g., roads, Nordic trails, huts, snowmobile, and snowcat operations) in the LAU have been mapped and are part of the project file. The Village at Wolf Creek project area is a small portion of the Ski Area SUP area (1,871 acres), which is 1.1 percent of the THLAU.

Table 3.5-6. Environmental Baseline Status Of Lynx Habitat in the 176,750-acre Trout-Handkerchief LAU (THLAU; LAU #20913).

Habitat Description	Acres of Habitat in LAU	% of all Lynx habitat in LAU
Winter Foraging	14,390	10.72
Denning	51,786	38.58
Other	42,135	31.39
Non-habitat	42,534	24.06
Suitable	108,311	80.69
Unsuitable	25,905	19.31
Total Lynx Habitat	134,216	75.94

This table is in a format requested by Broderdorp (2003). Data are based on updated USFS (2004b, Gomez 2004) habitat mapping and classification criteria. Acres include NFS, state, and private lands within the LAU.

Beginning on June 19, 2002, the Million Acres Fire burned approximately 9,222 acres (1,366 acres of private land and 7,856 acres of NFS lands) near South Fork, Colorado (USFS 2003i). The entire burned area was within the boundaries of the THLAU. A complete ground-truth evaluation of the fire's impacts upon lynx habitat is occurring during the 2004 field season, but preliminary surveys strongly suggest that 100 percent of the suitable lynx habitat in the burn was converted into non-habitat. The USFS (2003g) proposed salvaging a portion of the fire-killed trees from the Million Acres Fire burn area. Other ongoing and planned vegetation management altering activities within the THLAU include: (1) the Million Acres Fire Salvage Sale, (2) the Million Acres Fire Small Salvage Sales, (3) the Beaver Creek II Timber Sale, and (4) the Shaw Divide Aspen Sale. The effects of these projects are reflected in the numbers provided in Table 3.5-6.

West Fork San Juan River Lynx Analysis Unit

The West Fork San Juan River LAU is one of two LAUs on the SJNF overlapping the portion of the Wolf Creek Pass Landscape Linkage (WCPLL, discussed in detail, below) that occurs on the

west side of the Continental Divide (the other being the East Fork San Juan River LAU discussed below). Most of the WCPLL and the entire Highway 160 corridor west of the Divide occur in the West Fork San Juan River LAU. About 70 percent of the LAU occurs north of Highway 160. Approximately one-half of that LAU is contained within the Weminuche Wilderness. Private land distribution in the LAU closely flanks the Highway 160 corridor, starting below the foot of Wolf Creek Pass and extending west down the West Fork San Juan River to where the LAU ends, at the confluence of the East Fork of the San Juan River. Environmental baseline statistics for lynx habitat in the West Fork San Juan River LAU are presented in Table 3.5-7. Lynx habitat acreages meet quantitative habitat percentages required by the LCAS (Ruediger et al. 2000).

Table 3.5-7. Environmental Baseline Status of Lynx Habitat in the 57,011-Acre West Fork San Juan River Lynx Analysis Unit (WFSJRLAU; LAU #21316).

Habitat Description	Acres of Habitat in LAU	% of all Lynx habitat in LAU
Winter Foraging [a]	5,709 [a]	14.88 [a]
Denning	16,840	43.90
Other [b]	15,429 [b]	40.22 [b]
Non-habitat	18,652	48.62
Suitable	37,978	99.01
Unsuitable	381	0.99
Total Lynx Habitat [c]	38,359 [c]	100 [c]

Source: USFS. This table is in a format requested by Broderdorp (2003). Data are based on the most current (Nov. 14, 2001) USFS habitat mapping and classification criteria. Acres include NFS, state, and private lands within each LAU.
[a] Excludes winter foraging values associated with denning habitat.
[b] Also known as low quality habitat.
[c] Total lynx habitat = suitable and unsuitable habitat.

Large effective blocks of denning and year-round foraging habitat (totaling 58.78 percent of the LAU) are well distributed within the West Fork San Juan River LAU (SJNF GIS mapping). However, with the exception of boreal forest connectivity with the THLAU and the East Fork San Juan River LAU in the vicinity of Wolf Creek Pass per se, habitat connectivity with other LAUs to the north, east, and west is remarkably poor because of a band of alpine averaging approximately 0.5-0.75 miles wide that completely surrounds those boundaries of the LAU. East-west connectivity between the West Fork San Juan River LAU and the THLAU may be influenced somewhat by winter recreational activities associated with large patches of unsuitable habitat (i.e., the Ski Area on the east side and clearcuts on the west side) that support downhill and Nordic skiing and snowmobiling. As discussed above, north-south habitat connectivity across Highway 160 the west side of the Pass is poorer than that on the east side because of extensive highway cuts, extensive highway fill slopes, and natural landform constraints. Only one percent of the lynx habitat in the LAU is currently in unsuitable condition.

East Fork San Juan River Lynx Analysis Unit

A small portion (several hundred acres) of the East Fork San Juan River LAU overlaps the remaining portion of the WCPLL on the west side of the Continental Divide. Approximately 85 percent of this LAU is contained within the East Fork Valley where the only private land is approximately 3.5 square miles of Piano Creek Ranch. Approximately one-half of this LAU is contained within the South San Juan Wilderness. Environmental baseline statistics for lynx

habitat in the West Fork San Juan River LAU are presented in Table 3.5-8. Lynx habitat acreages meet quantitative habitat percentages required by the LCAS (Ruediger et al. 2000).

Table 3.5-8. Environmental Baseline Status of Lynx Habitat in the 72,905-Acre East Fork San Juan River Lynx Analysis Unit (EFSJRLAU; LAU #21318).

Habitat Description	Acres of Habitat in LAU	% of all Lynx habitat in LAU
Winter Foraging [a]	9,974 [a]	18.28 [a]
Denning	27,024	49.52
Other [b]	17,391 [b]	31.87 [b]
Non-habitat	18,336	33.60
Suitable	54,389	99.67
Unsuitable	180	0.32
Total Lynx Habitat [c]	54,569 [c]	100 [c]

Source: USFS. This table is in a format requested by Broderdorp (2003). Data are based on the most current (Nov. 14, 2001) USFS habitat mapping and classification criteria. Acres include NFS, state, and private lands within each LAU.

[a] Excludes winter foraging values associated with denning habitat.

[b] Also known as low quality habitat.

[c] Total lynx habitat = suitable and unsuitable habitat.

Large effective blocks of denning and year-round foraging habitat (totaling 67.8 percent of the LAU) are well distributed within the East Fork San Juan River LAU (SJNF GIS mapping). This LAU is well connected with surrounding LAUs, including across the relatively low, forested Continental Divide to the northeast, but constrained by a 1-2 mile wide alpine zone across the Continental Divide to the southeast. Collectively, these three LAUs (i.e., the THLAU, West Fork San Juan River LAU, and East Fork San Juan River LAU) compose the focal habitat block where management decisions would influence lynx movements through the WCPLL and habitat connectivity with surrounding large blocks of habitat composing the San Juan Core area. Only 0.32 percent of the lynx habitat in the LAU is currently in unsuitable condition.

Wolf Creek Pass Lynx Linkage

Four separate linkage areas have been identified on the RGNF due to their importance contributing to lynx connectivity with other Forests and other large blocks of habitat (USFS 2003d). These linkages include (1) Spring Creek Pass, (2) Wolf Creek Pass, (3) North Pass/Cochetopa Hills, and (4) Poncha Pass. Ruediger et al. (2000, Oct. 2001 rev. definition) defines linkage areas as:

> Habitat that provides landscape connectivity between blocks of habitat. Linkage areas occur both within and between geographic areas, where blocks of lynx habitat are separated by intervening areas of non-habitat such as basins, valleys, agricultural lands, or where lynx habitat naturally narrows between blocks. Connectivity provided by linkage areas can be degraded or severed by human infrastructure such as high-use highways, subdivisions or other developments.

The goal of linkage areas is to ensure population viability through population connectivity (USFS 2004a). Linkage areas are areas of movement opportunities. They exist on the landscape and can be maintained or lost by management activities or developments. They are not "corridors" which imply only travel routes; they are broad areas of habitat where animals can find food, shelter and security.

The WCPLL includes 359 square miles on both sides of Highway 160, on both sides of Wolf Creek Pass, and provides for north-south lynx movements (USFS 2004a). It extends out from the highway to major hydrologic/topographic divides. In the vicinity of WCSA, it extends south to the Continental Divide and includes the Ski Area's entire 1,871-acre SUP and the private Village at Wolf Creek parcel (thus the SUP is 0.8 percent of the WCPLL). USFS (2004a) indicated that a threat to this linkage included the high-volume, 2-4 lane highway, which is currently being upgraded. While the entire Village at Wolf Creek project area, including the private parcel (which occurs as close as 491 feet from the south shoulder of Highway 160), is within the WCPLL, USFS jurisdiction is limited to NFS lands.

The Wolf Creek Pass Landscape Linkage was designated expressly because this portion of the Continental Divide is known to be important for lynx (and multiple wildlife species) movements and because of concern that Highway 160 is presently impairing those movements (USFWS 2003). High-speed, high-volume highways can fragment and restrict lynx habitat use, impair home range effectiveness, and inhibit local and dispersing movements that may lead to reduced habitat connectivity (Apps 1998, 1999, Alexander 1998, USFWS 2000). Such uses may be further impaired along highways by adjacent human developments, including, but not limited to, subdivisions (USFWS 2000).

Highways also result in lynx mortality from vehicular collisions, which can be detrimental to small populations (Ruediger et al. 2000). Introduced lynx are more vulnerable to highway mortality than resident animals because they exhibit more extensive movements through unfamiliar landscapes (Brocke et al. 1990, 1991, 1993). In an unsuccessful attempt to restore lynx to the Adirondack Mountains, 18 of 37 mortalities of translocated lynx were road-killed (Brocke et al. 1990). Highway mortality was a primary cause leading to the extirpation of lynx in the White Mountain National Forest of New Hampshire (Brocke et al. 1993). While road-kills might not be a significant mortality source in resident lynx populations (Aubry et al. 1999, Ruggiero et a. 1999), it can be a significant mortality source in depleted or recovering populations until the population becomes viable.

Six of the 166 lynx released to date in Colorado have been killed attempting to cross highways, including I-70, 160 (see below), and 550. Based on results of the reintroduction attempts in New York and New Hampshire (Brocke et al. 1990, 1993), the CDOW anticipated that some highway lynx mortality could occur (Seidel et al. 1997). Small, non-viable populations can be adversely affected by any mortality and the loss of individuals may adversely affect the current lynx population in the Southern Rockies.

Highway volume, vehicular speed, highway characteristics (e.g., width, barriers, fencing), adjacent obstacles to movement that might increase residency time on the highway, and surrounding habitat that might encourage or discourage highway crossing attempts are some factors presumably influencing lynx road-kill potential. With respect to highway traffic volumes and lynx crossings, Canadian studies suggest that 2,000-3,000 VPD are problematic and $\geq$ 4,000 VPD are more serious threats to mortality and habitat perforation (Ruediger et al. 2000).

Highway 160 is a year-round, high-speed highway and the major east-west transportation artery in southwestern Colorado. It exhibits significant variations in volume due to local, regional, and recreation use. AADT in 1997 was 2,600 vehicles, with June to August peaks of 3,500 VPD and

off-season ebbs to 800 VPD (ERO Resources 2001). Traffic is expected to increase about 4 percent annually, with peak, off-season, and AADT traffic in 20 years projected at around 7,560, 1,723, and 5,600 VPD, respectively (ERO Resources 2001), not considering indirect effects associated with the proposed action. As mitigation required to increase permeability across the highway and to reduce the probability of lynx road-kill, lynx passageways have been incorporated into the design of ongoing Highway 160 improvements east of Wolf Creek Pass (ERO Resources 2001, USFWS 2003). Most use of the highway occurs during daylight and crepuscular hours, with little use during the middle of the night.

In an attempt to quantify Highway 160 permeability relative to obstacles, an analysis was conducted as part of this study assessing landforms that might restrict lynx highway crossings, from FS Road 410 to Big Meadow Reservoir (on the east side of the pass), to Wolf Creek (on the west side of the pass). The length of barriers (e.g., tall, vertical road cuts) and restrictions (cut slopes $\geq 60^{o}$) that would likely block or deflect cross highway movements, resulting in greater latency time on the highway and potentially increasing road-kill potential was measured as a surrogate of permeability. Results are shown in Table 3.5-9.

Table 3.5-9. Obstacles along the Highway 160 Corridor Over Wolf Creek Pass That Would Likely Block or Deflect Lynx Movements, Resulting in Greater Latency Time on the Highway and Potentially Increasing Road-kill Potential.

Analysis Area	Total Length	Barriers	Restrictions	Unrestricted
West of Wolf Ck Pass	6.84 mi.	2.88 mi. (42%)	0.3 mi. (4.4%)	3.67 mi. (53.6%)
East of Wolf Ck Pass	7.5 mi.	2.49 mi. (33.1%)	0.55 mi. (7.3%)	4.46 mi. (59.5%)
Total Wolf Ck Pass	14.34 mi.	5.36 mi. (37.4%)	0.85 mi. (5.9%)	8.13 mi. (56.7%)

Note: The 14.34 mile analysis area extended from FS Road 410 to Big Meadow Reservoir, on the east side of the Pass, to Wolf Creek, on the west side of the pass. See text for definitions.
Source: Western Ecosystems, Inc.

A relatively large percentage of Highway 160 on each side of Wolf Creek Pass contains barriers and restrictions along the ROW (generally on the north [cut slope] side) that would likely cause any lynx attempting to cross the highway to move parallel to traffic before landforms would allow an escape. Barriers and restrictions total 46.4 percent, 40.4 percent, and 43.3 percent of the highway's length on the east side, west side, and both sides of Wolf Creek Pass, respectively (Table 3.5-9). Obstacles resulting in greater residency on and along the highway would likely increase road-kill probabilities as a result of animals panicking at the approach of a vehicle and dashing back across the highway into traffic in an escape attempt. Greater road-kill probabilities primarily affect northbound animals, although obstacles affect overall highway permeability. On both sides of the Pass, there are continuous cliffs $\geq$0.5 miles long. A lynx climbing the long, steep fill slope up to the highway would not be able to see virtually any of these barriers until it was on the road surface. Fortunately for lynx, most of the extensive cliffs are relatively low on each side of the pass (< 9,080 feet on the east side and < 9,400 feet on the west side). Excluding lands below these elevations, where lynx movements are less likely to occur, barriers and restrictions total 25.0 percent, 33.9 percent, and 30.4 percent of the highway's length on the east side, west side, and both sides of Wolf Creek Pass, respectively. As indicated above, lynx road-kill probabilities involve multiple variables. Considering only contiguous landforms, compared to other Colorado highways where lynx have been road-killed, this section of Highway 160 over Wolf Creek Pass is less permeable and contains a higher percentage of obstacles that would likely increase highway mortality probabilities of lynx that attempt crossings.

Lynx are heavily using the Wolf Creek Pass linkage area as a dispersal corridor and the viability of this linkage is vital to the recovery of lynx in Colorado. The linkage spans a forested swath over the Continental Divide between large blocks of highly effective subalpine habitat. Lynx denning and established home ranges have been identified to the north and south (Shenk 2004). The linkage is part of the CDOW's "Core Research Area" in the San Juan Mountains, recognized as the largest continuous block of high quality lynx habitat in the state and where the CDOW focuses their lynx monitoring and research efforts. This core area (defined as New Mexico north to Gunnison, west to Taylor Mesa, and east to Monarch Pass; USFWS 2003) is where all 166 lynx have been released to date (spring 2004) as part of the CDOW's augmentation plan and where another 65 are scheduled for release in 2005-2008. The CDOW has numerous relocations of collared animals in the habitat blocks to the north and south of this linkage with movements between these habitat blocks involving animals crossing Highway 160 (Wait 2004). To date, at least 54 radio-collared lynx (33 percent of all lynx released to date by the CDOW) have been relocated south of Highway 160 (Shenk 2004) and based upon their locations it is likely that virtually all of them crossed the highway in the Wolf Creek Pass linkage area. Lynx have regularly used this linkage since the first (1999) releases. Native lynx were also present in the general vicinity of this linkage (i.e., approximately 4 mi. south of the project area) as recently as 1991 (Thompson and Halfpenny 1991). Considering the percentage of collared lynx that have used this linkage, reduced permeability across Highway 160 or increased mortality probabilities on the highway could appreciably impair the recovery of lynx in Colorado.

Not all lynx that attempt crossing Highway 160 are successful. In 2000, a lynx from the 1999 releases was road-killed on Highway 160 2.98 miles north of the project area (adjacent to Pass Creek Lake; Wait 2004). It is unknown which way the lynx was headed, but the west side of the highway was a rock face, considered a barrier, with spruce forest behind, with the lake and aspen grassland on the east side. That lynx had been in the area for sometime and had successfully crossed the highway multiple times (Wait 2004). That portion of the highway has three lanes and while posted speeds are 45 mph, most traffic goes 55-60 mph in both directions. The highway section contiguous to the Village at Wolf Creek project area is also three lanes, with steep, adjacent cut and fills slopes and acceleration/deceleration lanes at the ski area entrance. The snowshed (a curved tunnel below an avalanche path) and a sharp curve above the Ski Area entrance reduce local vehicular highway speeds somewhat. Both sites have localized areas of limited sight-distances that might contribute to increase road-kill potential.

Few human developments are present along Highway 160 in the Wolf Creek Pass linkage area. The primary development is the Ski Area, a single-season, day use resort. Ski area use results in increased traffic volumes along Highway 160 through the linkage area and may increase the probability of road-kill. Although most traffic associated with this single season ski area occurs during the day, some skier traffic within the linkage area occurs during crepuscular periods when lynx are actively moving through the landscape. The ski terrain, per se, probably has a minimal influence on local lynx movements. Lynx have crossed through other Colorado ski areas (Thompson 2003) and a lynx was detected moving off the Ski Area and through the private parcel towards Highway 160 during winter tracking surveys associated with this project. Lynx movements through the Ski Area may be relatively rapid because most portions of the Ski Area do not support prey densities that would encourage more prolonged foraging use. Buildings and large retaining walls in the Ski Area's base area, at the CDOT maintenance facility (north of the highway opposite the Ski Area's entrance), local cliffs and steep cut slopes along the highway,

and the snowshed are other man-made landscape features that would likely deflect local lynx movements. North-south movements through the linkage area could occur virtually anywhere within this zone; however, a greater concentration of movements would be expected in the spruce-fir zone and in areas with better forest connectivity across the highway and in the immediate approach to the highway.

While the Wolf Creek Pass linkage area was designated to facilitate north-south movements, as an area containing several forested passes over the Continental Divide, this linkage zone could also facilitate east-west habitat connectivity. Some collared lynx in Colorado may have crossed alpine zones during exploratory and dispersing movements (Shenk 2004), however lynx are primarily a forest interior species whose movements and habitat use are facilitated by continuous forest cover. As such, all forest cover, particularly that in the spruce-fir zone, can be considered important, including all forested passes over the Continental Divide. However, individual forested passes over the Continental Divide are not as unique of a feature in this portion of southwestern Colorado (i.e., as they are in the northern mountains), because of the relatively high elevation of treeline and low elevation of the Divide. Alpine areas within the Wolf Creek Pass linkage area generally represent narrow, localized perforations in the forest matrix covering the Divide. As such, if lynx orient through continuous forest cover, their movements across the Divide in and adjacent to the Wolf Creek Pass linkage area would not be directed to a limited number of corridors in the localized areas of the landscape as they are in central and northern Colorado. Many routes of continuous forest cover exist over the Continental Divide in the vicinity of Wolf Creek Pass and elsewhere in and adjacent to this linkage.

Potential Lynx Use of the Trout-Handkerchief LAU

Foraging Habitat in the Trout-Handkerchief LAU

As indicated in Table 3.5-6, year-round foraging habitat (i.e., denning and winter foraging) totals 66,176 acres (49.31 percent) in the THLAU, with an additional 42,135 acres (31.39 percent) of other (summer foraging) habitat (USFS 2004b). Winter foraging habitat (excluding denning) totals 14,390 acres (10.72 percent), a relatively small percentage for most Colorado LAUs. However, that situation exists because a high percentage (38.58 percent) of the year-round foraging habitat is structurally suitable for denning. Year-round foraging habitat in the THLAU is well distributed (USFS 2004b). Large effective patches of winter foraging habitat and the year-round foraging values associated with denning habitat do not occur on the project area, although they do occur in the surrounding landscape, including habitats on the RGNF and SJNF.

Denning Habitat in the Trout-Handkerchief LAU

Denning habitat is abundant and well distributed throughout the THLAU, currently totaling 51,786 acres and 38.58 percent of the LAU (USFS 2004b). This is a relatively high percentage of denning habitat for a Colorado LAU. The largest block of denning habitat in the LAU occurs in the South Fork of the Rio Grande River. Other large, effective blocks of denning habitat occur in Pass, Park, and Beaver Creeks and in the Willow Park area. Because the Village at Wolf Creek project area occurs near the southwestern edge of the THLAU, habitat in the adjacent East Fork San Juan LAU (#21318; SJNF) is also relevant. That virtually undeveloped LAU also contains an unusually high percentage (53 percent) of denning habitat in large,

effective blocks in the contiguous undeveloped East Fork Valley. While some dispersed recreation occurs near most of these denning patches in both LAUs, it is largely concentrated along roads and trails that are outside of these patches. Denning and maternal home ranges have been documented in the vicinity of these LAUs (Shenk 2004).

Smaller patches of structurally suitable denning habitat occur within the project area. However, with the possible exception of part of one patch along the Ski Area's SUP southeastern boundary, these small patches in and adjacent to the developed Ski Area and Highway 160 are ineffective and unlikely to be used for denning. While little or no human activity may be present in or adjacent to these areas during the denning period per se, a resident lynx would likely avoid denning in most of these areas because of the preceding six months of intense skiing activity, post-ski season base area maintenance activities, vehicular use along Highway 160 and FSR 391, and summer recreational use around Alberta Park Reservoir. Low foraging values in this area and the lack of denning patches that could effectively compose a denning complex would also preclude lynx denning use. There are far superior habitat patches for a lynx to den in the THLAU than on a developed ski area adjacent to a high-speed highway.

Security Habitat in the Trout-Handkerchief LAU

Diurnal security habitat characteristics have not been well defined. Denning habitat is often used as a surrogate, but security habitat is more widespread and is effective in smaller forest blocks. It is likely that most forested habitats that provide adequate cover and diurnal seclusion from human activities, predators, and competitors support potential security habitat. Relatively non-forested habitats can also provide effective diurnal security areas (Thompson and Halfpenny 1989), depending on the level of human activity and a host of other factors. The distribution of security habitat in the THLAU is abundant and widespread (USFS 2004b, RGNF GIS mapping).

In the vicinity of the project area, habitat that may provide some seasonal security values probably includes most forested portions of the area other than around the Ski Area's base area facilities, a buffer zone along the Highway 160 corridor, and the FSR 391 corridor to Alberta Park Reservoir. Portions of the Ski Area that receive regular use during the ski season, including glades and tree skiing areas, probably do not provide effective diurnal security values during the ski season. Portions of both road access corridor alternatives no not provide diurnal security values. Portions of the private parcel away from the Highway 160 and FSR 391 corridors may provide security values year-round. Maintenance and recreational use of the Nordic/snowshoe trail through this parcel might locally displace diurnally bedded lynx, but such use is limited.

The distribution of effective diurnal security habitat in the vicinity of the project area is not as important for local or landscape-level habitat connectivity as it is on and around other Colorado ski areas. This is largely because of the following factors. First, human developments are spatially limited and localized in a large, surrounding, undeveloped landscape (with the exception of Highway 160). Lynx, concentrating their habitat use in higher quality habitats, might simply not encounter the project area. Lynx attempting to cross the area could do so fairly quickly, even during the ski season. At its widest points, the Ski Area ranges from one (southwest-northeast) to two (southeast-northwest) miles across. These distances are relatively narrow compared to the widths of other Colorado ski areas crossed by lynx (Thompson 2003, unpubl. data) and daily cruising distances of lynx (Ruediger et al. 2000). Nocturnal Ski Area

maintenance is also limited, providing a longer, disturbance-free period for lynx to cross developed ski terrain when lynx are most active. There is no snowmaking, there is virtually no activity on the Ski Area from when it closes (around 4:30 PM) until midnight, not every run is groomed each night (only about 40 percent of the runs are groomed in any one night), and there are only 4-6 snowcats grooming at any one time (USFS 1999, Pitcher 2004c).

Lynx Home Range Efficacy in the Trout-Handkerchief LAU

Preceding sections have discussed the distribution and effectiveness of lynx habitats in the THLAU and those associated with the Village at Wolf Creek project area. This section addresses the likelihood of a lynx residing in the LAU as part of a home range, given the distribution of natural and anthropogenic landscape features. With little doubt, the most disruptive anthropogenic feature in the LAU is Highway 160. Other potential human induced constraints are largely limited to land use activities, including timber harvest, developed recreation on the Ski Area, snowmobiling, and other more benign dispersed recreational uses. Relatively narrow alpine zones, cliffs, a few lakes and relatively narrow, open valley bottoms are the most physically constraining natural features. The low hare density around the Village at Wolf Creek project area is another limitation, although it is considered localized and non-representative of other areas in the LAU and connected habitats to the south. These and other features greatly influence habitat connectivity within and beyond the LAU and the ability of the area to support a resident animal.

While the THLAU may be the most heavily impacted LAU on the Forest (USFS 2003h), it is also the largest LAU on the Forest and it supports large, contiguous blocks of highly effective lynx habitat. Nevertheless, Highway 160 is a disruptive feature that likely discourages lynx movements and may impair the ability of lynx to maintain an overlapping home range. Lynx primarily use habitats along the highway corridor for north-south movements and there have been no known home ranges abutting or straddling the highway (Shenk 2004), although that situation may be independent of habitat effectiveness.

Highway 160 bisects effective lynx habitat in the THLAU. The Applicant's (Personal Communication 1998, 1999) Alberta study indicated that two male lynx crossed the Trans-Canada Highway where it was not divided, but lynx home ranges abutted the highway rather than straddling it. That four-lane high-speed highway supports about twice the average annual daily traffic volume as Highway 160. In the Applicant's study, even unfenced sections of the Trans-Canada Highway were considered a significant restriction, if not a barrier to home range and dispersal movements. The Applicant (Personal Communication 1999) found that all of his lynx crossed all highways examined within their home ranges at less than random expectation and concurred with Koehler and Aubry (1994) that highways within home ranges may influence home range selection just as dominant natural features can. The lynx killed on I-70 and Highways 160 and 550 also indicate that highways are contributing to additive mortality.

If Highway 160 influences lynx movements and habitat use, then home ranges established in its vicinity may abut the highway rather than effectively using habitats on each side. This may vary with the temperament of individuals and may not be as important now, when animals can select from an abundance of high quality, largely unoccupied habitat in the landscape. However, as the population recovers and more resident lynx frequent the landscape, the effectiveness of habitats

adjacent to the highway will likely become more influential on the ability of lynx to establish viable contiguous home ranges. Effective THLAU habitat patches that abut the highway are also functionally connected to large blocks of undisturbed adjacent habitat, including, but not limited to the Weminuche Wilderness (beginning 2 miles northwest of the project area) and the East Fork Valley and South San Juan Wilderness (beginning on the opposite side of the Continental Divide from the Ski Area). So even though the highway may impair home range boundaries, major portions of several lynx home ranges have been documented overlapping the THLAU and adjacent, connected LAUs (Shenk 2004).

Lynx Use of Habitats on the Wolf Creek Village Project Area

USFS (2004b) lynx habitat mapping for the THLAU was validated during field surveys in the vicinity of the project area (Table 3.5-10; map contained in project file). The Alternative 2 access road and contiguous utility corridors would follow the access road to WCSA's Tranquility Parking Lots, now under construction. However, that road would not accommodate the type and level of use for subsequent development on the private parcel. As a result, this road would have to be widened to the north, encroaching into the southern portion of the 46 acre spruce island. The disturbance area would extend into an 11.3-acre patch (Feature ID 12358) of Stage 4B/4C spruce classified as denning habitat and a large block (841 acres, Feature ID 12278) of unsuitable habitat that includes most conventional ski terrain on the Ski Area. The denning classification is invalid because of chronic disturbances surrounding this stand year-round, inadequate patch size, and inadequate surrounding foraging habitat (from a maternal home range perspective). Feature ID 12358 should be classified as winter foraging habitat. The unsuitable designation for the remainder of the access corridor is valid based on current criteria (USFS 2004b; however, this ca. 1960s-1970s clearcut is not without hare habitat values, and its values will improve, unlike ski trails maintained as unsuitable habitat.

Table 3.5-10. Summary of Field Validated Lynx Habitat Classifications for Polygons in the Trout-Handkerchief LAU Relevant to the Village at Wolf Creek Project Area.

Feature ID	Ac. [a]	Dominant Habitat Structural Stage [b]	Current Lynx Habitat Designation [c]	Recommended Lynx Habitat Designation Resulting from Field Validation
12358	11.3	SF4B/5	Denning	Winter Foraging
12278	841	Clearcut	Unsuitable	N/C [d]
12326	35	SF4B	Winter Foraging	N/C [d]
12003	563	MG/WET/ DEV [e]	Non-habitat	N/C [d, f]
12393	51.82	Lake	Non-habitat	N/C [d]
12436	7.873	WET Meadow	Non-habitat	N/C [d, g]
12346	115	SF4B	Other	Winter Foraging
12312	187	SF4B	Unsuitable	Winter Foraging
12429	28	SF4B	Denning	Winter Foraging
12412	7	SF4B	Denning	Winter Foraging
12486	28	SF4B	Winter Foraging	N/C [d]

Feature ID order follows that presented in the Affected Environment lynx text.
[a] Numbers may be rounded. [b] After Hoover and Wills (1984). [c] After USFS (2004b). [d] No Change (N/C) recommended.
[e] Mountain Grassland (MG), herbaceous and willow wetlands (WET), and Developed (DEV; highway, Ski Area parking lots, Ski Area base area facilities). [f] A portion of this polygon (in the northwest corner of the private parcel) contains willow wetlands that have been determined to have summer foraging values associated with them. While these willows would be more appropriately considered to be "other" habitat (USFS 2004b), they represent a small subset of the overall polygon, which is more appropriate to retain as "non-habitat". [g] This polygon is composed of the herbaceous inlet of Alberta Park Reservoir with adjacent 4A spruce-fir. While portions of this polygon may meet "other" habitat criteria, it is more appropriate to retain this polygon as "non-habitat".

The Snow Shed – East Village access road and Utility Corridor 3 under Alternatives 3 and 4 would cross through the eastern portion of a 46-acre spruce island surrounded on the north by Highway 160 and on the south and west by the WCSA parking lots. The northern 35 acres of this island, where disturbances would occur, is classified as winter foraging habitat (Feature ID 12326). That designation is valid based on habitat structure and the presence of snowshoe hare tracks in this stand.

Lynx habitat mapping on and adjacent to the private parcel is largely valid, although some modifications are warranted. Alberta Park (Feature ID 12003), Alberta Park Reservoir, and some meadows large enough to map are correctly classified as non-habitat. Two forest patches composed of mature, closed canopy (>40 percent) spruce (Stage 4B) occur north of these open areas. The southern patch (Feature ID 12346) is correctly classified as non-habitat, based on current (USFS 2004b) mapping criteria. The northern patch (Feature ID 12312) is incorrectly classified as unsuitable habitat. It should be classified as non-habitat according to mapping criteria. Indeed, both patches contain local areas of >60 percent canopy cover, which would classify them as denning habitat. While the denning classification would be invalid because of proximity to chronic human disturbance that classification would more accurately represent the winter foraging values present. West and south of Alberta Park, forest patches are classified as unsuitable habitat (Feature ID 12278), denning habitat (Feature ID 12429, 28 acres and 12412, 7 acres), and winter foraging habitat (Feature ID 12326). The unsuitable habitat patch, associated with an historic burn, now used as sparsely gladed ski terrain, and the 1960s-1970s era clearcut, is valid. The winter foraging habitat in the parcel's northwest corner is also valid. While the two dense spruce patches bisected by the Alberta Lift and ski trails meet structural criteria for denning habitat, that classification is invalid because of chronic disturbances around this stand year-round, inadequate patch size, patch perforation, and inadequate surrounding foraging habitat (from a maternal home range perspective). Although the combined size of these two patches is barely large enough to support a single snowshoe hare home range, hares are present in these stands because of their proximity to the forest patches across FSR 391 on the northern part of the private parcel. As such, these two patches should be classified as winter foraging habitat. In summary, based on field validations, the private parcel contains approximately 36 acres of winter foraging habitat, 57 acres of unsuitable habitat, 93 acres of non-habitat, and 102 acres of other habitat.

Lynx use of the project area may be characterized currently as opportunistic foraging during dispersing and exploratory movements not associated with established home ranges. At least five different collared lynx have been relocated on the project area and 10 additional lynx have been relocated within 2 miles of the project area (Shenk 2004). There have also been a few reports of lynx sightings by the public on and adjacent to the project area (Wiley 2004). To date, there is no evidence of concentrated lynx use on or immediately around the Village at Wolf Creek project area (Shenk 2004), although that could change, as more lynx inhabit the landscape.

3.5.5 Migratory Birds

The *Migratory Bird Treaty Act* (MBTA) of 1918 was passed due to concern for poaching of migratory birds. Except as regulated by permit, it is unlawful under the MBTA to for anyone at anytime, by any means or in any manner, to pursue, hunt, export, import, transport, or carry any migratory bird. In 2001, Executive Order 13186 ("Responsibilities of Federal agencies to protect

migratory birds") was signed stating that "environmental analysis of Federal actions, required by NEPA or other established environmental review processes, shall evaluate the effects of actions and agency plans on migratory birds, with emphasis on species of special concern." The Executive Order further directed action agencies to develop and implement a MOU with the USFWS that promotes the conservation of migratory birds. That MOU is currently under development as a means to reduce the direct, indirect, and cumulative effects of land management activities on migratory birds, including those dealing with habitat modification.

Direction concerning landbird conservation in USFS Region 2 is to interface with the State and Bird Conservation Region (BCR) working groups for actions and objectives to pursue concerning migratory bird conservation. Bird Conservation Regions consist of a hierarchical framework of nested ecological units that allow for the use of multiple scale-specific approaches to on-the-ground management. There are 37 BCRs in North America with four of these occurring at least partially in Colorado. The RGNF occurs within the Southern Rockies Colorado Plateau Bird Conservation Region (BCR 16), which encompasses portions of Colorado, New Mexico, Arizona, Utah and Wyoming. Information from BCR 16 was synthesized for use in Colorado through the development of the Colorado Landbird Conservation Plan (BCP).

The BCP (BCP 2000) identified priority species and habitats for each physiographic area in the state based on the Partners-In-Flight Species Prioritization Process. Priority habitats identified for the Southern Rocky Mountains Physiographic Area include alpine tundra, aspen, cliff/rock, high elevation riparian, lowland riparian, mixed-conifer, mountain shrubland, ponderosa pine, sagebrush shrubland, spruce-fir, and wetlands. All 11 of these habitat types also occur on the RGNF, with spruce-fir the most extensive and both sagebrush shrubland and lowland riparian the least common.

Migratory birds that occur or could potentially occur on the RGNF were assessed based on information identified for the Southern Rocky Mountains (Physiographic Area 62) in the BCP. The assessment process used was based upon the priority habitats and species identified in the BCP and their relationship to the Forest LTAs. The potential conservation issues identified in the BCP were compared to the issues and management activities identified for each LTA. All priority habitats identified in the BCP are, at a minimum, provided a coarse filter assessment that evaluates broad-scale habitat changes and ecosystem processes over time, and except for the aspen LTA, a fine filter assessment is applied to Forest LTAs so that there is an expected adequate level of monitoring provided for these avian species.

The BCP identifies ten primary goals and objectives that must be met on a statewide basis in order to meet the overall conservation goals concerning migratory and resident birds in Colorado. Each of these goals was reviewed in order to evaluate the potential effects of the Forest Plan implementation on migratory birds. The Forest Plan and its MIS Amendment incorporate and address these goals through standards and guidelines, Forest Plan monitoring, and MIS monitoring.

The USFWS developed a list of birds of conservation concern based on BCRs. Birds identified on that list were reviewed in conjunction with the Regional Species Conservation Project (SCP) and the 2003 update to the USFS R2 list of sensitive species. Those species identified in BCR

16 applicable to the RGNF are considered and conserved as part of Forest Plan Standards and Guidelines and Forest Plan monitoring for TES or MIS species. Species are displayed in the Migratory Bird Report (USFS 2003j). Species not evaluated in that assessment, but included on the updated USFWS list for the RGNF and evaluated as part of the Regional Forester's sensitive species review are displayed in Table 3.5-11. None of the birds identified in Table 3.5-9 breeds in or regularly inhabits the project area.

Other migratory birds are considered individually in this document as listed species, R2 sensitive species, and MIS.

Table 3.5-11. USFWS Birds of Conservation Concern in the Southern Rockies Colorado Plateau Bird Conservation Region (BCR 16) that occur on the RGNF and that are not Otherwise Addressed as MIS or Region 2 Sensitive Species.

Species	Regional Forester's Sensitive Species Review Disposition	RGNF Conservation Measures
Swainson's hawk	Consider as an emphasis species; protect nest sites, grasslands, shrublands, riparian	Forest Plan Wildlife Standards 5 and 21
Golden eagle	Consider as an emphasis species, protect nest sites, grasslands through ponderosa pine forests	Forest Plan Wildlife Standards 5 and 21
Prairie falcon	Consider as an emphasis species, protect nest sites, grasslands, shrubland, woodland	Forest Plan Wildlife Standards 5 and 21
Williamson's sapsucker	Common breeder on R2 units, ponderosa pine forests	Forest Plan Wildlife Standard 21
Pinyon jay	Common breeder on R2 units, pinyon-juniper woodlands	Forest Plan Wildlife Standard 21
Virginia's warbler	Consider as an emphasis species, shrubland habitats	Forest Plan Wildlife Standard 21

Source: USFWS.

3.6 LAND TENURE AND USE

3.6.1 Affected Environment

The affected Federal land, part of the RGNF (Figure 1.2-1), is located in Mineral County, Colorado. Federal land in Mineral County comprises approximately 96 percent (approximately 539,400 acres) of the county's 561,920 acres (Colorado Counties 1999, Colorado Frontier 2004). The affected land is within the RGNF permitted Ski Area boundary. The Ski Area operates under a SUP approved by the USFS in 1997 under the authority of the *National Forest Ski Area Permit Act* of 1986 (USFS 1999a). The affected land is bounded directly by Highway 160 to the northwest, by the Ski Area to the west, by the private property to the south and east, and by additional NFS land to the east. The private land is land obtained by the Applicant through a property exchange with the NFS as defined in the *Land Exchange EA* (USFS 1986a) and FONSI. NFS lands in the vicinity of the affected lands are used for forest management, including recreation, which consists of hiking, backpacking, fishing, boating, cross-country skiing, ice fishing, snowmobiling, and downhill skiing (USFS 1986a).

The RGNF land surrounds the private property. The USFS maintains a scenic easement and an access easement through the private property via FSR 391, which begins at Highway 160 and terminates at Alberta Lake (USFS 1986a).

3.7 SCENIC RESOURCES (USFS SCENERY MANAGEMENT SYSTEM)

The area of potential effect for scenic resources includes lands directly adjacent to the proposed project area, as well as all lands that have visibility of the project area and associated changes to the scenic quality of the area. Landscape visibility is a function of many essential, interconnected considerations including the context of viewers, duration of view, degree of discernible detail, seasonal variations, and number of viewers (UFSF 1995a). Depending on where visibility of a subject landscape is achieved, and the concern level for maintaining the form, color, line, pattern, and texture; effects to the scenic integrity of that landscape can alter the immediate foreground (0 to 300 feet), foreground (300 feet to 0.5 miles), middleground (0.5 to 4 miles), or background (4 miles to horizon) view from the subject viewpoint (USFS 1995a).

In general, scenery is the aggregate of visual, auditory (noise), and holistic features (such as "sense of place", landscape character, constituent feelings/attachment) that give character to the landscape and are an integrated part of ecosystem management. All lands administered by the USFS are managed in order to achieve a specific level of visual or scenic quality. The Scenery Management System is a process to provide national forest resource managers with a method of determining visual values on lands under their jurisdiction. The USFS has defined SIOs as specified in the Forest Plan for USFS lands within the area of the proposed access road and utility corridors, as well as lands surrounding the proposed project area (USFS 1996a). A map displaying the SIOs for RGNF lands surrounding the project site is presented in Figure 3.7-1.

The SIO is arrived at based upon a series of measurements and is a goal put on the landscape through an ecological/cultural/forest plan prescription to achieve the most desired outcome while maintaining the scenic quality. Photographs, on-site inspections, and aerial photographs are used to help determine if a SIO has been met after project implementation. There is a 2-year natural-rehabilitation period for all activities affecting scenic resources. Activities are expected to come into compliance with mapped SIOs within the 2-year period. After the 2-year period, the landscape architect monitors remaining disturbance levels to determine if SIOs have been met (USFS 1996a).

USFS Scenery Management System

The USFS uses the Scenery Management System that evolved from and replaces the Visual Management System (VMS) defined in Agricultural Handbook #462 (USFS 1995a). Definitions of terms and corresponding scenic integrity levels of the Scenery Management System are displayed in Table 3.7-1. The Scenery Management System emphasizes and increases the role of constituents throughout the inventory and planning process, and it borrows from and is integrated with the basic concepts and terminology of Ecosystem Management. The Scenery Management System provides for improved integration of aesthetics with other biological, physical, and social/cultural resources in the planning process. Thus, the Scenery Management System actually incorporates additional factors when evaluating potential scenery effects and does not exclude any VMS factors. The Scenery Management System process and terms are used in this analysis.

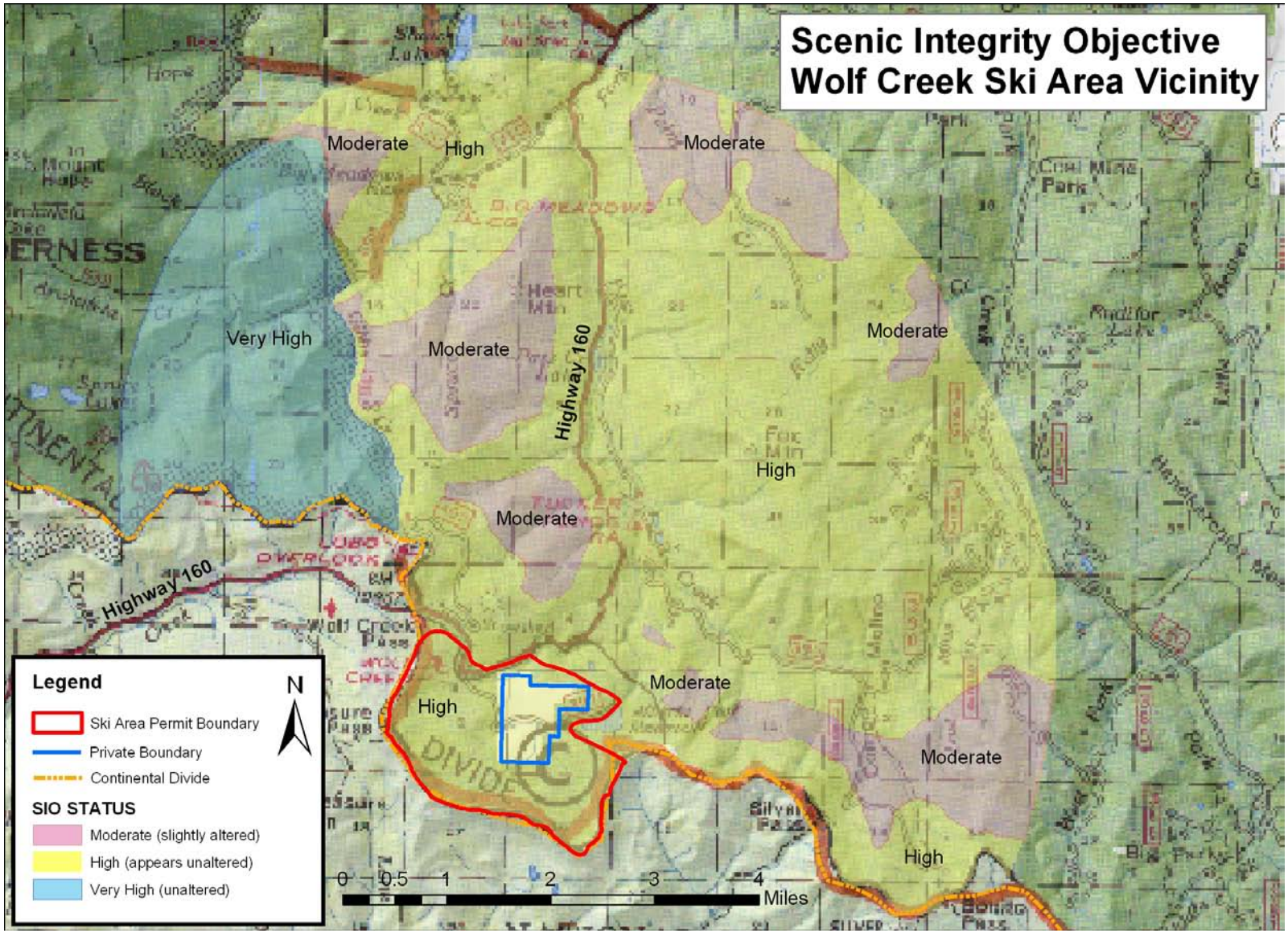


Figure 3.7-1. Rio Grande National Forest Scenic Integrity Objectives for Lands in the Vicinity of Project Site.

Table 3.7-1. Definitions of Terms and Corresponding Scenic Integrity Levels of the Scenery Management System.

USFS Scenery Management System	Existing Landscape Character Being Viewed
Very High	Landscape character is intact with only minute if any deviations.
High	Landscape character appears intact. Deviation may be present but blends in with the landscape character so they are not evident.
Moderate	Landscape character appears slightly altered.
Low	Landscape character appears moderately altered.
Very Low	Landscape character appears heavily altered.
Unacceptably Low	Landscape character appears extremely altered.

Source: USFS 1995a.

USFS lands with the potential to be directly affected by the Proposed Action or action alternatives have a management area prescription of 8.22 – Ski-Based Resorts, Existing and Potential (Figure 3.7-2). The management theme for lands within management area prescription 8.22 is for their existing or potential use as a ski-based resort site. This is an area of concentrated use and visitors can expect to see facilities associated with the Ski Area (USFS 1996a). Lands within the permit boundary of the Ski Area have a SIOs of "High" (Figure 3.7-2).

Lands with scenic resources that have the potential to be indirectly affected by the Proposed Action or action alternatives have management area prescriptions of 4.3, Dispersed and Developed Recreation; 5.13, Forest Products, and 3.3, Backcountry. The management theme for lands within management area prescription 4.3 emphasizes a wide range of recreation settings and opportunities within various landscapes. Because of the amount and type of use, these areas will offer a more social experience where visitor contacts are frequent (USFS 1996a). The majority of lands near the project area that have a management area prescription of 4.3 have a SIO of "High"; however, portions of the Lobo area east of FSR 402 have a SIO of "Moderate" (Figure 3.7-2). Lands with a management area prescription of 4.3 include the Lobo Overlook and Snow Shed and Powerline backcountry ski areas on the north side of Highway 160, as well as much of the Highway 160 corridor east of Wolf Creek Pass and along Pass Creek Road to Tucker Ponds.

The management theme for lands within management area prescription 5.13 allows a full range of activities with an emphasis on the production of commercial wood products. Numerous open roads offer commercial access and roaded recreational opportunities, while restricted roads offer nonmotorized-recreation opportunities. The area has a well-developed transportation system (USFS 1996a). Lands near the proposed project site that have a management area prescription of 5.13 have a SIO of "Moderate" and "High" (Figure 3.7-2). Lands with a management area prescription of 5.13 include the Highway 160 corridor from Pass Creek Lake to Tucker Ponds, Heart Mountain and the upper Spruce Creek drainage, lands south of and including Pass Creek Road to the Continental Divide, and lands south and east of Fox Mountain.

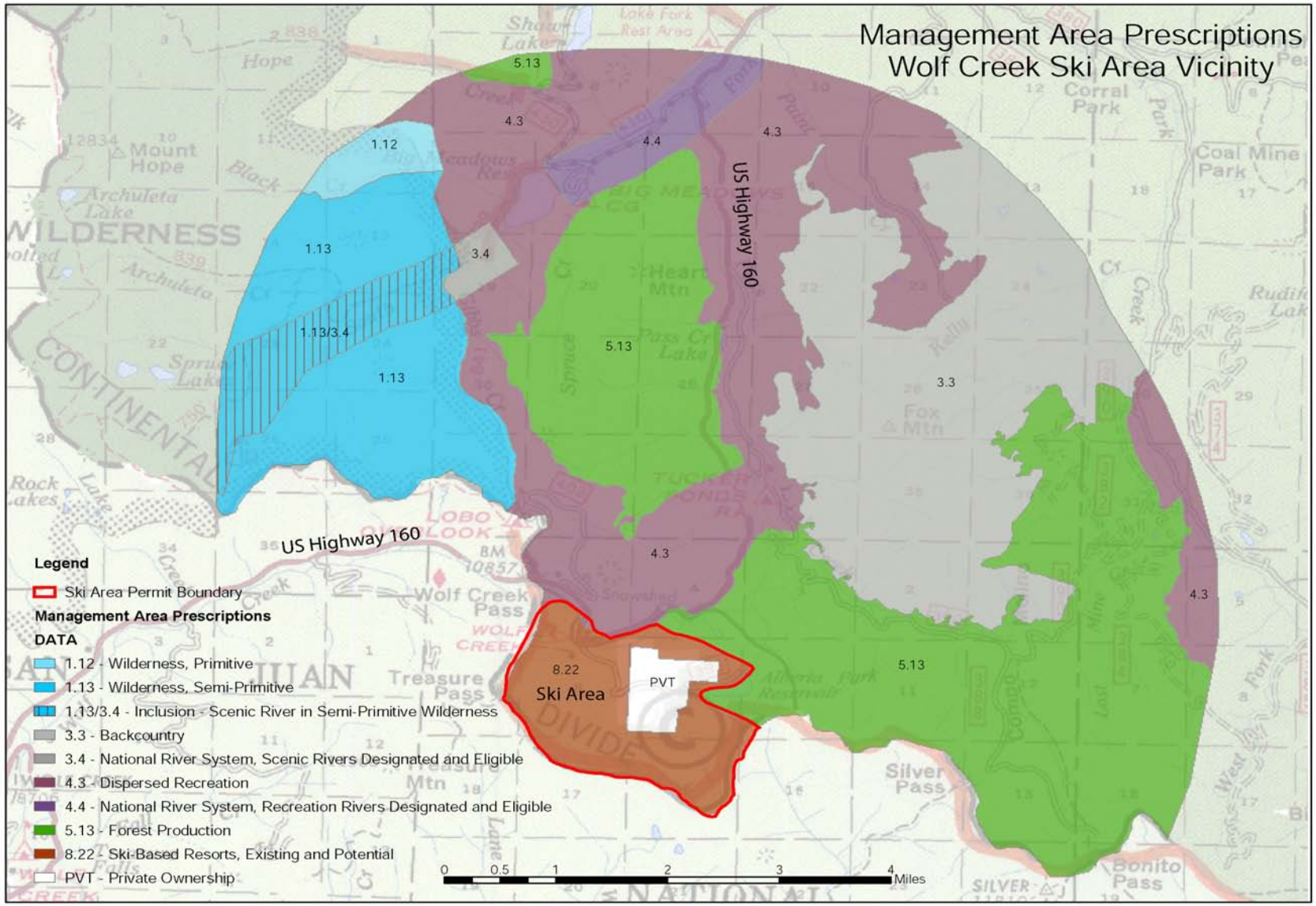


Figure 3.7-2. Management Area Prescriptions on the Rio Grande National Forest Near the Proposed Project Site.

The management theme for lands within management area prescription 3.3 is to maintain plant and animal habitats that are shaped primarily through natural processes, and to provide backcountry experiences to the public in areas where there is little evidence of human activity. The landscape is predominately natural appearing and relatively undisturbed by humans, and there is a reduced occurrence of human contact (USFS 1996a). Lands near the proposed project area that have a management area prescription of 5.13 have a SIO of "Moderate" (Figure 3.7-2). Lands with a management area prescription of 3.3 include the relatively isolated unroaded area of Fox Mountain. These 3.3 Areas also contain SIOs of "Moderate and High" (Figure 3.7-2).

Although the SIO figure does not graphically display the SIO for the Handkerchief Mesa area east of Park Creek, and approximately 6.5 miles east-northeast of the project site, the SIO is "High". The Handkerchief Mesa area would have a background view of the project site. Therefore, it is included in this discussion.

3.7.1 Affected Environment

People are concerned with the quality of their environment, including the aesthetic values of landscapes, particularly scenery and spiritual values. High quality scenery, especially scenery with natural-appearing landscapes, enhances people's lives and benefits society (USFS 1995a).

Typically, the USFS catalogs evaluates the Existing Scenic Condition of an area in order to establish a baseline that helps determine how much the landscape has changed or deviated from the Characteristic Landscape. The Existing Scenic Condition of lands in the vicinity of the Ski Area is presented in Figure 3.7-3. Upon comparison of the Existing Scenic Condition and the SIOs for any area, there may be a difference in the condition that exists now and future SIOs. The Objectives are used to help determine the placement and extent of activities on Forest Service Lands.

The following section is descriptive of the proposed project region.

3.7.1.1 *Viewsheds*

The most striking landform feature in the area surrounding the proposed project site is the Continental Divide. Atop the Continental Divide, the Continental Divide National Scenic Trail (CDNST) follows the ridge overlooking the entire project area. Users of the CDNST expect to have limited encounters with other visitors and have high quality foreground scenery opportunities along the trail corridor. Viewing opportunities from the CDNST include vast panoramas of mountainous terrain including the Weminuche and South San Juan Wilderness areas and rolling mountain ridges in the background, to spruce-fir stands and meadows that are largely naturally patterned across the landscape in the middleground. In addition, the middleground viewshed from the CDNST offers views of the Ski Area and associated facilities, Alberta Park and Alberta Park Reservoir, the spruce-fir dominated rolling mountainous terrain on either side of the divide, and the Highway 160 corridor on both the east and west side of Wolf Creek Pass.

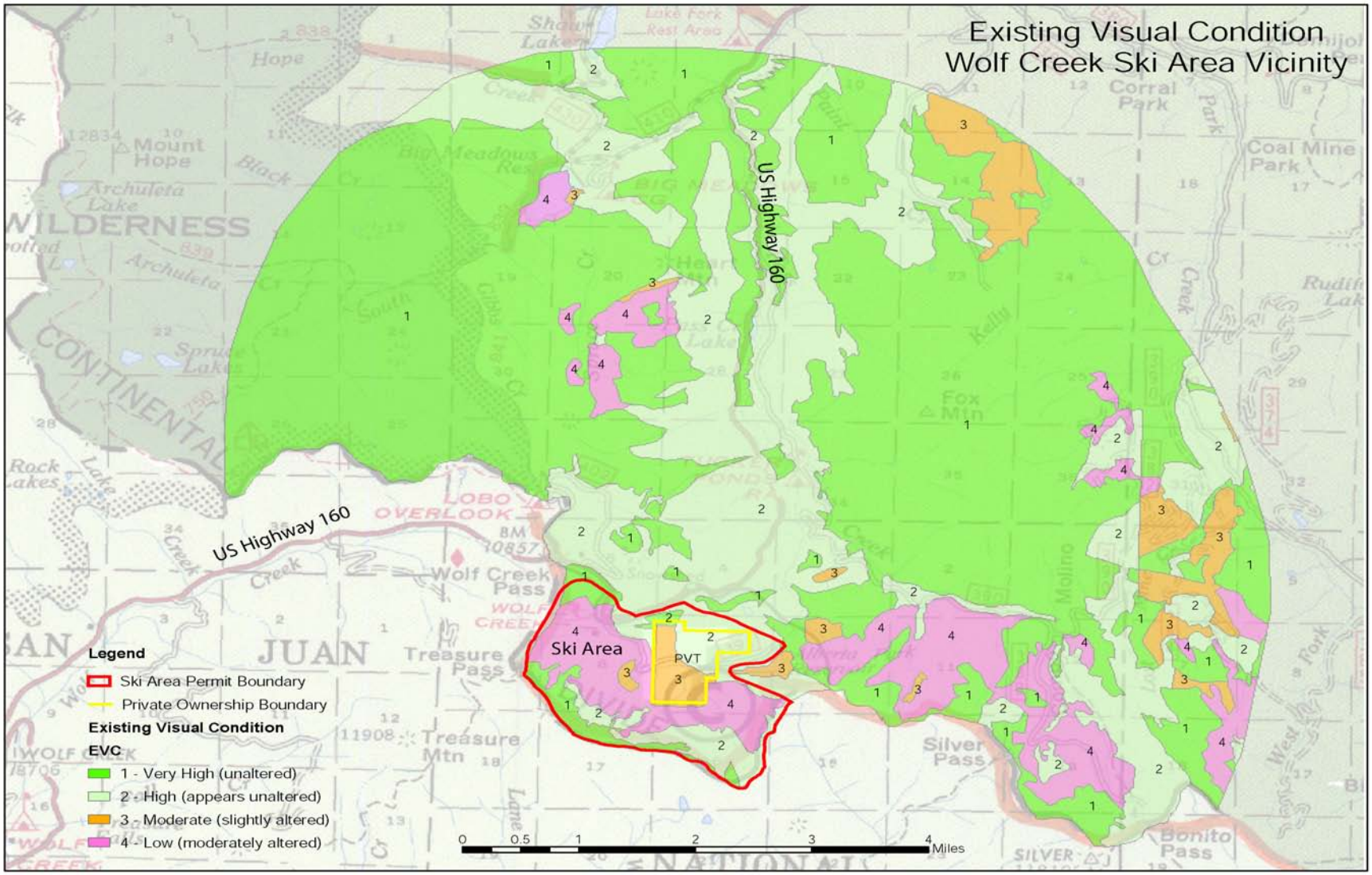


Figure 3.7-3. Existing Visual Condition of Rio Grande National Forest Lands Surrounding the Project Site.

From the CDNST, foreground views of the windswept ridge are afforded along with the various immediate vegetative characteristics of the high elevation exposed trail corridor. In winter, much of the trail is covered under deep snow, and only occasional conifer trees break up the undulating snowy terrain dominated by wind drifted snow and cornices. In the summer, rock outcrops along with conifer trees and herbaceous plants and grasses dominate the foreground view from the CDNST.

The most heavily traveled area near the proposed project site is the Highway 160 corridor. Highway 160 provides access over Wolf Creek Pass (Milepost 167.9) and passes directly by the Ski Area and the proposed Village. There are numerous pullouts along the highway for travelers to stop and take in the natural beauty of the landscape. Foreground views are largely dominated by the highway and associated road cuts and fill talus slopes. The middleground view from the Highway 160 corridor near the project site includes the Ski Area base area facilities and ski trails, Wolf Creek Pass, FSR 402, and the meadow and wetland complex associated with Alberta Park. Background views are more limited along the Highway 160 corridor due to the general lack of line-of-sight opportunities that exceed 4 miles. Although, where background views are achieved, distant forested ridges and mountainous terrain can be observed.

Another notable vantage point near the proposed project site is the Lobo Overlook area. In the summer, the Lobo Overlook area is used as both a scenic viewpoint and as a staging area for hikers and campers accessing the CDNST. In winter, the Lobo Overlook area is primarily used by winter backcountry enthusiasts accessing the terrain for various non-motorized pursuits. Snowmobile users have reached a voluntary agreement not to go off of FSR 402 in winter in order to avoid conflicts with non-motorized recreationalists. Foreground views from the Lobo Overlook area include rock outcrops, meadows, and the spruce-fir dominated vegetative patterning occurring at the overlook. In addition, a radio tower exists near the trailhead, and a powerline traverses the immediate area. Depending on the exact location an individual decides to view the area from, these infrastructure elements may be dominant in the foreground viewshed. The middleground view offered at the Lobo area provides a view of the Weminuche Wilderness and the Highway 160 corridor, as well as the Ski Area and the project site. Background views from the Lobo area include the distant peaks of the Weminuche and South San Juan wilderness areas, and the various conifer stands and forested ridges and mountainous terrain that are generally naturally patterned across the landscape.

Another destination for undeveloped recreation users closest to the proposed project area is Alberta Reservoir. This reservoir is a protected Rio Grande cutthroat trout fishery and is regulated by the CDOW. In order to access Alberta Park Reservoir, travelers must use FSR 391, which passes directly through the private property boundary on its way to the reservoir. Foreground views from the reservoir include the water body of the reservoir, dam structure, FSR 391, small portions of the eastern extent of Alberta Park, and the immediate forested area surrounding the reservoir. Middleground views afforded from Alberta Park Reservoir include views of the lifts and trail system at the Ski Area, the forested and unforested ridge of the Continental Divide, the eastern extent of the private property, and limited views of mountainous areas around Fox Mountain east of Pass Creek Road. Background views from Alberta Park Reservoir are extremely limited or nonexistent due to steep, enclosing terrin. Line of sight under most circumstances does not exceed 4 miles unless visitors to the reservoir decide to seek higher

ground above the reservoir to gain longer sight distance opportunities. The Alberta Park area is not visible from either the Weminuche or South San Juan Wilderness areas.

3.7.1.2 *Land Use*

USFS land uses in the area include existing roadway and utility corridors on Highway 160 and FSR 391. FSR 391 currently serves the adjacent Ski Area in its first mile and terminates approximately 2 miles to the east, providing public road access to Alberta Park Reservoir for recreation opportunities. Current land uses on the private property include the operation and maintenance of the Alberta Lift, a Ski Area chairlift that accesses the saddle area between the Knife Ridge and Alberta Peak. The chairlift is located on the subject property for approximately the first half of its total length. In addition, recreational visitors accessing Alberta Park Reservoir use FSR 391, which passes directly through the private property. The USFS has a perpetual easement through the subject property for recreational access to the reservoir that cannot be compromised by any action occurring on the subject private property.

In the winter, FSR 391 is buried under several feet of snow and is closed by the USFS. A limited number of nordic trails are groomed throughout the private property for use by non-motorized recreationalists. In addition, a number of ski runs that descend the eastern acreage within the Ski Area permitted boundary on their way to the Alberta Lift are located on the subject property. The ski runs that traverse portions of the subject property are groomed by the Ski Area.

3.7.1.3 *Lighting*

The only local direct source of lighting in the USFS access corridor comes from the adjacent Ski Area and intersection lighting at Highway 160 and FSR 391. Base area facilities at the Ski Area have limited security and safety lighting during both the summer and winter. The Ski Area hours of operation are limited to daylight hours; therefore, no major lighting requirements are necessary after hours at Ski Area facilities. No light-assisted night skiing currently occurs at the Ski Area.

Both direct and indirect lights which can be seen within the project area are the result of lights from vehicles traveling on Highway 160 and FSR 391. Lighting currently used within the private property is limited to direct lighting of the base facilities of the Alberta Lift. No additional direct lighting is present on the subject property.

3.7.1.4 *Constituent Information*

The RGNF, as part of their forest planning process, collected great amounts of constituent information to assist with the preparation of the Revised Forest Plan and the Scenic Resource portion of the Forest Plan. Constituent information collected during the forest planning process provided the USFS with forest-wide feelings, values, expectations, desires, preferences, behaviors, and acceptable levels of quality for areas Forest-wide. In addition, public scoping and public meetings collected additional information about public feelings, values, and desires for the project. People from the broader constituency and local constituency have strong opinions about this project.

3.8 RECREATION RESOURCES

3.8.1 Lands Within and Directly Adjacent to the Proposed Access Road and Utility Corridors

The area of potential effect for recreation resources includes lands within and directly adjacent to the proposed access road and utility corridors for the private property and Ski Area, as well as the Highway 160 corridor from Wolf Creek Pass to the Ski Area. Recreational use across these lands varies, based on location, access, developed and dispersed recreation resources, and opportunities. An overview of the Highway 160 corridor from Wolf Creek Pass to the Ski Area, the Ski Area, and lands adjacent to the private property are presented below.

The Management-Area Prescription allocations on the RGNF and SJNF outline the setting, desired conditions, standards, guidelines, and activities that are to be managed. The discussion of recreational opportunities is broken into winter and summer seasonal usage patterns and opportunities. Spring and fall are excluded from discussion because the extended winter-like conditions at the high elevations of the area of potential effect typically begin in October and extend into June of the following year. Likewise, summer-like conditions are typically present at the high elevations from June through September. Therefore, the calendar spring and fall better conform to conditions that more readily mirror winter or summer-like climatic conditions and are incorporated into these discussions accordingly.

The Recreation Opportunity Spectrum (ROS) is a system used by the Forest Service to describe a variety of forest settings provided on NFS lands. There are six major setting categories within the ROS system. These are: Urban, Rural, Roaded Natural, Semi-Primitive Motorized, Semi-Primitive Non-Motorized, and Primitive. The setting categories are constructed to display the range from very developed and convenient (Urban) to very remote and wild (Primitive). There are seven descriptors that are used to differentiate between the various categories and provide agencies with evaluation tools for monitoring the success of management efforts. In addition, agency personnel can use these descriptors to guide decisions on site development proposals. Furthermore, forest visitors can use the descriptors to evaluate whether a particular part of the forest offers the setting that matches with their expectations. The descriptors are 1. Access; 2. Remoteness; 3. Naturalness; 4. Social Encounters; 5. Visitor Impacts; 6. Visitor Management; and 7. Facilities and Site Management.

The access criterion describes the type and mode of travel compatible within each setting category. The remoteness criterion defines the perception of being removed from the sights and sounds of human activities. The naturalness criterion describes the physical conditions of the setting as compared to a natural environment. This descriptor is primarily a visual evaluation of the surrounding landscape and describes the level of human modifications that has occurred or is proposed. The social encounters criterion attempts to define the appropriate frequency of meeting others during the course of a day's activities within an area with a particular setting category. The visitor impacts criterion describes the physical change that human use produces in the environment. This criterion focuses on how much change will be allowed and what tools for control are appropriate, rather than how impacts can be prevented. The visitor management criterion focuses on the amount of regulation and control, plus the level of information and services provided to visitors. More developed settings offer sufficient regulation and services to

provide a necessary level of security for visitors; whereas a primitive setting lacks such management, demanding independence and a level of risk taking. The facilities and site management criterion refers to the level of site development, in that urban and rural settings provide more convenience and comfort with more developed facilities than primitive settings where facilities are not present.

A map showing the ROS setting on RGNF lands surrounding the proposed project area is presented in Figure 3.8-1. The ROS is a framework for defining classes of recreation setting, opportunities, and experiences. Recreational opportunities and experiences associated with each setting are linked to the physical landscape (size of an area, remoteness, and degree of human influences), social interaction (amount and type of contact), and managerial efforts (degree of controls or restrictions).

The current ROS setting for all NFS lands within the permit boundary of the Ski Area is Roaded Natural (Figure 3.8-1). Because the private property is not part of NFS lands, the ROS setting would not normally apply. However, the amended scenic easement dated December 11, 1998, states the desire to administer the private lands to protect the scenic and recreational values of adjoining NFS lands (USFS 1998). Therefore, the ROS setting would indirectly apply to the subject private land by providing an architectural style and building design guidelines that fit with the setting and provide visitors with a resort (urban) experience.

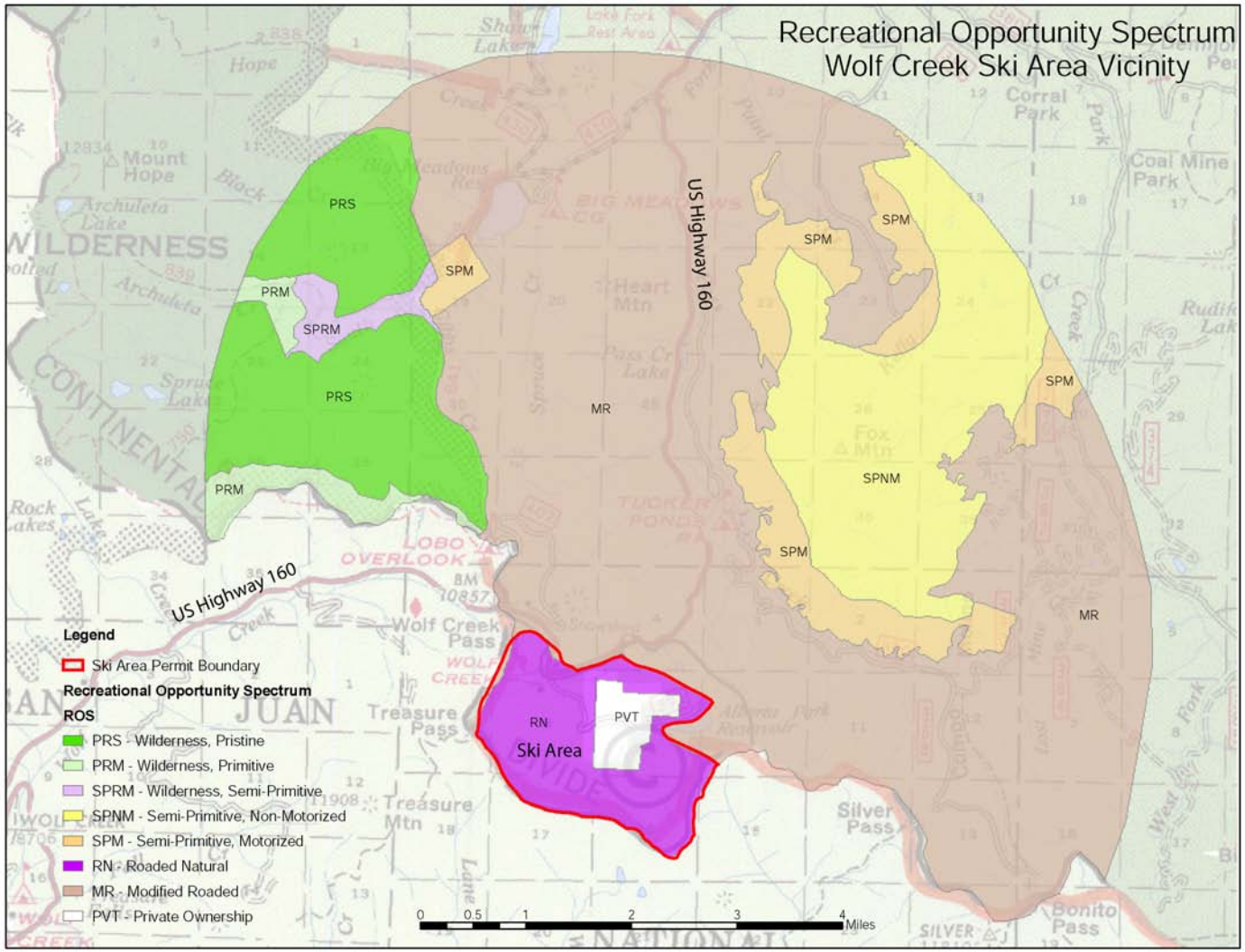


Figure 3.8-1. ROS Setting for Rio Grande National Forest Lands Surrounding the Private In-Holding.

3.8.1.1 *Winter*

NFS lands on the south side of Highway 160 at Wolf Creek Pass provide dispersed recreation opportunities in the winter. Snowmobiling is a major recreational use of NFS lands west of the Continental Divide. Snowmobiles are not confined to trails or roads. This allows users to traverse very large open areas and past timber harvested areas. Most of the moderately slopped terrain is used by snowmobile users on a regular basis.

Less than 1 mile east of Wolf Creek Pass is FSR 402, commonly referred to as Lobo Overlook Road. From the overlook area, a host of dispersed winter recreation opportunities are available. During winter months, CDOT plows a large parking area approximately 150 feet up from the intersection of FSR 402 and Highway 160. Cross country skiers, showshoers, people who build snow caves, and a few snowmobile users have to traverse up the road to access the top of the Lobo Overlook. Snowmobile users have to stay on the road and usually turn around in the Lobo Overlook parking area. Cross country skiers use the open areas and ski down the power line area. Snowshoers use the open areas of the parking area. A few cross country skiers and snowshoeres enter the Weminuche Wilderness area. Because the "snow play" and sledding area are just east of the parking area, visitors have quick access to the sledding area.

The winter use in the Wolf Creek Pass and Lobo Overlook area has been problematic in the past between the motorized (snowmobilers) and the non-motorized (skiers) recreational user groups. A task force was formed in late 2001 under the auspices of the USFS to resolve conflicts and identify reasonable solutions. After meetings between the different user groups, volunteers, and agency personnel, the task force recommended management options to the USFS. The USFS, working with the user groups and volunteers, then came up with the recommended use pattern for the various motorized and non-motorized winter use areas and signed it accordingly. By the winter of 2002-2003, the task force erected signs explaining recommendations. The current recommendations from the task force include a voluntary restriction of motorized winter traffic to the use of Lobo Overlook Road, with no off road travel. In addition, snowmobiles are recommended to forgo using areas adjacent to the Ski Area out of courtesy to Ski Area customers and terrain safety issues related to extremely steep slopes. Furthermore, all motorized and non-motorized recreational users are recommended to avoid use of the sledding and snow play area near the entrance to FSR 402. For lands surrounding Wolf Creek Pass, task force recommendations have voluntarily limited motorized use to the west side of the Continental Divide at a safe distance from the Ski Area. On the east side of the Continental Divide, motorized users are voluntarily limited to FSR 402 with no off road travel; therefore, the gentle bowls and glades below the summit of Lobo Overlook have been reserved for non-motorized users.

Highway 160 has a traffic pullout and interpretive signage acknowledging the presence and elevation of the Continental Divide at Wolf Creek Pass. During winter months the interpretive sign at the summit of Wolf Creek Pass is removed and the parking area is plowed and used for parking.

3.8.1.2 *Summer*

NFS lands on the south side of Highway 160 at Wolf Creek Pass provide dispersed recreation opportunities in the summer. Recreational users access the area for hiking on the CDNST, wildlife viewing, dispersed camping, mountain biking, photography, rock-hounding, picnicking, and horseback riding.

A few miles east of Wolf Creek Pass is FSR 402. At the end of FSR 402 there exists a microwave tower and trailhead that accesses the CDNST, and a parking lot for the Lobo Overlook observation point. In the summer, visitors drive up FSR 402 to the trailhead at the top of Lobo Overlook to better access the CDNST and the Weminuche Wilderness. Visitors also drive to the top of Lobo to access the Lobo Overlook parking area for picnicking and to take in the view and take photos of the surrounding landscape.

The Continental Divide is the boundary between the RGNF and the SJNF. All lands west of the Continental Divide are part of SJNF, and all lands east of the Divide are part of the RGNF. The CDNST crosses Highway 160 at Wolf Creek Pass (10,850 feet above mean sea level [amsl]) and continues north and south along the Continental Divide. The CDNST provides access to a broad network of trails that offer dispersed recreation opportunities and access to both the Weminuche and South San Juan Wilderness areas.

The Weminuche Wilderness is located north of Highway 160. The Weminuche Wilderness lies on both the RGNF and the SJNF. Its boundaries are drawn around the Continental Divide and it stretches from Wolf Creek Pass at its eastern extent to Highway 550 near Silverton, Colorado, at its western extent. There are numerous dispersed recreation opportunities in the Weminuche Wilderness that include hiking and backpacking, backcountry and cross-country skiing, dispersed camping, horseback riding, picnicking, fishing and hunting under regulation by the CDOW, photography, rock-hounding, and wildlife viewing. As with any wilderness area, mechanized vehicles (motorized vehicles and bicycles) are prohibited. Maximum group size is limited to 15 people. Groups traveling with livestock must not exceed 25 (with the number of people still not exceeding 15) (USDA 1999).

Both the Weminuche and South San Juan Wilderness areas are managed for an ROS setting of Semi-Primitive, Primitive, or Pristine Wilderness (Figure 3.8-1). These areas are characterized by either a high or very high probability of experiencing solitude, freedom, closeness to nature, tranquility, self-reliance, and challenge and risk. In the Weminuche Wilderness along the Continental Divide, a large amount of recreational user traffic is generated by hikers. As a result, the CDNST that accesses the wilderness area directly from Highway 160 or from Lobo Overlook tends to be more heavily traveled. The only trail that provides access to the South San Juan Wilderness from Highway 160 is the CDNST. Due to the 25-mile trail distance from Highway 160 to the South San Juan Wilderness boundary, less recreational user traffic directly attributed to wilderness access occurs; however, day hiking recreational opportunities are numerous. In addition, recreational users that decide to travel deeper into either of the wilderness areas along the CDNST tend to have a more isolated, pristine experience.

Highway 160 has a traffic pullout and interpretive signage acknowledging the presence and elevation of the Continental Divide at Wolf Creek Pass. During summer months the interpretive

sign is in place. The parking area provides visitors with the opportunity to take photos, picnic, or hike along the CDNST.

3.8.2 Wolf Creek Ski Area

3.8.2.1 *Winter*

The Ski Area has approximately 1,005 acres of skiable terrain accessed by 6 lifts to cover 50 trails. The Ski Area has an existing capacity of 4,200 skiers at one time. The base elevation of the Ski Area is at 10,300 feet amsl while the summit elevation of Alberta Peak is 11,904 feet amsl. Terrain within the Ski Area boundary ranges from beginner to expert. The percentage of each type of terrain at the Ski Area is presented in Table 3.8-1.

Table 3.8-1. Percentage of Types Terrain at the Wolf Creek Ski Area

Slopes Rating	Percentage of Total Terrain
Beginner	20
Intermediate	35
Advanced	25
Expert	20
Total	100

The longest ski run at the Ski Area is Navajo Trail, which winds for 2 miles through conifer stands and glades from the top of the Treasure Chairlift (11,775 feet amsl) to the base area (Wolf Creek Ski Corporation 2004b). The ridge at the top of the Treasure Chairlift is part of the Continental Divide and the location of the CDNST.

The average annual snowfall at the Ski Area is 39 feet; however, over the past several years, drought conditions in the southwestern U.S. have resulted in depressed snowfall averages closer to 29 feet per year. The Ski Area operates six lifts (two doubles, two triples, one quad, and one magic carpet [moving conveyor lift]) to access terrain entirely within the permitted boundary. The ski season typically begins in early November and extends through early April (approximately 145 days). Lift hours are from 8:30 a.m. to 4 p.m., 7 days a week, while the Ski Area is operational (WCSC 2004b).

The Ski Area is open to both alpine and telemark skiing, as well as snowboarding. The Ski Area considers 4,200 skiers at one time to be a comfortable capacity. The maximum capacity of all 6 lifts is 8,280 skiers per day (WCSC 2004b).

The comfortable skier capacity of 4,200 skiers at one time is often times exceeded over peak times such as holiday periods, weekends, and during Spring Break. The number of skiers during these periods fluctuates based on snow conditions and weather, but usually range from 4,000 to 5,000 skiers per day. The 2003-2004 ski season was a record year for the Ski Area with the skier count reaching 210,819 skiers. The Ski Area's single busiest day on record also occurred during the 2003-2004 ski season with approximately 6,000 skiers (Haidorfer-Pitcher 2004).

3.8.2.2 *Summer*

After the close of the ski season, the Ski Area performs maintenance items on ski lifts, equipment, and base area facilities. During the summer months, the Ski Area does not provide summer recreation services or activities.

3.8.3 Lands Adjacent to the Private Property

3.8.3.1 *Winter*

A 4.5 mile Nordic ski trail is groomed in the Alberta Park area both on NFS and private lands. Portions of this trail are used by backcountry skiers to better access the Pass Creek Yurt that lies approximately 1.5 miles from the Alberta Lake Reservoir. The privately owned Pass Creek Yurt is located at SE1/4, SW1/4, Section 2, T37N, R2E, on Pass Creek east of the Continental Divide and must be reserved by skiers intending to use it.

3.8.3.2 *Summer*

In the summer, Alberta Park Reservoir is known to attract individuals interested in dispersed recreation opportunities such as wildlife viewing, photography, hiking, boating, fishing, picnicking, and camping. The CDOW manages Alberta Park Reservoir as a Rio Grande cutthroat, rainbow, and brook trout fishery. There are no developed recreation resources at Alberta Park Reservoir; however, there is a primitive boat ramp for launching small boats.

3.9 TRAFFIC AND TRANSPORTATION

The private property owned by the Applicant lies on the south side of Highway 160 approximately 1 mile from Wolf Creek Pass. The private property is located to the east of the Ski Area entirely within the Ski Area boundary. Highway 160 passes through Wolf Creek Pass at an elevation of 10,850 feet. Currently, FSR 391 connects Highway 160 with Alberta Lake and crosses portions of the Village, and is the only access from Highway 160 to the private property.

The majority of Highway 160 between Pagosa Springs and South Fork is a two lane highway with portions of the route comprised of four lanes. In 2003, the Annual Average Daily Traffic Count on Highway 160 north of County Road AA (in Pagosa Springs) is 2,271 vehicles per day, and 11.5 percent of this total is truck traffic. The Annual Average Daily Traffic Count on Highway 160 between Pagosa Springs and South Fork is 6,573 vehicles per day with 8 percent comprised of truck traffic based on 2003 data (CDOT 2004a). There are several construction projects occurring on Highway 160, accommodating future traffic projections and providing additional safety features.

Based on the alternatives requiring access off of Highway 160, an access permit may be required by CDOT. The access would need to comply with the State of Colorado Access Code. The code provides procedures and standards to protect the functional level of public highways while meeting state, local, and private transportation needs. Access feasibility requires the following parameters:

- Trip Generation estimates and traffic study
- Access feasibility through existing access locations, including discussion of peak and seasonal daily volumes
- Intersection design
- Location of and spacing of intersections
- Safety
- Geometric layout

Local road access would require approval through the USFS and Mineral County planning process, and adhere to USFS and Mineral County road design guidelines. Specific to these criteria include:

- Roadway width
- Roadway slope
- Adequate snow storage and drainage

- Adequate horizontal and vertical geometry

- Parking lot traffic flow impact studies for appropriate alternatives

The proposed Village is entirely within the Ski Area boundary. Present comfortable ski capacity is 4,200 people. Using the Ski Area's estimate, this equates to 0.5 vehicles per skier, or 2,500 vehicles (Pitcher 2004b). The SUP for the Ski Area provides for a maximum skier population of 11,800 skiers/day.

The alternative access locations would have varying traffic counts based on the combined and non-combined uses as well as seasonal effects of the Ski Area.

3.10 CULTURAL RESOURCES

Cultural resources are those aspects of the physical environment that relate to human culture, society, and cultural institutions that hold communities together and link them to their surroundings. Cultural resources include expressions of human culture and history in the physical environment, such as prehistoric and historic sites, buildings, structures, objects, districts, natural features, and biota that are considered important to a culture, subculture, or community. Cultural resources include aspects of the physical environment that are a part of traditional lifeways and practices, and are associated with community values and institutions.

3.10.1 Cultural Resource Types

Cultural resources include prehistoric and historic archaeological sites, architectural properties, and ethnographic resources. Archaeological sites are the tangible remains of past activities that show use or modification by people. Archaeological sites are distinct geographic areas that can include artifacts, features such as hearths, road remnants, homesteads, or landscape alterations. In general, archaeological sites are the locations of purposeful human activity that have resulted in the deposit of cultural materials beyond the level of a few accidentally lost artifacts. Remains that do not meet this criterion are still archaeological in nature, but are described as isolated occurrences. Prehistoric archaeological sites refer to cultural resources used or modified by people before the presence of Europeans in the region in the 18th century. Historic archaeological sites are those cultural resources used or modified since the arrival of Europeans in the region. Architectural properties, such as homestead cabins, can be part of larger archaeological sites or can be considered alone.

Cultural resources that have a direct and current association with a living culture may be considered ethnographic resources. These resources can include traditional cultural properties (TCPs), or Native American sacred sites and religious resources. TCPs are places or objects that are important to a particular living community, and this importance is "derived from the role the TCP plays in the community's historically rooted beliefs, customs, and practices" (Parker and King 1990). TCPs are associated with the cultural practices and beliefs that are based in a community's history or important in maintaining the cultural identity of the community. TCPs are not limited to a certain ethnic group; rather Americans of every ethnic origin have properties to which they ascribe traditional cultural value. In south-central Colorado, Hispanic culture and Native American groups in particular have maintained traditional communities, practices, beliefs, and subsistence patterns.

3.10.2 Significance of Cultural Resources

The long history of legal jurisdiction over cultural resources, dating back to 1906 with the passage of the *Antiquities Act* (16 U.S.C. 431-433), demonstrates a continuing concern on the

part of Americans for their cultural resources. Foremost among these statutes are the NHPA of 1966, as amended (16 U.S.C. Section 470), and its revised implementing regulations (36 CFR Part 800). This statute describes the process for identification and evaluation of cultural resources, assessment of the effects of Federal actions on important resources, and consultation to avoid, reduce, or mitigate adverse effects. The NHPA does not require preservation of cultural resources, but does ensure that Federal agency decisions concerning the treatment of these resources result from meaningful consideration of cultural and historic values, and identification of options available to protect the resources.

Identified cultural resources are fully recorded and evaluated to determine if they are eligible for listing on the National Register of Historic Places (NRHP). To be determined eligible, a resource must retain most of seven aspects of integrity, be at least 50 years old (though there are exceptions to this), and meet one of four criteria of significance. Resources that are determined eligible are afforded consideration under the NHPA and are called *historic properties*. If a Federal action will adversely affect an historic property, then measures must be considered to avoid, reduce, or mitigate the effect.

3.10.3 Tribal Consultation

Various statutes require consultation with Native Americans to identify cultural resources important to tribes and to address tribal concerns for potential impacts on these resources. These statutes include the NHPA, *American Indian Religious Freedom Act* (AIRFA) of 1978 (42 U.S.C. 1996), *Native American Graves Protection and Repatriation Act* (NAGPRA) of 1990 (25 U.S.C. 3001), Executive Order 13007 *Indian Sacred Sites* (61 FR 26771), and Executive Order 13175 *Consultation and Coordination with Indian Tribal Governments* (65 FR 67249). Federal guidelines direct agencies to consult with Native American tribal leaders and others knowledgeable about cultural resources important to them. Consultation addresses Federal actions with the potential to affect locations of traditional concern, religious practices, areas of traditional cultural uses, archaeological sites, and other modern and/or ancestral tribal remains.

3.10.4 Definition of the Region of Influence

Information on cultural resources that could be impacted by the Proposed Action or the alternatives was collected through systematic cultural resource inventories of the region of influence (ROI). The ROI was determined to be the area within which construction activities would take place. The systematic inventories included Class I site records search, archaeological field survey, and report preparation. The inventories covered 100 percent of the areas where construction activities would take place, including:

- 287.5-acre Village parcel

- Tranquility Road, adjacent corridors for proposed utilities, and the additional 250 feet of proposed new road

- Snow Shed - East Village alternative access road and adjacent utility corridors

- the optimal utility corridor

3.10.5 Results of Cultural Resource Inventories in the ROI

A cultural resource inventory was conducted for the proposed Village project area, Tranquility Road, adjacent utility corridors, and the additional 250 feet of new access road in 1984 by RGNF personnel (RGNF 1985). The inventory was originally conducted for the proposed land exchange and consisted of a block area of 480 acres, within which the above-listed project elements would be located. This inventory included research of previously conducted inventories within the survey area, field survey of 480 acres, and preparation of a report.

A cultural resource inventory was conducted for the Alternative 3 access road, adjacent utility corridors, and the optional utility corridor in 2004 (RGNF 2004b). The inventory included research of previously conducted inventories within the survey area, field survey of 13 acres, and preparation of a report. The corridors for the field survey of the access road and utility corridors were wider than needed for construction to allow for realignments to avoid important cultural resources, and to include ample room for construction activities.

These two inventories identified two archaeological sites and three isolated occurrences within the surveyed areas, all located within the Village project area. No archaeological materials were found within the project areas for any of the roads or the utility corridors under Alternative 2, 3, and 4. The archaeological sites include 5ML110 and 5ML01, both open lithic scatters with no culturally diagnostic material. The isolated occurrences include a scatter of four stone flakes (5ML111), a basalt scraper and two basalt flakes (5ML112), and an obsidian projectile point midsection (5ML113). The inventories fully recorded and evaluated all of these resources to determine if they are eligible for listing on the NRHP. The USFS has determined that the two sites and three isolated occurrences are not eligible for inclusion in the NRHP, and thus are not historic properties (RGNF 1985).

Both of the inventory reports were submitted to the Colorado SHPO for consultation to comply with Section 106 of the NHPA. The SHPO concurred on the RGNF's determinations of eligibility and potential effect for both inventories.

3.10.6 Results of Tribal Consultation

Another phase conducted to identify cultural resources was consultation with interested Native American tribes. USFS sent a consultation letter, in the form of a Tribal Consultation Bulletin, to the following tribes in March 2004: Southern Ute Indian Tribe, Ute Mountain Ute Tribe, Northern Ute Tribe, Jicarilla Apache Nation, Navajo Nation, Hopi Tribe, San Ildefonso Pueblo, Santa Clara Pueblo, Pojoaque Pueblo, Tesuque Pueblo, Nambe Pueblo, San Juan Pueblo, Picuris Pueblo, Taos Pueblo. Two of the tribes, the Jicarilla Apache Nation and the Southern Ute Indian Tribe, have expressed an interest in continuing consultation regarding the proposed project. Consultation efforts are being initiated with these two tribes and will continue through preparation of the Final EIS.

3.11 SOCIAL ENVIRONMENT

This section describes the social and economic environment that would be potentially affected by the Proposed Action and alternative actions. The social and economic environment of a region is characterized by its demographic composition, the structure and size of its economy, and the types and levels of public services available to its citizens. Accordingly, this socioeconomic analysis evaluates the potential effects of the Proposed Action on the surrounding region's population growth, employment and income levels, business activities, housing stock, public services, environmental justice, and the protection of children.

The socioeconomic environment evaluated for this EIS encompasses three counties in southwestern Colorado—Mineral, Archuleta, and Rio Grande. These counties form the economic ROI and define the geographic area in which the predominant social and economic impacts would occur. The study recognizes that the ROI covers a broader area than would likely be impacted by the proposed Federal Action. However, when combined with other reasonably foreseeable actions, the cumulative impacts would likely extend well beyond the boundaries for Mineral County in which the proposed Federal action would be implemented. Hence, the affected environment presented is for the larger three-county area, which includes Mineral County.

The baseline year for the impact analysis is 2004, although much of the economic and demographic data for the ROI are available only through the year 2000. Wherever possible, the most recent data available will be presented so that the affected environment descriptions are reflective of current conditions in the ROI.

3.11.1 Population

The three counties comprising the economic ROI are generally rural and sparsely populated (Table 3.11-1). Only two counties in the state of Colorado (Hinsdale and San Juan) had smaller populations than Mineral County. A majority of Mineral County is comprised of Federal land and is not available for development. Mineral County has a population density of 0.9 persons per square miles, compared to population densities of 8 and 13.2 persons per square mile for Archuleta and Rio Grande Counties, respectively. The State of Colorado has a population density of 41.5 persons per square miles, which is still only a little more than half the U.S. population density of 79 persons per square mile. However, it should be noted that the vast majority of Mineral County is Federal land and not available for development.

The populations of Mineral and Rio Grande Counties have increased slowly between 1970 and 2000. Mineral County has increased by 80 persons or approximately ten percent in the last three decades. The population of Rio Grande increased by about 20 percent during the same period, but recent Census population estimates indicated a small decrease in population between 2000 and 2002. Of the three ROI Counties, only Archuleta County has experienced robust growth, even exceeding the strong growth seen throughout the State of Colorado. In fact, for the last ten years, Archuleta has been the 10th fastest growing county in the U.S. (percentage growth). As shown in Table 3.11-1, the population of Archuleta County increased from 2,733 in 1970 to 9,898 in 2000. During the 1990s, the County increased at an annual rate of 6.5 percent. Archuleta County added another 10 percent during the period of 2000 to 2002. During this same 30-year period, the population of the State of Colorado more than doubled. Table 3.11-2

provides percentage changes in population for each of the counties presented in Table 3.11-1. Data for Colorado and the U.S. are also provided for comparison purposes.

Table 3.11-1. Total Population[a, b]

Location	1970	1980	1990	2000	July 1, 2002
Mineral County	786	804	558	831	860
Archuleta County	2,733	3,664	5,345	9,898	11,012
Rio Grande County	10,494	10,511	10,770	12,413	12,273
ROI	14,013	14,979	16,673	23,142	24,145
Colorado	2,207,259	2,889,964	3,294,394	4,417,714	4,501,051
U.S.	203,211,926	226,545,805	248,709,873	281,421,906	287,973,924

[a] Source of 1970, 1980, and 1990 data: Census 1995.
[b] Source of 2000 data: Census 2000a.

Table 3.11-2. Percent Population Change

Location	% Change 1970–1980	% Change 1980–1990	% Change 1990–2000	% Change 1970–2000
Mineral County	2.3	-31.0	49.0	9.4
Archuleta County	34.1	45.9	85.2	303.0
Rio Grande County	0.2	2.5	15.3	17.0
ROI	6.9	11.3	38.8	72.3
Colorado	30.9	14.0	34.1	100.0
United States	11.5	9.8	13.2	38.5

Recent demographic forecasts by the Colorado State Demography Section (Colorado State Demographic Section 2003) indicate relatively slow population growth for most of the ROI. As seen in Table 3.11-3 below, Archuleta County is projected to have continued strong growth relative to Mineral and Rio Grande counties. For example, Archuleta is forecasted to have an annual growth rate exceeding 3 percent throughout the period 2005 to 2020, while Mineral and Rio Grande Counties are projected to have annual growth rates much closer to 1 percent, especially in the years 2010 to 2020.

Table 3.11-3. Population Projections for the ROI Counties

County	July 2005	July 2010	July 2015	July 2020	Annual % Change 2005-2010	Annual % Change 2010-2015	Annual % Change 2015-2020
Mineral	911	989	1,039	1,111	1.7	1.0	1.3
Archuleta	12,100	14,449	16,934	19,813	3.6	3.2	3.2
Rio Grande	12,767	13,359	14,071	14,691	0.9	1.0	0.9
ROI	25,778	28,797	32,044	35,615	2.3	2.2	2.2

Source: Colorado State Demographic Section 2003.

3.11.2 Employment and Unemployment

3.11.2.1 *Employment*

The ROI civilian labor force, which is made up of all civilians 16 years of age and over, was 12,481 in 2003 (see Table 3.11-4). Consistent with the ROI's population distribution, more than half the ROI's labor force resides in Rio Grande and less than 4 percent reside in Mineral County (Table 3.11-4).

Table 3.11-4. ROI Civilian Labor Force

County	1994	2000	2003
Mineral	372	455	479
Archuleta	3,236	4,776	5,329
Rio Grande	5,030	5,196	6,673
ROI	8,638	10,427	12,481

Source: Colorado Department of Labor and Employment 2004.

As noted above in Section 3.11.1.1, the ROI is a rural and sparely populated area. There are no military bases, Federal facilities, state prisons, commercial airports, or institutions of higher learning. The vast majority of businesses in the ROI employ less than 10 workers. In Mineral County, all establishments are small businesses with less than 20 employees. Tourism, agribusiness, and state and local governments are currently the major sources of employment in the ROI. It is worth noting that because the populations of the counties comprising the ROI are so small, regional employment levels and distribution among the different sectors can be volatile on a year-to-year basis. For example, the closure or opening of a single facility can significantly alter the level and distribution of employment among the different sectors. Nonetheless, as seen in Table 3.11-5, employment changes in the ROI during the past two decades indicate a strong trend toward jobs in tourism and other related service sectors.

The ROI's employment trend is similar to many other areas in the U.S., where regional economies have become more service sector-oriented and less dependent on traditional manufacturing sectors to generate employment.[1] The service sector in the year 2000 generated almost a quarter of all jobs in the ROI compared to about 15 percent in 1990. More recent Bureau of Economic data indicate that this trend is continuing. In the year 2001, for example, 1,167 jobs in the ROI (9.5 percent of total employment) were associated with the accommodation and food services subsector.[2] In Mineral County, this subsector accounted for 137 jobs, or more than 17 percent of all jobs in the County. The tourism sector, which includes

[1] The services industry includes establishments primarily engaged in providing a variety of services, such as hotels and other lodging places; establishments providing personal, business, repair, and amusement services; health, legal, engineering, and other professional services; educational institutions; membership organizations; and other miscellaneous services (OSHA 2001).

[2] Starting in the year 2001, BEA began providing employment by NAICS code, rather than by SIC code. Hence, employment in the accommodation and food services sector was included in the services sector numbers in the 2000 and 1990 data.

the accommodation and services subsector, is estimated to account for more than 70 percent of all jobs in Mineral County. In Archuleta County, accommodation and food services businesses generated 734 jobs and accounted for almost 12 percent of the County's employment. Rio Grande was the least dependent of the three counties on this subsector for employment; about 433 jobs and or 6 percent of the County's total employment were associated with accommodation and food services.

The public sector, especially the local and state government remains an important source of employment in the ROI, accounting for almost 12 percent of all jobs in 2000. The construction sector has also increased in size during the past decade, growing from less than 300 jobs in 1990 to more than 1,536 jobs in 2000. Most of these jobs have been generated in Archuleta and Rio Grande counties. Finally, historically important sectors such as agriculture and mining have remained stagnant or have declined in the past decade (see Table 3.11-5) as employment has shifted to service sector jobs. Employment in the agriculture and mining sectors accounts for about half the percentage of ROI jobs generated in 2000 compared to 1990. This trend is likely to remain unchanged in the foreseeable future as the ROI economy continues to transform to a more service oriented economy and one that is less rural than in the past.

3.11.2.2 *Unemployment*

The ROI unemployment rate has varied greatly over time and among the three counties comprising the region. For example, at the end of 2003, the unemployment rate in the ROI ranged from 3.6 percent in Mineral County to 7.5 percent in Rio Grande County. Archuleta County had an unemployment rate in December 2003 of 5.7 percent. The unemployment rate for the ROI as a whole in December 1993 was 6.4 percent. Statewide the unemployment rate was 5.9 percent (BLS 2004a).

During the past decade, unemployment rates have reached as high as 9 percent in Mineral County (1994) and 10 percent in Rio Grande County (1996). The unemployment rate, in Mineral County has been as low as 2.4 percent (2002) (BLS 2004a). As noted earlier the large annual volatility in unemployment rates can be partially attributable to the very small populations and labor force residing in the ROI. In 2002, the civilian labor force for the ROI totaled only 11,003 persons.

Table 3.11-5. Employment by Industry (Number of Jobs)

	1980					1990					2000				
Industry Sector	**Mineral**	**Rio Grande**	**Archuleta**	**ROI**	**Pct.**	**Mineral**	**Rio Grande**	**Archuleta**	**ROI**	**Pct.**	**Mineral**	**Rio Grande**	**Archuleta**	**ROI**	**Pct.**
Agric. Ser., Forestry, Fishing	D	473	14	487	6.4	L	533	67	600	6.8	D	779	124	903	6.6
Mining	D	12	50	62	0.8	D	104	34	138	1.6	L	36	49	85	0.6
Construction	10	241	158	409	5.3	10	234	D	244	2.8	99	451	986	1,536	11.2
Manufacturing	12	361	48	421	5.0	12	348	72	462	5.2	D	348	133	481	3.5
Transportation Public Utilities	L	224	39	263	3.4	L	180	80	260	2.9	L	295	121	416	3.0
Wholesale Tr.	L	254	11	265	3.5	L	460	D	460	5.2	0	388	52	440	3.2
Retail Trade	83	692	249	1,024	13.4	83	697	525	1,305	14.7	97	954	1,185	2,235	16.3
Finance, Insurance, Real Estate	D	301	D	301	3.9	D	345	268	613	6.9	D	680	939	440	3.2
Services	86	998	D	1,084	14.1	171	1,185	D	1,356	15.3	327	1,463	1,555	3,345	24.3
Government	76	810	299	1,185	15.5	80	930	409	1,419	16.0	102	1,001	586	1,619	11.8
Total Nonfarm Employment	736	4,366	1,596	6,698	87.4	410	5,653	2,569	7,995	90.2	702	6,395	5,730	12,287	89.4
Farm Employment	21	751	195	967	12.6	20	703	215	872	9.8	21	373	248	642	4.7
Total Employment	757	5,117	1,791	7,665	100.0	433	5,016	2,784	8,867	100.0	723	7,089	5,978	13,748	100.0

Source: BEA 2004a.

D=Not shown to avoid disclosure of confidential information, but the estimates for this item are included in the totals. L= Less than 10 jobs, but the estimates for this item are included in the totals

3.11.3 Current Tourism Economic Impacts on the ROI

Tourism is a growing source of employment in the ROI economy during the past two decades, as more traditional industries such as agribusiness have declined in importance (as shown in Table 3.11-5, farm employment decreased between 1980 and 2000). The degree to which the individual counties comprising the ROI are dependent on tourism, however, varies greatly. As noted above, Mineral County is the most dependent on tourism, with 64 percent of the jobs in the county linked to tourism. Rio Grande County was the least dependent of tourism, with only 8 percent of total employment associated with tourism. In Archuleta County about 30 percent of all employment is linked to tourism activities.

Several different studies have been performed to estimate the employment and income impact of tourism in Colorado at the state, regional, and county levels. Although none of the studies estimate the number of annual visitors to the region, estimates were made on total spending and resulting income and employment generation.

Dean Runyan Associates, in a study for the Colorado Tourism Board, estimated that in the year 2000, direct spending by tourists in the region totaled $60.1 million and generated 1,500 direct jobs. The study indicated that average annual spending increased by about 6.9 percent during the period 1996 to 2000. Direct employment levels, however, remained unchanged. Total ROI employment in 2000 was 13,748, hence direct tourism employment accounted for about 11 percent of the regional jobs. As seen in the Table 3.11-6, Archuleta County accounted for almost half the employment and earnings generated by tourist spending in the tri-county region.

Table 3.11-6. Tourist Direct Impacts on the ROI in Year 2000

	Direct Spending (millions $)	Earnings (millions $)	Employment
Archuleta	28.9	10.7	700
Mineral	11.2	3.8	300
Rio Grande	20	6.8	500
Region Total	60.1	21.3	1,500

Source: Colorado Tourism Office and Dean Runyan Associates 2001.

Other studies performed for the Colorado Tourism Board indicate a larger impact of tourism on the regional economy. These studies, performed by the Center of Business and Economic Forecasting and Southwest Colorado Travel Region (SWCTR), took into account indirect impacts of tourism as well as the impacts of vacation homes. Tourism related jobs accounted for 19 percent of the region's employment. For example, construction and real estate jobs generated by the construction and sale of vacation homes accounted for 567 of the estimated 1,649 jobs generated by the tourist sector in the year 2000 (Table 3.11-7). Retail trade is also a significant component of tourism related jobs in Archuleta County; the SWCTR study estimates that 640 jobs in this sector are generated by tourism.

Table 3.11-7. Tourist Direct and Indirect Impacts on the ROI in Year 2000

	Employment Income (million $)	Employment
Archuleta	24.15	1,649
Mineral	6.89	419
Rio Grande	10.33	521
Region Total	41.37	2,591

Source: Southwest Colorado Travel Region 2002.

The overall findings of the SWCTR study were that tourism related employment increased moderately over the period 1997 to 2000, with the largest increases taking place in the real estate and construction sectors, primarily as a result of second home construction and use. These conclusions comport with the Dean Runyan Associates Study that assessed only the impacts traveler spending has on direct jobs in the tourism sector (e.g., lodging, restaurants). That study indicated no job growth in this sector during the period 1996 to 2000.

3.11.4 Personal Income

The ROI economy has lagged behind Colorado and the rest of the nation in generating income growth. As shown in Table 3.11-8, the ROI as a whole, as well as the three counties, has a significantly lower per capita income than the State of Colorado and the U.S. In fact, during the past decade, all three counties have lagged behind in income growth compared to Colorado and U.S. as a whole. For example, in 1990, the ROI per capita income (PCI) was $14,671, or 77 percent of the national PCI of $29,760.[3] In the year 2000, the ROI PCI increased to $19,680, but dropped to 66 percent of the national per capita income. In contrast, the PCI for the State of Colorado increased from near parity with the United States per capita income to a level of more than 11 percent above the nation per capita income.

Table 3.11-8. Per Capita Income of ROI, Colorado, and the United States[a]

Region	1990 Per Capita Income	2000 Per Capita Income	Percent U.S. Per Capita Income 1990	Percent U.S. Per Capita Income 2000
Mineral	16,262	21,198	83	71
Rio Grande	15,569	20,585	80	69
Archuleta	12,992	18,439	66	62
ROI	14,761	19,680	77	66
Colorado	19,680	33,060	101	111
United States	19,572	29,760	100	100

Source: BEA 2004b.

[a] All Per Capita Income dollar amounts presented are in nominal dollars (i.e., current dollars, not adjusted for inflation), as reported by BEA.

[3] All PCI dollar amounts presented are in nominal dollars (i.e., current dollars, not adjusted for inflation), as reported by BEA.

3.11.5 Government Finance

The three counties comprising the ROI largely rely on property taxes and intergovernmental revenues to fund their operations. In Mineral County, for example, intergovernmental revenue (Federal transfers, and allocation of State Highway users taxes) accounted for more than 40 percent of the total revenue received by the Mineral County in 2001. In the Rio Grande County, intergovernmental revenues accounted for more than 50 percent of the total revenue received by the Rio Grande County government. In Archuleta County, property and sales taxes accounted for the larges share of government revenue. Table 3.11-9 provides a breakdown of revenue sources for each of the ROI Counties.

Table 3.11-9. ROI Revenue Sources

Revenue Source	Mineral	Archuleta	Rio Grande
Total Taxes	$770,447	$5,901,521	$2,745,761
Intergovernmental	$787,807	$3,409,174	$4,591,220
Miscellaneous[a]	$250,197	$1,971,197	$772,842
Total Revenue	$1,808,451	$11,445,852	$8,121,506

Source: Colorado Department of Local Affairs, 2004.
[a] Charges for service, fines and forfeits, licenses and permits, and other sources.

Major expenditures for each of the jurisdictions included public safety, public works, and social services, as well as spending on education.

3.11.6 Housing

The ROI housing stock is summarized in Table 3.11-10, which identifies both owner-occupied and renter-occupied homes, along with median home values, for each county in the ROI and for the ROI as a whole. The housing units identified in Table 3.11-10 include all structure types (e.g., single-family homes, apartments, and mobile homes). Mineral County, the smallest of the three counties in the ROI in terms of land area and population, accounts for 8 percent of the ROI's housing stock. Archuleta County and Rio Grande County each account for about 45 percent of the ROI housing stock. The median home value ranges from $82,400 in Rio Grande County, to $167,400 in Archuleta County.

Table 3.11-10. 2000 ROI Housing Stock

	Archuleta County	Mineral County	Rio Grande County	ROI
Total Housing Units	6,212	1,119	6,003	13,334
Occupied Housing Units	3,980	377	4,701	9,058
Owner-occupied	3,057	279	3,323	6,659
Renter-occupied	923	98	1,378	2,399
Vacant Housing Units	2,232	742	1,302	4,276
Vacant for Seasonal, Recreational, or Occasional Use	1,456	672	761	2,889
Vacancy Rate, Homeowner	4%	7%	2%	4% (average)
Vacancy Rate, Rental	11%	4%	9%	8% (average)
Median Home Value (Owner-occupied)	$167,400	$127,400	$82,400	$127,400 (median of ROI)

Source: Census 2000b.

The majority of the housing units in the ROI are single-family homes (70 percent, or 9,332 units). Mobile homes account for 14 percent (1,894 units) of the housing stock. Multifamily units (2 units up to 20 or more units in one structure) comprise 13 percent of the housing stock (1,717 units). Most importantly, the ROI housing market is characterized by the large proportion of housing units used for recreational purposes.

Between 1980 and 2000, 6,837 new homes were built in the ROI (Table 3.11-11). Archuleta County accounted for the largest number of these new homes, with 65 percent of the new housing units built in the ROI, followed by Rio Grande County with 28 percent (Census 2000b). Mineral County, with less than 10 percent of the population of either Archuleta or Rio Grande County, also has the smallest housing market. In Mineral County, 483 homes were built between 1980 and 2000, or just 7 percent of the total number of housing units built in the ROI during that time period. Eighty-nine percent of the housing units in the Mineral County are single-family homes; the county has 18 multi-family units (14 duplexes, and 4 structures with 10 to 19 housing units).

Table 3.11-11. Number of Housing Units Built, 1980-2000

Year	Archuleta County	Mineral County	Rio Grande County	ROI
1999 to 2000	505	56	235	796
1995 to 1998	1,223	123	636	1,982
1990 to 1994	1,129	127	420	1,676
1980 to 1989	1,603	177	603	2,383
Total, 1980-2000	4,460	483	1,894	6,837
Total, 1990-2000	2,857	306	1,291	4,454

Source: Census 2000b.

3.11.7 Quality of Life

Quality of life encompasses those attributes or resources (man-made or naturally occurring) of a region that contribute to the well-being of its residents. The relative importance of these attributes to a person's well-being is subjective (e.g., some individuals consider outdoor recreational opportunities essential to their well-being, others require access to cultural institutions essential to their quality of life, and still others may hold public safety as their primary quality-of-life concern). NEPA quality-of-life analyses typically address issues relating to potential impacts of the Proposed Action on the availability of public services and leisure activities that contribute to quality of life of an affected ROI's inhabitants. For purposes of this study, the quality of life affected environmental includes public schools, law enforcement, medical facilities, and fire protection services. Recreational opportunities, including sporting, shopping, and cultural resources are also described.

The counties of the San Luis Valley are uniformly characterized by low population density, slow population growth, high unemployment, and low annual per capita income. In general, the residents of the San Luis Valley have retained a significant portion of their past heritage. Settlement began prehistorically as early as 10,000 B.C., and a significant American Indian presence, by the Utes, continued until around 1881. The American Indian population in the valley is low in numbers and dispersed, consisting of individual family groups. The nearest

American Indian population centers are located about 100 miles away on the lands of the Southern Ute, the Ute Mountain Ute, the Jicarilla Apache, and the Taos Pueblo. Both local American Indians and those in more distant population centers view portions of the San Luis Valley and the surrounding mountains as areas of cultural importance. Ceremonial sites and traditional gathering areas for certain plants and other materials exist on the RGNF.

By the 1850s permanent agriculture settlement, generally by Hispanics from New Mexico, began to increase. For generations, rural residents of Hispanic descent have relied upon woodland and grassland resources to satisfy subsistence needs for food, fuel, and building materials. This system of resource use is linked to deeply rooted traditional value systems. Many rural Hispanics presently chose to live in somewhat traditional ways, including farming family plots, hunting and gathering to supplement the diet, gathering wood for heating and cooking, grazing small herds of domestic animals, and obtaining materials from nearby public lands for producing traditional cultural objects.

By the 1870s there was a significant increase of foothill and high-country grazing by sheep and cattle. Today, many of these ranchers are managed by descendents of original landowners. As permittees, a number of these families have been grazing sheep and cattle on the same areas of the Forest since it was formed in 1908. Activities such as procuring posts and/or corrals are often done on the Forest.

More extensive farming activity began in the 1880s, especially near Monte Vista, where large irrigation canals were built. These larger farms were developed mostly by Anglos during this period of settlement. Many descendents of the original families are still farming the same land. These, and other farmers who settled later, make up a cultural group which dominates many rural areas of the Valley. This cultural group is generally family oriented and their use of the Forest is generally recreational based. A number of these families maintain reservoirs, mostly small in size, on the Forest, some dating back to 1908, when the Forest was established.

Subsistence use of the Forest plays a serious role in the lives of all cultures present. Hunting, fishing, plant gathering, trapping, and firewood gathering are all important uses of the Forest.

3.11.7.1 *Schools*

The ROI has 5 public school districts with a total of 18 primary and secondary schools serving a student population of about 4,200 (Tables 3.11-12 and 3.11-13). All of the schools in the ROI have student/teacher ratios lower than the state and national averages of 16.8 and 15.9, respectively, with the exception of the Archuleta County School District, which has a ratio of 17.3. Each county's public school district provides education facilities for those students residing in the small towns and rural areas throughout the counties in kindergarten through 12th grade. The "other school" identified in Table 3.11-12 is an alternative school/development center.

Table 3.11-12. Public Schools in the ROI

School Districts by County	Elementary	Inter-mediate	Middle/ Junior High	Junior/ Senior High	High Schools	Other Schools	Total Number of Schools
Archuleta County							
Archuleta County 50 Jt	1	1	1		1		4
Mineral County							
Creed Consolidated 1	1			1			2
Rio Grande County							
Del Norte C-7	2		1		1		4
Monte Vista C-8	2		1	1	1	1	6
Sargent Re-33j	1			1			2
Totals	7	1	3	3	3	1	18

Source: NCES 2003.

Table 3.11-13. 2001–2002 School Year Public Education Inventory by School District

School Districts by County	Student Enrollment	Number of Teachers	Student/Teacher Ratio
Archuleta County			
Archuleta County 50 Jt	1,565	90	17.3/1
Mineral County			
Creed Consolidated 1	155	17	8.9/1
Rio Grande County			
Del Norte C-7	709	58	12.2/1
Monte Vista C-8	1,409	99	14.3/1
Sargent Re-33j	413	31	13.2/1
Total for Rio Grande County	2,531	188	13.5/1
Total for the ROI	4,251	295.8	14.4/1

Source: NCES 2003.

The Archuleta County School District schools are operating within their capacity, with no student enrollments beyond design capacity. A new high school (Pagosa Springs High School) was completed 4 years ago. The district has no plans for building any new schools or expanding any schools (Bennett 2004).

Schools in Mineral County's Creede Consolidated School District are at or above capacity. Module units are needed to accommodate the number of students in the second and fifth grades. The district has no plans to construct new schools or expand the existing schools. There has been discussion of the need for more classroom space, but no plans have been made because of lack of funding (the state budget deficit has resulted in a decrease in education spending) (Stroh 2004).

The three school districts in Rio Grande County are operating at or below capacity. Two of the districts (Del Norte and Monte Vista) have experienced declines in student enrollment during the last several years. The Del Norte District built a new middle school and high school about 10 years ago. The Monte Vista School District constructed a new elementary school and added an addition to a middle school, also about 10 years ago. The construction was completed to relieve overcrowding at that time. There are no future plans for school construction or expansion in any of the school districts in Rio Grande County (Foster 2004, Montoya 2004, Vehill 2004).

The public school districts in the ROI receive funding from local, state, and Federal sources. However, the most revenues to public schools are provided through the *Public School Finance Act* of 1994 (as amended). The legislation provides for school funding via state taxes, vehicle registration taxes, and local property taxes (CDE 2003). Funding levels are a reflection of the student body size of each district. Consequently, Rio Grande County receives the highest level of funding and Mineral County receives the lowest level. Table 3.11-14 lists revenue by source for each district for the 2001–2002 school year. Federal funds constituted the smallest contribution to each school district, with funding ranging from 1.9 percent to 7.6 percent of total revenue. Local funding typically made up the largest funding source for each school district, with the exception of Rio Grande, which received greater funding from state sources than from local or Federal sources.

Table 3.11-14. Revenue by Source by District, 2001–2002 School Year

School District	Local	Local Percent	State	State Percent	Federal	Federal Percent	Total
Archuleta County	$6,665,259	59.2	$4,078,230	36.2	$516,131	4.6	$11,259,620
Mineral County	$875,974	49.2	$871,055	48.9	$33,487	1.9	$1,780,515
Rio Grande County	$6,040,116	31.2	$11,839,079	61.2	$1,469,164	7.6	$19,348,359

Source: CDE 2003.

3.11.7.2 *Public Safety*

Police Services

Table 3.11-15 shows an ROI total of 83 law enforcement personnel, including sheriffs, deputies, police officers, dispatchers, and other staff. Together these law enforcement personnel cover a land area of about 3,100 square miles and a population of almost 24,000. This averages out to about 1 law enforcement employee per 38 square miles of the ROI, and about one staff per 286 people in the ROI. When looking at just Mineral County, the county has 1 law enforcement employee per 63 square miles, or 58 persons per employee.

Fire Services/EMS

Fire protection services in the ROI are provided through the Mineral County Fire Department, municipal fire departments in Rio Grande County, and the Pagosa Springs Fire Protection District (PSFPD) in Archuleta County. Table 3.11-16 lists fire protection personnel by county. In general, these fire departments cover large territories and can travel large distances to fight fires. Many of the fire departments have mutual aid agreements to provide fire-fighting assistance when needed.

A central emergency dispatch and response 911 service is available in all three counties in the ROI. The Upper San Juan Health District (USJHD) provides ambulance service to Mineral County, as well as to Archuleta County. The USJHD has 4 ambulances and 2 quick-response vehicles, 8 full-time employees and 14 part-time employees (USJHD 2004).

Table 3.11-15. Police Resources for the ROI

Agency	Full-Time Employees
Archuleta County[a]	
County Sheriffs Office	11
Municipal Police	8
Mineral County[b]	
County Sheriffs Office	3
Municipal Police	11
Rio Grande County[2]	
County Sheriffs Office	22
Municipal Police	28
Total ROI	83

[a] Source: Archuleta County Sheriff's Office 2004.
[b] Source: SLVDRG 2002.

Table 3.11-16. Fire Protection Personnel for the ROI

Agency	Staff/Volunteers
Archuleta County[a]	86
Mineral County[b]	25
Rio Grande County[2]	
Del Norte	30
Monte Vista	20
South Fork	15
Total ROI	176

[a] Source: Pagosa Springs Fire Protection District 2004.
[b] Source: SLVDRG 2002.

Health Care Facilities

The Rio Grande Hospital in the town of Del Norte, Rio Grande County, is the only hospital in the ROI. The hospital has a 4,900 square mile service area that includes Rio Grande County, Mineral County, as well as Saguache County, which is outside the ROI. The communities serviced include Del Norte, Monte Vista, Center, Saguache, South Fork, Creede, and the Ski Area (HUD 2004). The hospital has 12 beds and a total staff of about 75. Groundbreaking for a new hospital, which will replace the existing hospital, took place on July 29, 2003, and construction completion is expected in August 2004. The new 35,000 square-foot facility will include 14 private patient rooms, an expanded emergency room, and additional space for laboratory, physical therapy, pharmacy, and administration functions (HUD 2004). Other medical facilities in Rio Grande County are the Durmon Family Medical Practice, Los Pinos Health Center, Monte Vista Family Practice, Rio Grande Medical Center, and the San Louis Valley Medical Clinics. Patients in need of medical services not available at the Rio Grande Hospital or the medical clinics are transported to Denver, Albuquerque, and other larger cities by ambulance or helicopter (SLVDRG 2002).

Healthcare in Archuleta County is available at the Dr. Mary Fisher Medical Center and the Pagosa Springs Family Medical Center. The closest hospitals are the Mercy Medical Center in Durango, Colorado and the San Juan Regional Hospital in Farmington, New Mexico.

3.11.7.4 *Recreation*

For a discussion of recreational resources, please see Section 3.8.

3.11.7.5 *Protection of Children*

On April 21, 1997, the President issued Executive Order 13045, *Protection of Children from Environmental Health Risks and Safety Risks*. This Executive Order directs each Federal agency to ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks. EO 13045 recognizes that a growing body of scientific knowledge demonstrates that children may suffer disproportionately from environmental health risks and safety risks. These risks arise because children's neurological, immunological, digestive, and other bodily systems are still developing; children eat more food, drink more fluids, and breathe more air in proportion to their body weight than adults; children's size and weight may diminish their protection from standard safety features; and children's behavior patterns make them more susceptible to accidents because they are less able to protect themselves. Therefore, to the extent permitted by law and appropriate, and consistent with the agency's mission, the President has directed each Federal agency to (1) make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children, and (2) ensure that the agency's policies, programs, and standards address disproportionate health risks to children that result from environmental health risks or safety risks. Examples of risks to children include increased traffic volumes and industrial or production-oriented activities that would generate substances or pollutants that children may come into contact with or ingest. Actions or alternatives indicating potential disproportionate risks to children will be identified and addressed in Section 4.12 of this EIS.

3.12 ENVIRONMENTAL JUSTICE

On February 11, 1994, the President of the U.S. issued Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations*. The Executive Order is designed to focus the attention of Federal agencies on the human health and environmental conditions in minority communities and low-income communities. Environmental justice analyses are performed to identify the disproportionate placement of high and adverse environmental or health impacts from proposed Federal actions on minority or low-income populations, and to identify alternatives that could mitigate these impacts. Data from the U.S Department of Commerce *2000 Census of Population and Housing* (Census 2000a) were used for this environmental justice analysis. Minority populations included in the census are identified as Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and other Pacific Islander; other race; of two or more races; and Hispanic or Latino. Poverty status, used in this EIS to define low-income status, is reported as the number of persons with income below poverty level. The 2000 Census defines the poverty level as $8,794 annual income, or less, for an individual; and $17,603 annual income, or less, for a family of four.

3.12.1 Environmental Justice Affected Environment

Table 3.12-1 presents data on minority and low-income populations for the ROI Census tracts. Census tracts are subdivisions of a county and represent the level at which disproportionate impacts would be most noticeable. Table 3.12-1 also lists minority and low-income statistics for the State of Colorado. The significance thresholds for environmental justice impacts are established at the state level (EPA 2004c). For the analysis of baseline conditions of the affected environment, individual Census tracts are assumed to contain disproportionately high percentages of minority or low-income populations if the percentage of minority or low-income persons in the Census tract exceeds the state average (EPA 2004c). The percentage of minority populations in the state is 26 percent, and the percentage of persons below the poverty level is 9.3 percent.

There are four Census tracts where the minority population exceeds the percentage of minority populations for the State of Colorado. These block groups are shaded in Table 3.12-1. The percentage of the population living below poverty level exceeds the state poverty rate in all but one Census tract. These are is also shaded in Table 3.12-1. Therefore, based on the Census data, the ROI does have minority or low-income populations that could potentially be affected by the Proposed Action.

Table 3.12-1. Minority or Low-income Population

Minority		Low-income	
Census Tract	**Minority**	**Census Tract-Block Group**	**Below Poverty Level**
9404, Archuleta County	28%	9404, Archuleta County	11%
9742, Archuleta County	13%	9742, Archuleta County	10%
9743, Archuleta County	27%	9743, Archuleta County	14%
9744, Archuleta County	17%	9744, Archuleta County	11%
9736, Mineral County	5%	9736, Mineral County	10%
9766, Rio Grande County	24%	9766, Rio Grande County	14%
9767, Rio Grande County	56%	9767, Rio Grande County	14%
9768, Rio Grande County	59%	9768, Rio Grande County	23%
9769, Rio Grande County	17%	9769, Rio Grande County	9%
Colorado	26%	Colorado	9.3%

Note: Shaded block groups have a higher percentage of minority populations than Colorado, or a higher poverty rate than Colorado.
Source: Census 2000a, 2000c, and 2000d.

3.13 INFRASTRUCTURE AND UTILITIES

The affected area for infrastructure and utilities is defined as the road and utility corridor locations (Figure 2.2-1) through RGNF lands from Highway 160 to the private property (287.5 acres) through the RGNF permitted Ski Area. The project area includes Tranquility Road and lands directly adjacent to Tranquility Road. Tranquility Road begins directly east of FSR 391 at the intersection with Highway 160. Another affected area is located approximately 0.2 to 0.3 mile east of FSR 391 and extends to the northeast corner of the private property.

Infrastructure within the federally affected areas includes Tranquility Road, FSR 391, and the Alberta Lift electrical corridor. Construction of Tranquility Road has been approved by the NFS, along with additional parking lots within the permitted Ski Area boundary, which is currently under construction (permitted road length of 2,150 feet with a driving space width of 23 feet). Tranquility Road and the parking lots at the Ski Area will be constructed, operated, and maintained by the Ski Area under a RGNF SUP. Completion of the road is expected in late 2004. Tranquility Road currently terminates approximately 250 feet from the private property boundary.

FSR 391 is a gravel road that currently serves as the only connecting road from Highway 160 through the private property to Alberta Lake. Although FSR 391 is currently the only road that accesses the private property, it would be used to maintain access to Alberta Lake under existing easement restrictions. FSR 391 is a USFS Level C Road with a Traffic Service Level C. The road is available for use by the public (vehicular and non-vehicular). The road is limited to dry weather use by vehicles that do not exceed 8 feet in width or 80,000 pounds gross vehicle weight (gvw). Generally, FSR 391 is available and open for use by the public from mid-June through September (or the first snow accumulation of the season). It is closed to public vehicular traffic for the remainder of the year. Alteration of current use criteria for this road cannot occur without application to an approval by the RGNF.

An electrical service comes though the RGNF access corridor to provide power to the Ski Area. The service consists of a 12.5-kV aerial line from South Fork, Colorado. The San Luis Valley Rural Electric Cooperative, Inc. supplies the power (USFS 1999a).

3.14 GEOLOGY, MINERALS AND SOILS

3.14.1 Geology and Minerals

The proposed project area of road and utility corridor development is located in subalpine terrain (10,240 to 10,840 feet) in the central part of the San Juan Mountains near the Continental Divide, approximately 1 mile east of Wolf Creek Pass. The proposed access roads and utility corridors are located near the head of Pass Creek (Chen and Associates 1986, Chen and Associates 1987)[1] at the base of the Ski Area. The San Juan Mountains are a dissected volcanic dome composed of middle Tertiary-age volcanic rocks that are generally flat to gently dipping. This area has undergone several glacial events during the Pleistocene era (Chen and Associates 1987).

Alberta Park is underlain by the Treasure Mountain Tuff of the Oligocene era that is generally covered by surficial deposits (glacial till). The Treasure Mountain Tuff is a heterogeneous rock, generally consisting of air-fall and ash-flow tuff with some reworked sandstones and conglomerates. Glacial deposits overlie the bedrock (tuff). Glaciation has generally resulted in hummocky topography that is still present at locations throughout the project area, particularly in the northeastern portion. The glacial till varies in thickness from a thin veneer to more than 35 feet. These glacial deposits consist of unstratified gravel, cobbles, and boulders in a silty and clayey sand matrix. Colluvial deposits, largely derived from the till, are present generally as a thin veneer along most of the steeper valley walls. The colluvium generally has a composition similar to the till from which it was derived (Chen and Associates 1987).

The proposed access road(s) and utility corridors do not lie within an area of hard rock locatable minerals. There are no occurrences of gold, silver, copper, lead, or zinc shown within the proposed project area and the potential for occurrence is not high.

Geologic and geomorphic hazards in the vicinity of the subject area include landslides and avalanches. The area is mapped as a high landslide hazard (Chronic and Williams 2002). Similarly, the area has a small potential to experience avalanches (Clark 1987). A site specific evaluation of potential impacts from avalanches is ongoing to validate hazard ratings associated with the Federal action.

The area of the proposed roads and utility corridors falls within the Colorado Mineral Belt. Consequently, there is some potential for economic minerals in the area. However, the proposed roads are located within the Ski Area boundary and mineral extraction is prohibited in the Ski Area (USFS 2004a) by Public Law 104-333 dated November 12, 1996. Likewise, oil and gas wells may not be located within the Ski Area. Federal land to the east of the private property is available and authorized for leasing. Faults mapped in the vicinity of the site are not considered to be active and are considered to impose no greater risk than that normally encountered in this part of Colorado, which is located in Seismic Risk Zone 1 of the Uniform Building Code. No faults were observed on the site (Chen and Associates 1987). Wells could be located on Federal lands outside the Ski Area and directionally drilled and completed under the Ski Area, which lies within an area of high probability for oil and gas.

[1] Chen and Associates have performed geotechnical and engineering geology studies of the private land to evaluate foundation conditions. The studies included the drilling of 8 shallow (<30 feet deep) test holes and geologic reconnaissance of the Village area. The studies did not include the proposed road alignment or the utility corridors.

3.14.2 Soils

Soils within the permitted Ski Area (Figure 3.14-1) primarily consist of the Cryochemist-Cryaquolls (landtype symbol 128) and the Endlich- Leighcan (landtype symbol 149) associations (USFS 1996b). There are two soil mapping units in the proposed access road(s) and utility corridors project area: the Endlich-Leighcan (landtype symbol 149) association and the Crychemist-Cryaquolls (landtype 128) association. On-site soil pedon investigations to validate soil mapping units found in the proposed project area are ongoing.

The Endlich-Leighcan association is found on the Alternative 2 -Proposed Action route, on the existing 2,100 feet of Tranquility Road and on the areas bordering Highway 160 where Alternative 3 – Snow Shed – East Village and the Snow Shed component of Alternative 4 – Dual Access Road downslope towards the private property. The Endlich-Lecan association is described in Table 3.14-1.

Table 3.14-1. Description of Soils within the Permitted Ski Area

LANDTYPE SYMBOL. 128 **LANDTYPE UNIT.** Sedge/Elephant-Head on Floodplains, Cryohemists-Cryaquolls Soils **NCSS MAP UNIT NAME.** Cryohemists-Cryaquolls association, 0 to 12 percent slopes
This association occurs on gently sloping floodplains, fans, and in closed basins. The main plant association is sedge/elephant-head on Cryohemists and willow/sedge on cryaquolls. Elevations range from 9,500 to 12,000 feet. This map unit comprises approximately 20,224 acres, or 1.1 percent of the west part of the Rio Grande National Forest. The Cryohemists and the Cryaquolls soils consist of very deep, poorly and very poorly drained soils. The Cryomhemist consist of organic peat materials while the Cryaquolls consist of mineral soils. Wetness affects most uses. Soil Potential for Unsurfaced Roads is rated poor due to wetness, organic soil for Cryohemists; poor due to wetness for Cryaquolls. Soil ratings do not preclude an activity but may require higher incurred costs to overcome soil limitations.
LANDTYPE SYMBOL. 137 **LANDTYPE UNIT.** Subalpine Fir-Engelmann Spruce/Rocky Mountain Whortleberry on Moderate and Steep Mountain Slopes, Endlich-Hechtman Soils **NCSS MAP UNIT NAME.** Endlich-Hechtman association, 5 to 60 percent slopes, very stony
This association occurs on moderate to steep mountain backslopes and ridges. The main plant association is subalpine fir-Engelmann spruce/Rocky Mountain whortleberry. Elevations range from 10,000 to 11,00 feet. This map unit comprises approximately 57,899 acres, or 3.2 percent of the west part of the RGNF.
LANDTYPE SYMBOL. 149 **LANDTYPE UNIT.** Subalpine Fir-Engelmann Spruce/Rocky Mountain Whortleberry on Moderate and Steep Mountain Slopes, Leighcan-Endlich Soils **NCSS MAP UNIT NAME.** Leighcan-Endlich association, 2 to 50 percent slopes, very stony
This association occurs on hight elevation timbered moderate to steep mountain backslopes. The main plant association is subalpine fir-Engelmann spruce/Rocky Mountain whortleberry on both soils. Elevations range from 10,500 to 11,800 feet. This map unit comprises approximately 58,984 acres, or 3.3 percent of the west part of the RGNF.

Source: RGNF 1996.

Soils of the Endlich-Leighcan association are located along the steeper slopes of the site (approximately 20 percent slopes) and tend to be deep, well drained, and have a moderate erosion hazard, with a low potential for movement on slopes of less than 20 percent, and a moderate potential for movement on steeper slopes (USFS 1996b). Slope varies generally from nearly level to moderate (less than 30 percent with some areas of steep slope adjacent to streams and the western rim of Alberta Park (Chen and Associates 1987). The proposed 250-foot

extension of Tranquility Road would occur in an area where trees have been logged (stumps remain) and revegetation has occurred.

The Crychemist-Cryaquolls (landtype 128) association is the soil mapping association located where Alternative 3 – Snow Shed-East Village, Alternative 4-Dual Access Road (Snow Shed access route) and Utility Corridor #3 would enter the northern boundary of the private property. This association is primarily a deep loamy material. The description of this soil mapping unit is in Table 3.14-1.

This association occurs on gently sloping floodplains, fans, and in closed basins. The main plant association is sedge/elephant-head on Cryohemists and willow/sedge on cryaquolls. Elevations range from 9,500 to 12,000 feet. This map unit comprises approximately 20,224 acres, or 1.1 percent of the west part of the RGNF. The Cryohemists and the Cryaquolls soils consist of very deep, poorly, and very poorly drained soils. The Cryomhemist consist of organic peat materials, while the Cryaquolls consist of mineral soils. Wetness affects most uses. Soil Potential for Unsurfaced Roads is rated poor due to wetness, organic soil for Cryohemists; poor due to wetness for Cryaquolls. Soil ratings do not preclude an activity but may require higher incurred costs to overcome soil limitations.

The mass movement potential for these soil associations is very low and low, respectively. Wet areas are perennially along the valley floors of the major streams that border the northern boundary of the private property. Boggy soils consisting generally of peat and muck deposits range in thickness up to 4 feet and overlie till deposits. Seasonally wet areas also exist within the project area. These are associated with the closed depressions in the morainal deposits in the site. Seasonally wet areas also exist on the floor of the southern portion of the Alternative 3 – Snow Shed - East Village access road and Alternative 4 - Dual Access Road (Snow Shed access route). Peat and mucky soils are not common above the till in these areas. The seasonally wet areas are generally associated with the rise of groundwater near the surface during spring snow melt (Chen and Associates 1987).

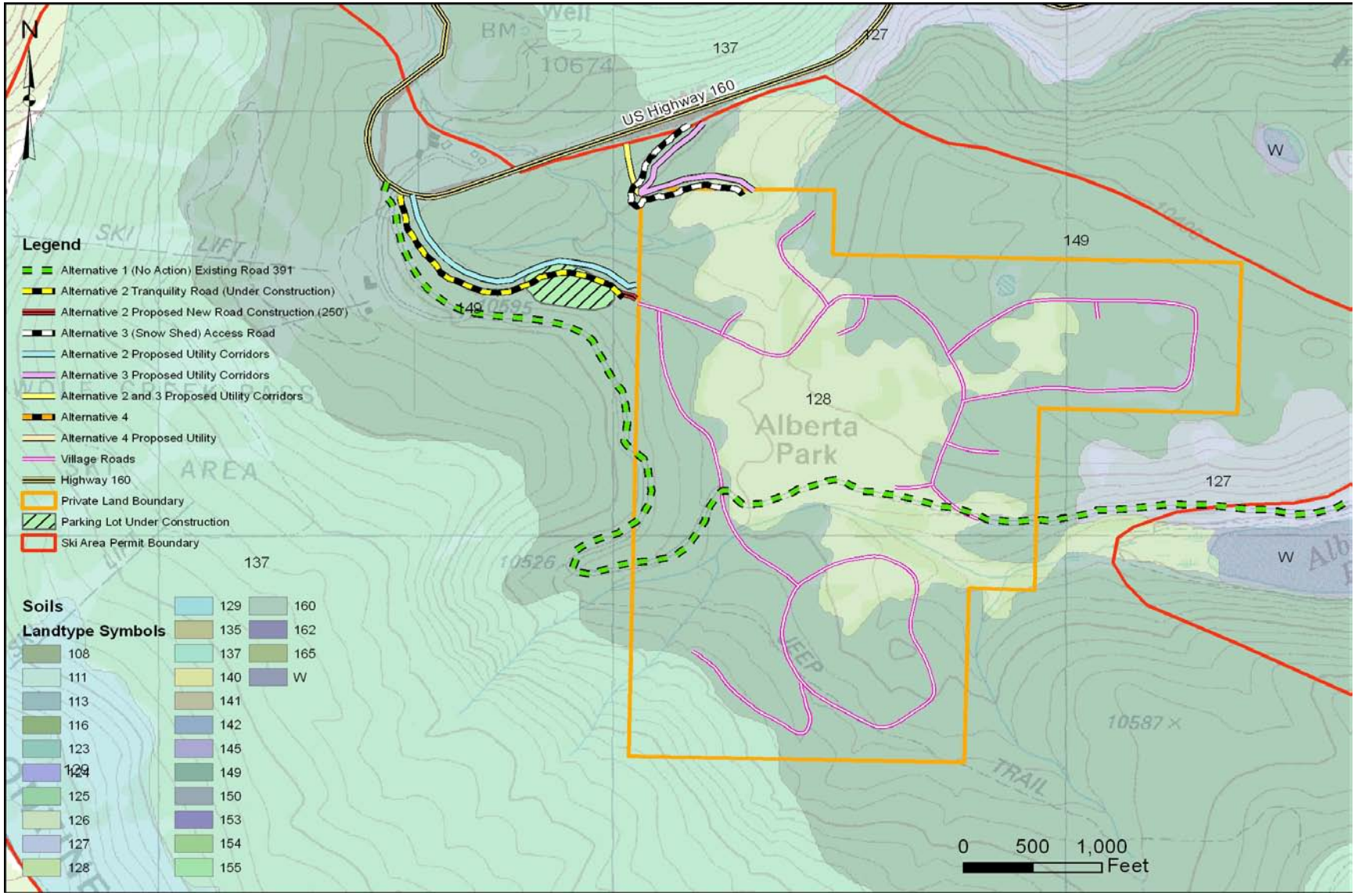


Figure 3.14-1. Soils within the Wolf Creek Project Area.

3.15 AIR QUALITY AND NOISE ENVIRONMENT

3.15.1 Climate

Climate is a composite of the long-term average weather patterns of a given area. Weather affects air quality through its impact on the dispersion of pollutants emitted into the atmosphere. In some cases, weather conditions can also affect the amount of pollutants emitted, such as fugitive dust particles blown airborne from exposed soils. The most important meteorological parameters affecting air quality are wind speed and wind direction. Wind speed and direction determine where pollutants are transported and the rate of dilution in the atmosphere. Temperature and precipitation also affect air quality through their effects on emissions, pollutant transport, atmospheric removal mechanisms, and atmospheric chemistry.

3.15.1.1 *Regional Climate*

The main feature of the mountainous areas of central and western Colorado is the dramatic differences in climate over short distances. With elevations ranging from below 7,000 feet in the lower mountain valleys to more than 14,000 feet at the highest peaks, all aspects of the climate are affected. In general, temperatures decrease with increases in elevation. Summer afternoon temperatures consistently decrease about 4 to 5 degrees Fahrenheit (°F) per thousand feet. Elevational temperature changes are often masked by temperature inversions, especially at night and during the winter. Strong winds are common at elevations above tree-line (approximately 11,500 feet) throughout the winter months, and can exceed 50 to 100 miles per hour (mph) in exposed locations. Wind patterns in the mountains are almost always controlled by topography. Mountain-valley circulations are common with winds often blowing up the valleys from lower to higher elevation during the day, and reversing and blowing down the valleys at night. The mountains form a substantial block to regional air motion, causing winds in most valleys west of the Continental Divide to be very light, especially in fall and winter, while winds along and east of the crest of the Continental Divide are much stronger and typically blow from a westerly direction for much of the cool half of the year. Precipitation increases with increases in elevation both winter and summer, but the elevation effect is greatest in mid-winter when winds at mountain top level are typically the strongest. High peaks and mountain ranges generally receive the majority of their precipitation during with winter months. In summer, local thunderstorms form nearly every afternoon in and near the mountains (Doesken et. al 2003).

3.15.1.2 *Local Climate*

Climatological averages for atmospheric variables such as temperature, pressure, winds, and precipitation are based on observations made at the Wolf Creek Pass meteorological weather station from 1971 to 2000 (WRCC 2004). Normal (30-year mean) minimum and maximum temperatures range from a mean low of 10.2°F in January to a mean high of 70.4°F in August. Temperatures have dropped as low as -40°F, and have reached as high as 81°F. The normal

annual precipitation for Wolf Creek Pass is approximately 46.5 inches. The lowest recorded annual precipitation on Wolf Creek Pass was 29.6 inches and the highest was 59 inches. Winter precipitation is primarily snow. Average annual snowfall is approximately 422 inches, but can vary considerably from year to year. Annual snowfall ranges from a minimum of 205 inches to a maximum of 807 inches. Prevailing winds at the summit of Wolf Creek Pass are from the west during the winter months, from the northeast during the month of July, and from the southwest for the remainder of the year. Wind speeds average 9.8 mph annually with diurnal and seasonal variations. Average wind speeds between 10.5 and 11.6 mph are typically observed between 4:30 a.m. and 2 p.m. Lower wind speeds, 6.5 to 9.1 mph are generally observed between 2 p.m. and 4:30 a.m. Seasonally, wind speeds are higher in the spring and winter months and lower in the summer and fall months. Gusts in the 20 to 30 miles per hour range are observed year round. Occasional gusts exceeding 100 mph have also been observed.

3.15.2 Air Quality

3.15.2.1 *Ambient Air Quality*

Ambient air quality is characterized by the atmospheric concentrations of criteria pollutants: carbon monoxide, nitrogen dioxide, ozone, lead, sulfur dioxide, and particulate matter (PM) defined as two categories; fine particulates with an aerodynamic diameter of 10 micrometers (PM_{10}) or less, and fine particulates with an aerodynamic diameter of 2.5 micrometers or less ($PM_{2.5}$). NAAQS have been promulgated for these criteria pollutants and are intended to protect public health, with a margin of safety. In addition, the Colorado Air Quality Control Commission (CAQCC) has established state standards termed the Colorado Ambient Air Quality Standards (CAAQS). The national and state ambient air quality standards are shown in Table 3.15-1.

Although air quality monitoring is not conducted throughout most of the analysis area, air quality in Mineral County is generally considered excellent because there are relatively few sources of air pollution, and the regional topography provides adequate drainage. Mineral County is part of the San Louis Intrastate Air Quality Control Region (40 CFR §81.176), which is classified as an attainment area for all air quality standards. The Denver, Colorado, metropolitan area (approximately 300 miles north of the proposed project area), which is classified as an 8-hour ozone non-attainment area, is the nearest non-attainment area to the proposed project area. The nearest maintenance areas are the towns of Pagosa Springs, Colorado (approximately 25 miles southwest of the proposed project area), and Telluride, Colorado (approximately 65 miles northwest of the proposed project area). Both towns are classified as PM_{10} maintenance areas (40 CFR §81.306).

Table 3.15-1. National Ambient Air Quality Standards (NAAQS), Colorado Ambient Air Quality Standards (CAAQS), and Significant Monitoring Concentrations.

Pollutant	Averaging Period	Primary NAAQS[a] µg/m^3	Secondary NAAQS[a] µg/m^3	CAAQS[a] µg/m^3	Significant Monitoring Concentration[b]
Nitrogen Dioxide	annual	100	100	100	14 µg/m^3
	1-hour	40,000	none	40,000	none
Carbon Monoxide	8-hour	10,000	none	10,000	575 µg/m^3
	3-hour	none	1,300	700	none
	24-hour	80	none	none	13 µg/m^3
Sulfur Dioxide	annual	365	none	none	none
	1-hour[c]	235	235	235	100 tpy VOCs
Ozone	8-hour	157	157	none	none
	24-hour	150	150	150	10 µg/m^3
PM_{10}	annual	50	50	50	none
	24-hour	65	65	none	none
$PM_{2.5}$	annual	15	15	none	none
	quarterly	1.5	1.5	none	0.1 µg/m^3
Lead	monthly	none	none	1.5	none
Mercury	24-hour	none	none	none	0.25 µg/m^3
Beryllium	24-hour	none	none	none	0.001 µg/m^3
Fluorides	24-hour	none	none	none	0.25 µg/m^3
Vinyl Chloride	24-hour	none	none	none	15 µg/m^3
Total Reduced Sulfur	1-hour	none	none	none	10 µg/m^3
Hydrogen Sulfide	1-hour	none	none	none	0.2 µg/m^3
Reduced Sulfur Compounds	1-hour	none	none	none	10 µg/m^3

Source: 40 CFR Part 50, 69 FR 23857, 69 FR 23996, 69 FR 35028, Colorado Air Quality Regulations.

[a.] Annual standards are not to be exceeded; short-term standards may be exceeded once per year.

[b.] The significant monitoring concentrations (de minimis levels) apply only to new sources and modifications subject to PSD review.

[c.] The 1-hour ozone standards are to be implemented on an interim basis until the 8-hour standards go into full effect.

The proposed project area is located in a rural mountainous area. Major point sources of air pollutants, such as power plants, are absent in the area; therefore, large quantities of sulfur dioxide are not locally generated. However, a number of upwind facilities including power plants fueled by bituminous coal and oil and gas developments contribute to pollutant levels in the project area. Potential local sources of air pollution include automobiles, trains, generators, and wood stoves/fireplaces (in the winter). Controlled and uncontrolled burns also contribute to air pollution in the area. These sources typically generate carbon monoxide, nitrogen dioxide and other nitrous oxides, volatile organic compounds (VOCs), and particulate matter (PM_{10} and $PM_{2.5}$). Additionally, ozone, a highly reactive form of oxygen, forms when emissions from these sources react with sunlight on hot, still days. With the removal of leaded gasoline in the marketplace, and the absence of industries such as nonferrous smelters and battery plants, airborne lead pollution is not an issue of concern in the area.

3.15.2.2 *Visibility*

Federal and Colorado state law prohibits visibility impairment in national parks and wildernesses due to large stationary sources of air pollution. CAQCC has been delegated authority to administer the Prevention of Significant Deterioration (PSD) program within the state. The PSD portions of the 1977 CAA Amendments (Public Law 95-95) classified areas of the country as Class I, II, or III. All areas in Colorado are either Class I or Class II areas. Class I areas are specifically identified federally-protected wilderness areas and national parks, where visibility is considered to be an important value and requires protection. The PSD rules ensure that the Class I areas experience the least amount of deterioration. Class II areas are designed to allow for moderate, controlled growth.

Colorado has 12 Class I areas; the closest is the Weminuche Wilderness Area, located approximately 1 mile northwest of the proposed project site. Other Class I areas within 100 miles of the proposed project site the La Garita Wilderness Area, the Great Sand Dunes National Park, and Mesa Verde National Park. Class I PSD increments are shown with the ambient air quality standards in Table 3.15-1.

Current levels of pollution are high enough to produce haze and obscure important vistas in Colorado's Class I areas. The cause of visibility impairment in Colorado is most often $PM_{2.5}$. Sulfate, nitrate, elemental carbon and organic carbon are the types of particulate matter most effective at scattering and/or absorbing light. The man-made sources of these particulates include woodburning, electric power generation, industrial combustion of coal or oil, and emissions from cars, trucks and buses (CDPHE 2003).

Visibility is measured according to a standard visual range (i.e., how far an image is transmitted through the atmosphere to an observer some distance away). Visibility has been officially monitored at the Weminuche Wilderness Area, the Great Sand Dunes National Park, and Mesa Verde National Park since March of 1988. The view distance at Weminuche Wilderness Area has been recorded from approximately 65 miles to 140 miles. The visual range has not deteriorated during the period for which data are available. Similar visual ranges have been observed at Mesa Verde and the Great Sand Dunes (EPA 2001).

3.15.3 Noise

The level and composition of noise at the project site exhibits diurnal and seasonal variation, and is consistent with it rural mountainous setting. Measurements reveal most noise occurs during the daytime; nighttime noise levels are low (CDOT 1998). Noise levels during the winter season are more varied and include noise from snow grooming activities, operation of ski lifts, avalanche control, operation of snowmobiles, and noise produced by traffic moving to and from the Ski Area.

There are no continuous noise sources in the project area. Intermittent noise includes traffic on Highway 160 and FSR 391, motorized boats on Alberta Lake, and distant overhead aircraft. Natural sounds in the area such as wind rustling trees, flowing water, birds, and animals, are not considered to be noise but contribute to the overall noise environment.