3.0 AFFECTED ENVIRONMENT

3.1 Introduction

This chapter describes the existing conditions of the affected physical, natural, and human environments in the Project Area.

In accordance with NEPA regulations at 40 CFR 1502.15, this chapter provides a baseline from which to understand the potential effects of the Proposed Action and alternatives discussed in Chapter 4.0.

Each section of this chapter includes a description of the existing conditions and trends of the resource, relevant management considerations, and a summary of concerns identified during scoping. In preparing the sections, resource specialists collected data from existing reports, consulted with various agencies and individuals, and conducted field investigations, as appropriate.

The analysis area described for most of the resources is the existing or proposed transmission line ROW. In those cases where individual resources needed to narrow or redefine the analysis area to better describe the affected environment, those assumptions are discussed by resource section.

The analyzed resources are grouped and ordered as follows:

3.1.1.1 Physical Resources

- Air Quality, Climate, and Global Climate Change
- Soil Resources
- Paleontological Resources
- Cultural Resources
- Electric and Magnetic Fields

3.1.1.2 Human Resources

- Land Use
- Visual Resources
- Socioeconomics and Environmental Justice
- Recreation and Wilderness
- Biological Resources
- Aquatic Resources
- Vegetation Resources
- Special Status Plant Species
- Wetland Resources
- Terrestrial and Avian Wildlife Resources
- Special Status Terrestrial, Avian, and Aquatic Wildlife Species

3.2 Air Quality, Climate, and Global Climate Change

This section includes a description of existing air quality in the Project Area, including regional climate and ambient air quality, and a summary of applicable regulations.

3.2.1 Analysis Area

The project is located in Grand County. Portions of the existing transmission line are adjacent to the western shoreline of Lake Granby and are within the ANRA. The Project Area is located southwest of RMNP, which is designated as a Class I airshed by the U.S. Environmental Protection Agency (EPA). Class I airsheds are areas of special national or regional natural, scenic, recreational, or historic value and have special air quality protections associated with them.

The analysis area is the same for all alternatives since the alignments for all alternatives are located within Grand County.

3.2.2 Existing Conditions and Context

3.2.2.1 Climate

The climate of north-central Colorado is classified as continental-highland, characterized by highly variable local temperatures, abundant sunlight, and a moderate wind environment. The climate of local areas is profoundly affected by differences in elevation, and to a lesser degree, by the orientation of mountain ranges and valleys with respect to general air movements. Wide variations occur within short distances (WRCC 2009a). Elevation has a strong influence on local climate, with low valleys often being semi-arid and high elevations approaching sub-arctic conditions. Generally, average temperatures decrease and precipitation increases with increasing elevation. The Western Regional Climate Center (WRCC) maintains two weather stations at Grand Lake. Based on nearly 60 years of data collection, the average annual maximum temperature at Grand Lake is 51.0 degrees Fahrenheit (°F) and the average annual minimum temperature is 21.7°F. Based on historical data, lowest temperatures in the area are experienced in January and highest temperatures are observed in the month of July. The average maximum January and July temperatures at Grand Lake are 27.0°F and 75.0°F, respectively. Historically, August is the wettest month, with an average monthly precipitation of 1.68 inches. Snowfall is greatest in December, with an average monthly accumulation of 16.8 inches. Climate summary data from the WRCC Grand Lake station is provided in Table 3-1 for the period of record 1948-2008.

Table 3-1. Monthly Climate Summary 08/1948-12/31/2008, Grand Lake, Colorado[1].

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	*Annual*
Average Max. Temp. (°F)	27.0	31.1	38.3	48.0	59.3	69.5	75.0	73.0	66.3	55.4	39.6	29.4	*51.0*
Average Min. Temp. (°F)	0.5	2.1	10.2	20.3	29.4	36.0	41.8	40.8	33.5	24.9	15.6	5.6	*21.7*
Average Total Precipitation (in.)	1.02	0.81	0.95	1.16	1.42	1.25	1.54	1.68	1.33	0.93	0.88	1.00	*13.97*
Average Total Snowfall (in.)	15.6	12.2	12.3	7.9	2.1	0.4	0.0	0.0	1.1	1.9	8.5	16.8	*79.0*
Average Snow Depth (in.)	15	18	18	7	0	0	0	0	0	0	2	8	*6*

[1]Station identification: Grand Lake 6 SSW, Colorado 053500
Source: WRCC 2009b

3.2.2.2 Global Climate Change

The EPA defines global warming as "The progressive gradual rise of the earth's surface temperature thought to be caused by the greenhouse effect and responsible for changes in global climate patterns," (EPA 2001). Certain man-made and natural gases absorb and reradiate infrared radiation, which prevents heat loss to space. These gases are known as greenhouse gases. Greenhouse gases include water vapor, carbon dioxide (CO_2), methane, chlorofluorocarbons, ozone (O_3), and nitrous oxides.

The greenhouse effect is a natural phenomenon that helps regulate the temperature of the Earth. Although global warming occurred in the distant past as the result of natural influences, the term is most often used to refer to the warming predicted to occur as a result of increased emissions of greenhouse gases (EPA 2001). Human activities that contribute to global warming include burning coal, oil, and gas, and cutting down forests.

3.2.2.3 Regional Air Quality

Concentrations of the following air pollutants – ozone, carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), respirable particulate matter with an aerodynamic diameter of 10 micrometers or less (PM_{10}), and fine particulate matter with an aerodynamic resistance diameter of 2.5 micrometers or less ($PM_{2.5}$) – and lead (Pb) are used as indicators of ambient air quality conditions. These air pollutants are commonly referred to as "criteria air pollutants" because EPA regulates them by developing human health-based or environmentally-based criteria (science-based standards) for setting permissible levels. These standards are known as the National Ambient Air Quality Standards (NAAQS). These air pollutants are the most prevalent air pollutants known to be harmful to human health, and there is extensive documentation available on health effects of these pollutants. It should be noted that ozone is not emitted directly into the air, but is formed through complex chemical reactions between precursor emissions of volatile organic compounds and oxides of nitrogen in the presence of sunlight.

Overall, air quality in the Project Area is considered to be "good." The Air Pollution Control Division of the Colorado Department of Public Health and Environment (CDPHE) does not operate any air pollution monitoring stations in Grand County. However, no violations of NAAQS or Colorado Ambient Air Quality Standards (CAAQS) for criteria air pollutants have been reported

for Grand County (CDPHE 2009). EPA designates areas according to their attainment status for criteria air pollutants based on NAAQS violations. The purpose of these designations is to identify the areas with air quality problems and thereby initiate planning efforts for improvement. The three basic designation categories are nonattainment, attainment, and unclassified. Unclassified is used in an area that cannot be classified on the basis of available information as meeting or not meeting the standards. Grand County is designated as an attainment area for all criteria air pollutants (EPA 2009).

Major sources of air pollution in the area include fugitive dust emissions from unpaved roads and street sanding, and exhaust emissions from wood stoves. Private buildings, including residences, are located adjacent to or directly under the existing transmission line. The distance from homes, barns, and other structures varies by alternative. These buildings represent the sensitive receptors with respect to air quality.

3.2.3 Management Considerations

3.2.3.1 Federal Standards

Air Quality Standards

EPA's air quality mandates are drawn primarily from the CAA, which was enacted in 1970. The most recent major amendments to the CAA were made by Congress in 1990. The CAA required EPA to establish the NAAQS. As shown in Table 3-2, EPA has established primary and secondary NAAQS for ozone, CO, NO_2, SO_2, PM_{10}, $PM_{2.5}$, and Pb. The primary standards protect the public health, while the secondary standards protect the public welfare. The CAA also requires each state to prepare an air quality control plan, referred to as a state implementation plan (SIP). The Federal CAA Amendments of 1990 added requirements for states with nonattainment areas to revise their SIPs to incorporate additional control measures to reduce air pollution. EPA is responsible for reviewing all SIPs to determine whether they conform to the mandates of the CAA and its amendments, and to determine whether implementing the SIPs will achieve air quality goals.

Table 3-2. Federal and State Ambient Air Quality Standards.

		NAAQS		Colorado AAQS
Pollutant	Averaging Time	Primary[3]	Secondary[4]	Concentration[5]
Ozone (O_3)[6]	8-Hour	0.075 ppm (147 µg/m^3)	Same as Primary Standard	-
Carbon Monoxide (CO)	1-Hour	35 ppm (40 mg/m^3)	None	-
	8-Hour	9 ppm (10 mg/m^3)		-
Nitrogen Dioxide (NO_2)	Annual Average	0.053 ppm (100 µg/m^3)	Same as Primary Standard	-
	1-Hour	0.1 ppm	None	-
Sulfur Dioxide (SO_2)	Annual Average	0.030 ppm (80 µg/m^3)	-	-
	24-Hour	0.14 ppm (365 µg/m^3)	-	-
	3-Hour	-	0.5 ppm (1,300 µg/m^3)	700 µg/m$^{3(7)}$
	1-Hour	0.075 ppm	None	-

Pollutant	Averaging Time	NAAQS Primary[3]	NAAQS Secondary[4]	Colorado AAQS Concentration[5]
Respirable Particulate Matter (PM_{10})[8]	24-Hour	150 µg/m^3	Same as Primary Standard	-
Fine Particulate Matter ($PM_{2.5}$)[9]	24-Hour	35 µg/m^3	Same as Primary Standard	-
	Annual Arithmetic Mean	15 µg/m^3		-
Lead (Pb)[10]	Rolling 3-Month Average[10]	0.15 µg/m^3	Same as Primary Standard	-

[1] NAAQS (other than O_3, particulate matter, and those based on annual averages or annual arithmetic mean) are not to be exceeded more than once a year. The O_3 standard is attained when the fourth highest 8-hour concentration in a year, averaged over 3 years, is equal to or less than the standard. For PM_{10}, the 24-hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 µg/m^3 is equal to or less than one. For $PM_{2.5}$, the 24-hour standard is attained when 98% of the daily concentrations, averaged over 3 years, are equal to or less than the standard. Contact EPA for further clarification and current federal policies.

[2] All measurements of air quality are corrected to a reference temperature of 25˚C and to a reference pressure of 760 millimeters of mercury (1,013.2 Millibars). Standards other than annual averages are not to be exceeded more than once per year.

[3] National Primary Standards: The levels of air quality necessary, with an adequate margin of safety, to protect the public health.

[4] National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

[5] Concentration expressed first in units in which it was promulgated. Ppm in this table refers to ppm by volume or micromoles of pollutant per mole of gas.

[6] On June 15, 2005, the 1-hour ozone standard was revoked for all areas except the 8-hour ozone non-attainment Early Action Compact Areas (those areas do not yet have an effective date for their 8-hour designations). Additional information on federal ozone standards is available at http://www.epa.gov/oar/oaqps/greenbk/index.html.

[7] CDPHE has set the following standard for SO_2: The actual concentration of SO_2 at any given receptor site (no greater than five meters above ground level) in the State of Colorado shall not exceed a 3-hour maximum of 700 µg/m^3 more than once in any 12-month period. CDPHE also has set ambient standards for SO_2, expressed as allowable amounts of increase in ambient concentration (increments) over an established baseline.

[8] Due to a lack of evidence linking health problems to long-term exposure to coarse particle pollution, EPA revoked the annual PM_{10} standard on December 17, 2006.

[9] Effective December 17, 2006, EPA lowered the $PM_{2.5}$ 24-hour standard from 65 µg/m^3 to 35 µg/m^3.

[10] Final rule signed October 15, 2008. The 1978 lead standard (1.5 µg/m^3 as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved

˚C = degrees Celsius; µg/m^3 = micrograms per cubic meter; km = kilometer; mg/m^3 = milligrams per cubic meter; ppm = parts per million

Source: EPA 2011, CDPHE 2011

The CAA also provides special protection for visibility and other air quality related values in specially designated Class I areas. The nearest Class I area to the Proposed Action is RMNP, with the closest point being an estimated 2 miles northeast of the Granby Pumping Plant.

Hazardous Air Pollutants

Air quality regulations also focus on hazardous air pollutants (HAPs). EPA has identified 188 air toxics as HAPs. In general, for those HAPs that may cause cancer, there is no concentration that does not present some risk. In other words, there is no threshold level below which adverse health impacts may not be expected to occur. This contrasts with the criteria air pollutants for which acceptable levels of exposure can be determined and for which ambient standards have been established (Table 3-2). Instead, EPA regulates HAPs through statutes and regulations that generally require the use of the maximum achievable control technology for stationary sources of HAPs to limit emissions. Primary HAPs of concern include diesel particulate matter.

3.2.3.2 State Standards

In addition to the NAAQS, EPA allows states to set air quality standards based on the state's air quality. The Air Quality Control Commission of the CDPHE has established ambient air quality standards for (SO_2). These standards are also shown in Table 3-2.

3.2.3.3 Regional Standards

The Grand County Natural Resources Department, under the authority of the CDPHE Air Pollution Control Division, regulates the open burning of any material in Grand County. The Grand County Burning Management Plan follows from the *Colorado Air Quality Control Commission Regulation No. 1.II.C.1*, which states in part as follows:

> Except as provided below, no person shall burn or allow the burning of rubbish, wastepaper, wood, or any flammable material on any open premises, or any public street, alley, or other land adjacent to such premises, or any public street, alley, or other land adjacent to such premises, unless an open burning permit is first obtained from the Colorado Department of Public Health and Environment or its authorized agents (Grand County Natural Resources Department).

3.2.4 Scoping Issues

No issues related to air quality were raised during scoping.

3.3 Soil Resources

The soil assessment for the proposed project is based on Soil Survey Geographic (SSURGO) database review and analyses. Field mapping methods using national standards are used to construct the soil maps in the SSURGO database. SSURGO is the most detailed level of soil mapping done by the NRCS. SSURGO digitizing duplicates the original soil survey maps. The map extent for a SSURGO dataset is a soil survey area, which may consist of a county, multiple counties, or parts of multiple counties (NRCS 2009).

3.3.1 Analysis Area

The Granby Pumping Plant Switchyard-Windy Gap Substation Transmission Line Rebuild Project is within the Southern Rocky Mountain Parks Major Land Resource Area (NRCS 2006).

The Southern Rocky Mountain Parks consist of nearly level to rolling mountain parks and valleys and a few narrow mountain ridges. The topography ranges from rolling to steep, and slopes commonly are strongly dissected. Deep, loamy soils dominate the landscape; these typically have thick, dark, organically enriched topsoil layers. On steep or rocky slopes, shoulders, and ridges, shallow erodible soils are common. Mollisols are the dominant soil order in this Major Land Resource Area. Alfisols are of lesser extent.

Soils in the Project Area are used for grazing and irrigated hay production. Vegetative communities found in the Project Area include grass and shrub, sagebrush, lodgepole pine forest and woodland, aspen, riparian herbaceous, riparian willow shrubland, riparian cottonwood, rock outcrops, talus slopes, and irrigated hay meadow.

3.3.2 Existing Conditions and Context

This section provides context for the evaluation of potential project-induced environmental consequences to soil associations occurring within the analysis area in Grand County. Each alternative was examined by reviewing the soils within each ROW. Appendix E indicates the soils crossed by each alternative in the Project Area.

No soils in the Project Area are classified as Prime Farmlands; however, Farmland of Statewide Importance is present. Slopes in the Project Area are variable, ranging from nearly flat to 65 percent. Much of the area is erosion-prone when disturbed due to steep slopes and fine textured soils. No soils in the Project Area are prone to erosion by wind.

Map 3-1, Map 3-2, Map 3-3, and Map 3-4 show various soil and bedrock characteristics within the Project Area.

Soil series that occur in the Project Area include:

- The Gateway series consists of moderately deep, well drained soils that formed in loamy slope alluvium over clayey residuum derived from mudstone or shale. Gateway soils occur on mountain slopes of 15-50 percent. These soils are fine textured, compaction-prone, and erodible when disturbed.
- The Leavitt series consists of very deep, well drained soils that formed in alluvium derived from crystalline and sedimentary rock. Leavitt soils are on relict fan aprons, coalescing fans, terraces, hills, mountain slopes, and valley filling side slopes with slopes of 6-55 percent. Leavitt soils that are on slopes less than 15 percent are considered Farmland of Statewide Importance.
- The Frisco series consists of very deep, well drained soils formed in till, colluvium, or slope alluvium. They are on mountain slopes, till plains, mesas, and toe slopes with slopes of 25-65 percent.
- The Mayoworth series consists of moderately deep, well drained soils that formed in alluvium and residuum on hillslopes and mountain slopes of 15-50 percent. Mayoworth soils are fine textured, compaction-prone, and wind erodible when disturbed.

- The Woodhall series consists of moderately deep to lithic bedrock, well drained soils that formed in noncalcareous stony materials weathered from rhyolite, sandstone, andesite, breccia, and Tuff. Woodhall soils are on upland hills, ridges, mesas, and mountain side slopes. Slopes range from 6-50 percent.
- The Youga series consists of very deep or deep, well drained, with medium to rapid runoff soils. The soils formed in glacial till, outwash, alluvium, eolian deposits, or similar material and are considered a Farmland of Statewide Importance. Youga soils are on upland hills, plateaus, foot slopes, fans, and mountainsides of slopes 2-50 percent.
- The Rock outcrop-Cryoborolls complex occurs on extremely steep slopes.
- The Cryoborolls are shallow to lithic bedrock and erodible when disturbed. Approximately 0.5-1.5 miles of rock outcrop is crossed by each alternative.
- The Cimarron series consists of deep, well drained soils that formed in noncalcareous glacial till or similar material derived from sedimentary and metamorphic rocks. Cimarron soils are on hills, ridges, and mountainsides and have slopes of 2-30 percent. Cimarron soils are considered a Farmland of Statewide Importance.
- Cumulic Cryaquolls have a thick organic epipedon and have aquic conditions. These soils are typically wet, sensitive to disturbance, and highly compaction-prone.
- The Waybe series consists of shallow, well drained soils that formed in material weathered from clayey shale. These soils are compaction-prone, especially when moist or wet. Waybe soils are on foothills and mountain slopes of 10-55 percent (NRCS 2007).

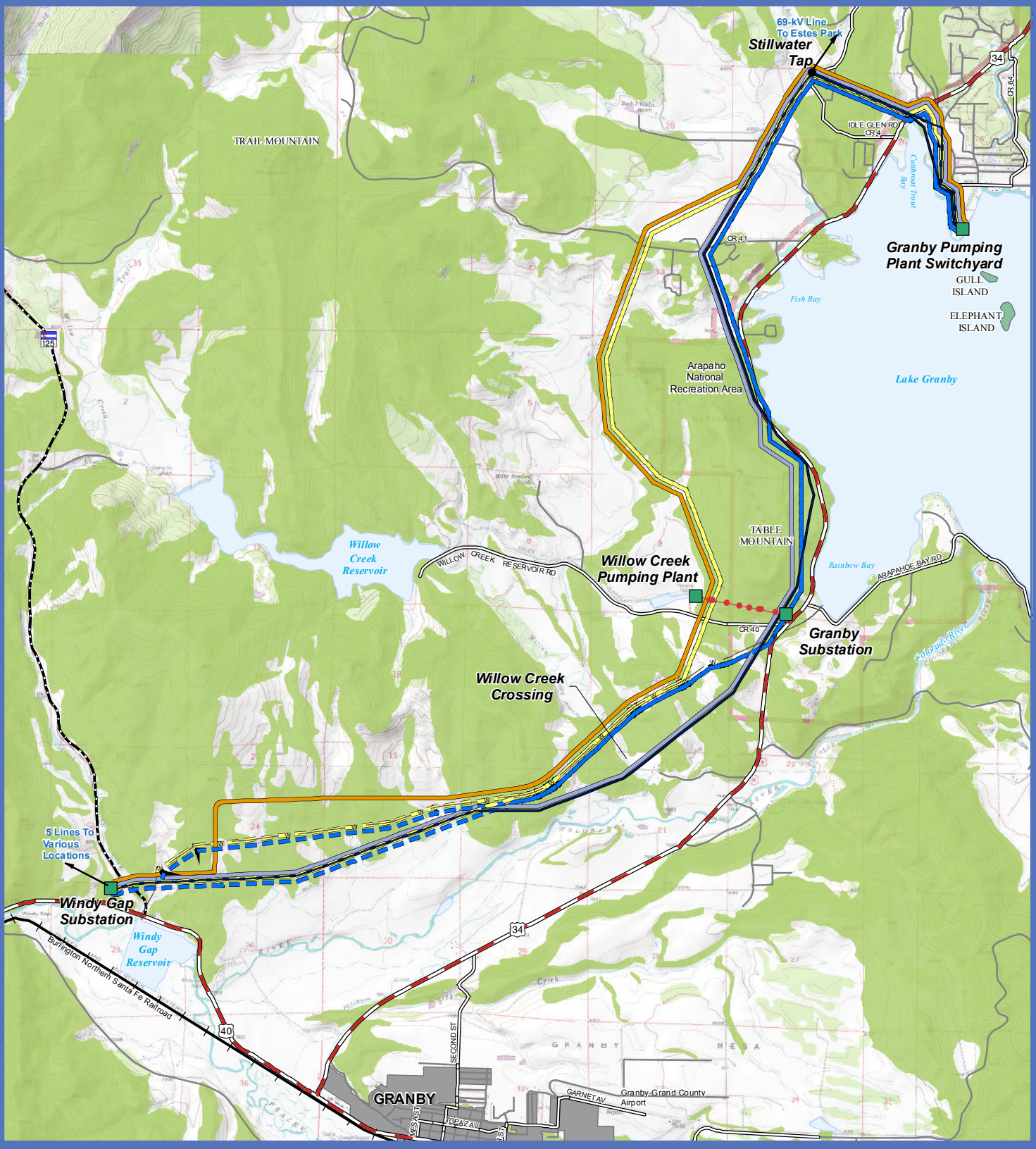
3.3.3 Scoping Issues

Potential soil erosion due to project related disturbance was identified as the primary scoping issue for soil resources.

3.4 Paleontological Resources

This section summarizes the affected environment for paleontological resources within the study area. The Paleontological Technical Report (Evanoff 2006) and Technical Report Addendum for the Granby Pumping Plant Switchyard-Windy Gap Substation Transmission Line Rebuild Project should be consulted for greater detail.

Paleontological resources, or fossils, are the remains, imprints, or traces of once-living organisms that have been preserved in rocks and sediments. These include mineralized, partially mineralized, or unmineralized bones and teeth; soft tissues; shells; wood; leaf impressions; footprints; burrows; and microscopic remains. Fossils are considered nonrenewable resources because the organisms they represent no longer exist. Thus, once destroyed, a fossil can never be replaced.



Map 3-1

Legend

Base Data

- Existing Willow Creek Tap (69-kV)
- Windy Gap Water Pipeline (NCWCD)

Transmission Line Alternatives

- Alternative A - Existing
- Alternative B1
- Alternative C1
- Alternative C2
- Alternative C2 - Options 1 and 2
- Alternative D
- Alternative D - Option 1 and 2

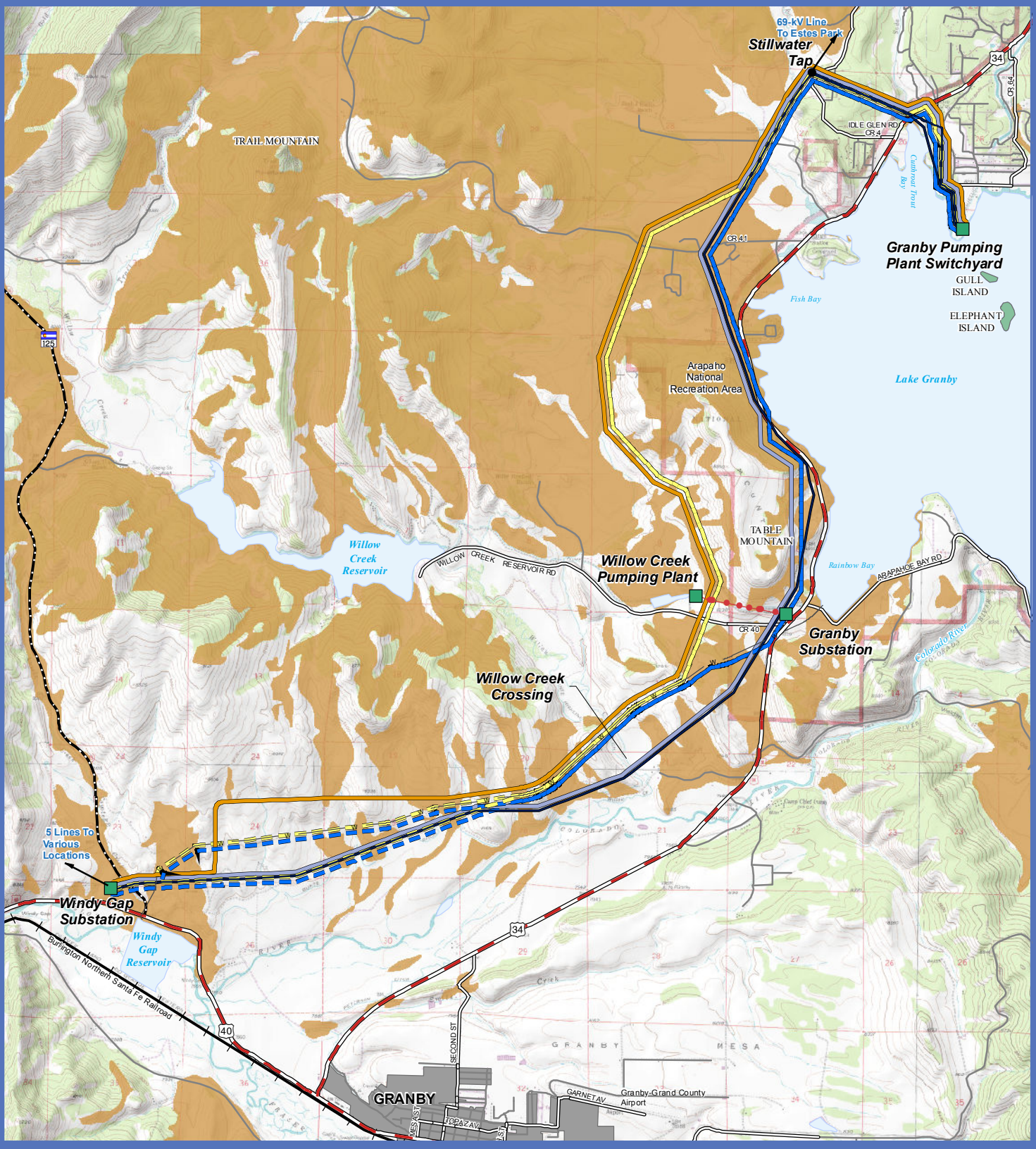
Water Erosion

- Kw>=0.28 + Slope>= 15 and Slope>= 30

Water Erosion

November 7, 2011

Source: Source: Bureau of Land Management (BLM), Northern Colorado Water Conservancy District (NCWCD), U.S. Forest Service (USFS), Grand County, and Natural Resources Conservation Service Soils (NRCS Soils)



0 0.5 1 2 Miles

Map 3-2

Legend

Base Data
- Existing Willow Creek Tap (69-kV)
- Windy Gap Water Pipeline (NCWCD)

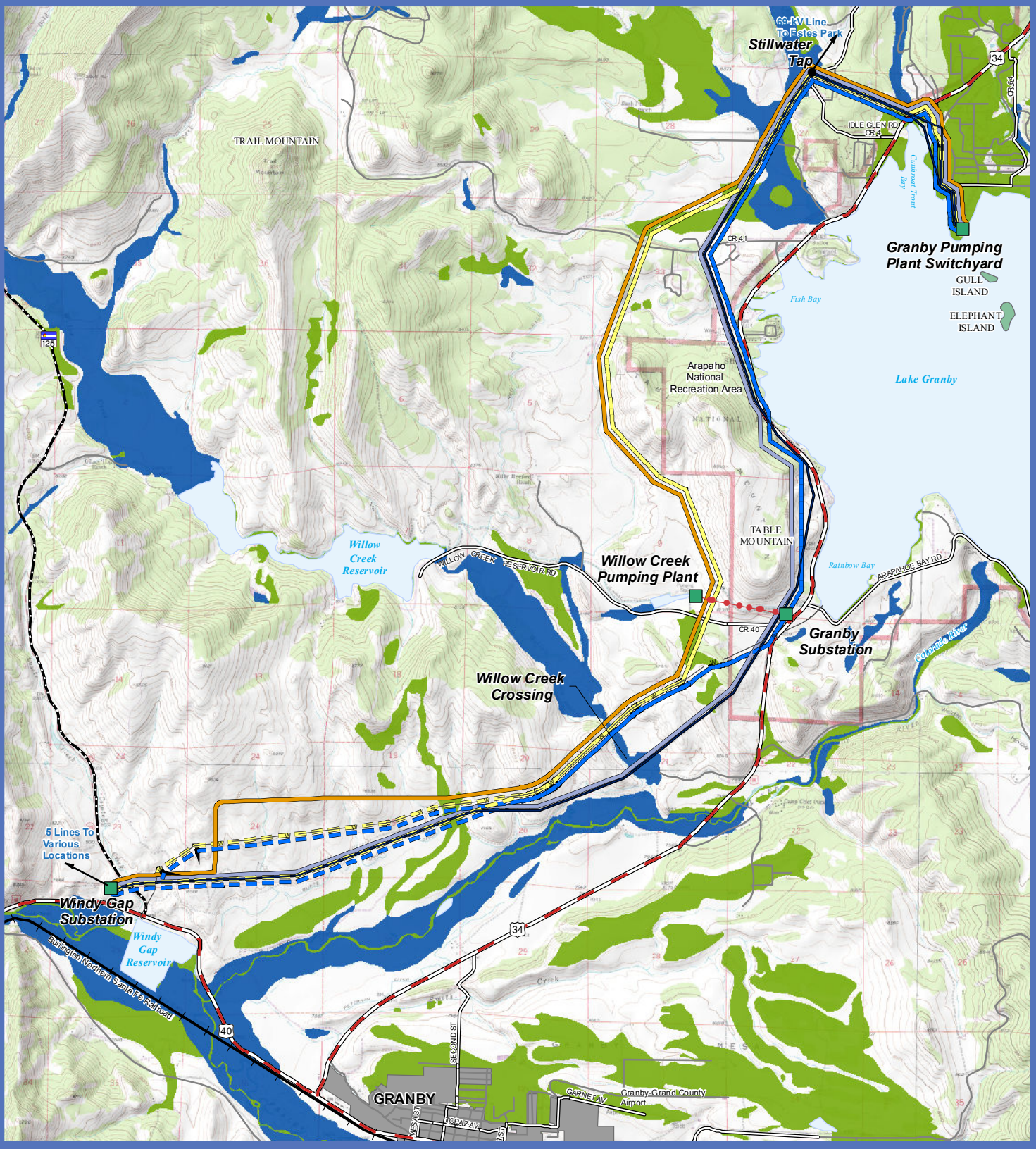
Transmission Line Alternatives
- Alternative A - Existing
- Alternative B1
- Alternative C1
- Alternative C2
- Alternative C2 - Options 1 and 2
- Alternative D
- Alternative D - Option 1 and 2

Compaction Prone Soils
- Clay >= 28%

Compaction Prone Soils

November 7, 2011

Source: Source: Bureau of Land Management (BLM), Northern Colorado Water Conservancy District (NCWCD), U.S. Forest Service (USFS), and Grand County Natural Resources Conservation Service Soils (NRCS Soils)



0 0.5 1 2 Miles

Map 3-3

Legend

Base Data
- Existing Willow Creek Tap (69-kV)
- Windy Gap Water Pipeline (NCWCD)

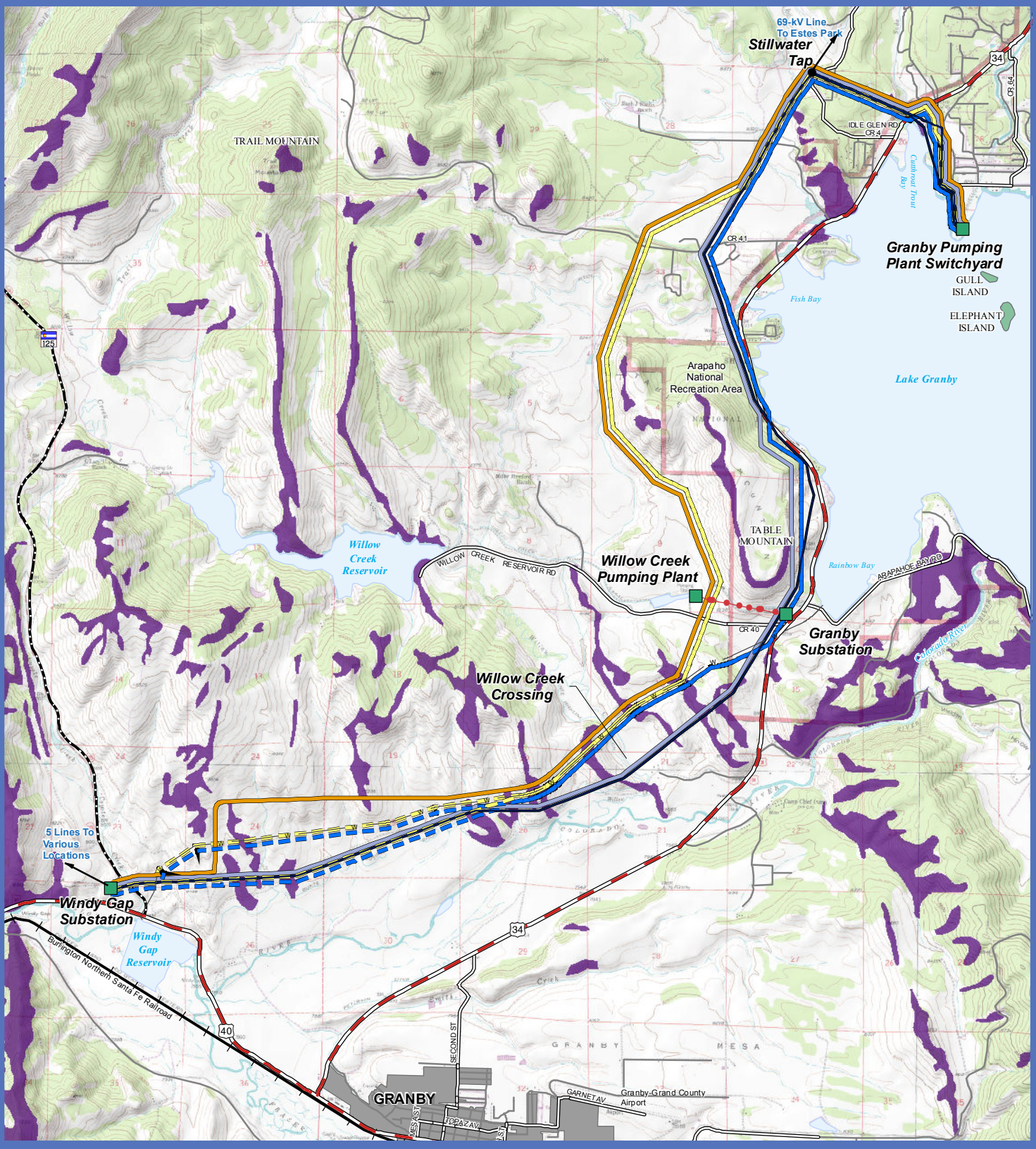
Transmission Line Alternatives
- Alternative A - Existing
- Alternative B1
- Alternative C1
- Alternative C2
- Alternative C2 - Options 1 and 2
- Alternative D
- Alternative D - Option 1 and 2

Hydric Soils
- All Hydric
- Partially Hydric

Hydric Soils

November 7, 2011

Source: Source: Bureau of Land Management (BLM), Northern Colorado Water Conservancy District (NCWCD), U.S. Forest Service (USFS), Grand County, and Natural Resources Conservation Service Soils (NRCS Soils)



0 0.5 1 2 Miles

Map 3-4

Legend

Base Data
- Existing Willow Creek Tap (69-kV)
- Windy Gap Water Pipeline (NCWCD)

Transmission Line Alternatives
- Alternative A - Existing
- Alternative B1
- Alternative C1
- Alternative C2
- Alternative C2 - Options 1 and 2
- Alternative D
- Alternative D - Option 1 and 2

Compaction Prone Soils
- Lithic Bedrock <= 60 inches

Depth to Bedrock

November 7, 2011

Source: Source: Bureau of Land Management (BLM), Northern Colorado Water Conservancy District (NCWCD), U.S. Forest Service (USFS), and Grand County Natural Resources Conservation Service Soils (NRCS Soils)

This paleontological resource analysis is based on the results of museum records and literature searches, and a field survey. The paleontological sensitivity of each geologic unit within the study area was evaluated using the Potential Fossil Yield Classification system (PFYC). This system is a predictive tool that ranks paleontological sensitivity from very low (PFYC Class 1) to very high (PFYC Class 5) on the basis of established paleontological data (see Appendix F). The PFYC system was originally developed by the Forest Service's Paleontology Center of Excellence and the Region 2 Paleontology Initiative in 1996. Modifications have been made by the BLM's Paleontological Resources staff in subsequent years. The PFYC version used for this analysis is widely used, and was recently approved as policy by the BLM (BLM 2007).

3.4.1 Analysis Area

The study area is located in Middle Park, Colorado, and is flanked by the Continental Divide of the Rocky Mountains to the northeast and by the Vasquez Mountains to the southwest. Glaciers occurring in the area during the 1.8 million years have shaped the mountains and bench terraces in the Fraser and Colorado river valleys.

Bedrock geologic units in the vicinity of the study area consist of both crystalline and sedimentary rocks. Crystalline rocks (igneous intrusive and extrusive, and metamorphic) include granitic rocks and biotitic gneiss, schist and migmatite of Precambrian age, as well as Tertiary age volcanic rocks. Sedimentary rocks include a variety of marine and terrestrial units of mostly Mesozoic and Cenozoic (Paleocene, Eocene, Oligocene, Miocene) age. The Mesozoic units were deposited in the Western Interior Cretaceous Seaway and adjacent marginal marine environments prior to the Laramide uplift of the Rocky Mountains. These rocks include the Dakota Group, Benton Shale, Niobrara Formation, and Pierre Shale. Following the initial stages of the Laramide uplift during the latest Cretaceous and Paleogene (Paleocene and Eocene), sediments eroding from the newly formed mountains were deposited in the valleys as sandstone, conglomerate, siltstone, mudstone, and volcanic debris that comprises the Middle Park and Coalmont formations. These units were deformed as the mountains continued to be uplifted. Later, during Oligocene and Miocene times, the Troublesome Formation was formed as tuffaceous siltstone and sandstone filled the Fraser River Valley, and Oligocene-age strata of the Troublesome Formation were interbedded with contemporaneous volcanic rocks consisting of basalt and trachyandesite. The crystalline and sedimentary bedrock geologic units in the vicinity of the study area are locally covered by younger alluvial and glacial deposits, and landslides.

3.4.2 Existing Conditions and Context

The existing and proposed transmission line alternatives cross three mapped bedrock geologic units (Cole and Braddock 2009) that are locally mantled by unconsolidated deposits of Quaternary age, including alluvium, colluvium landslide deposits, terrace gravels, and glacial till. The bedrock units include, from oldest to youngest and in approximate ascending stratigraphic order, the Middle Park Formation (PeKm and Peba; basalt and trachyandesite flows); and the Troublesome Formation (NPet, Map 3-5). Of these, only the Middle Park and Troublesome formations are known to contain fossils. The geology and paleontology of the geologic units that occur within the study area are summarized in the following subsections and in Table 3-3.

3.4.2.1 Middle Park Formation

Only the upper part of the Cretaceous and Paleocene Middle Park Formation occurs within the study area. This fluvially deposited unit consists of interbedded, light- to medium-brown, tan or gray, volcanic or arkosic sandstone and siltstone, conglomerate; and red, green, and brown mudstone. Its thickness exceeds 5,000 feet in the Middle Park Basin (Cole and Braddock 2009).

Fossils are uncommon in the Middle Park Formation, and as a result, any new discoveries would be scientifically important. Known fossils include only plants (leaves and pollen) that are typically poorly preserved (Izett 1968). The paleoflora of the Middle Park Formation is currently the subject of scientific research by paleobotanists at the Denver Museum of Nature and Science. Because fossils are scarce and generally poorly preserved in the Middle Park Formation, the unit is considered to have moderate paleontological sensitivity (PFYC Class 3a; see Table 3-3).

3.4.2.2 Basalt and Trachyandesite

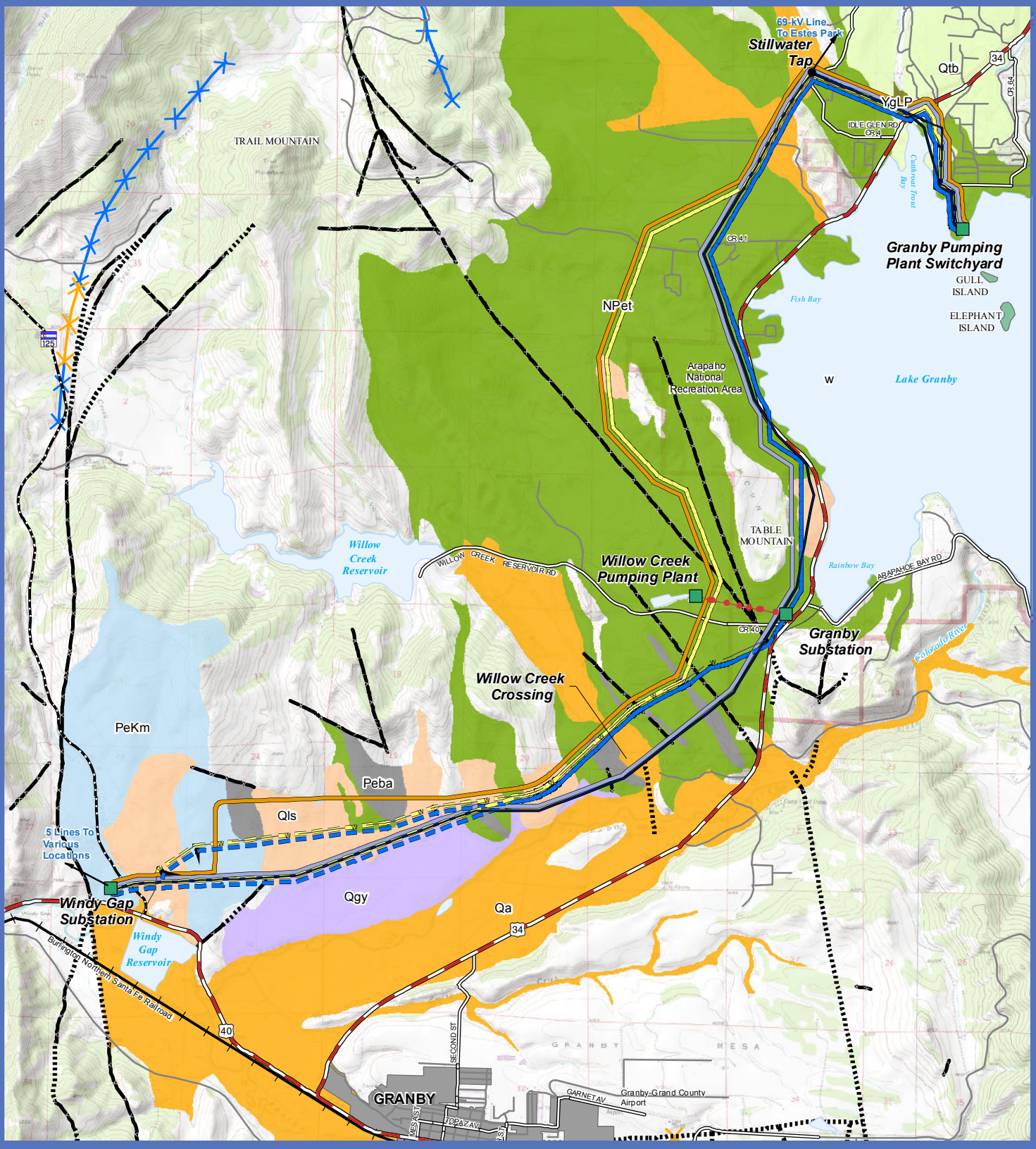
This extrusive igneous rock unit, of upper Oligocene age, consists of dark gray, very fine-grained basalt and trachyandesite that weathers to grayish brown, grayish purple, or moderate red. It is interlayered with the Troublesome Formation (Cole and Braddock 2009).

Igneous rocks are formed at extremely high temperatures and only very rarely preserve fossils. Therefore, they are considered to have very low paleontological sensitivity (PFYC Class 1; see Table 3-3).

3.4.2.3 Troublesome Formation

The upper Oligocene to lower Miocene Troublesome Formation is composed of gray and orange-gray tuffaceous mudstone and sandstone, volcanic ash, and lesser amounts of clayey limestone and conglomerate. It is locally interbedded with upper Oligocene basalt flows (Cole and Braddock 2009).

The Troublesome Formation is the only geologic unit within the study area that is known to produce well-preserved, scientifically significant vertebrate fossils. It is an important formation paleontologically because it is one of only a few known formations that record the mammalian fauna of an upland basin during the late Oligocene and Miocene. The Troublesome Formation has yielded a diverse array of vertebrate fossils including frog, turtle, bats, a variety of insectivores and rodents, camel, antelope, deer, rhinoceros, horse, mastodon, gomphothere, rabbit and pika; and carnivores including canids, felids, mustelids, and the enigmatic bear dog Amphicyon major (Izett 1974 and Kron 1988). Although fossil localities in the Troublesome Formation are sparse due to the mostly vegetated landscape, it does preserve a highly diverse vertebrate fossil fauna. Therefore, it is considered to have high paleontological sensitivity (PFYC Class 4; see Table 3-3).



Map 3-5

Legend

Base Data
- Existing Willow Creek Tap (69-kV)
- Windy Gap Water Pipeline (NCWCD)

Transmission Line Alternatives
- Alternative A - Existing
- Alternative B1
- Alternative C1
- Alternative C2
- Alternative C2 - Options 1 and 2
- Alternative D
- Alternative D - Option 1 and 2

Geology
- Fault - Certain
- Fault - Concealed
- Anticline - Certain
- Anticline - Concealed
- Qa- Alluvium (Holocene and upper Pleistocene)
- Peba- Basalt and trachyandesite (upper Oligocene)
- YgLP- Granite of Longs Peak batholith (Mesoproterozoic)
- Qls- Landslide deposits (Holocene and upper Pleistocene)
- PeKm- Middle Park Formation, upper part (Paleocene and Upper Cretaceous)
- w- Open water
- Qtb- Till of Bull Lake age (upper and middle Pleistocene)
- NPet- Troublesome Formation (lower Miocene and upper Oligocene)
- Qgy- Young gravel deposits at Granby Mesa (upper Pleistocene)

Geology

November 7, 2011

Source: Source: Bureau of Land Management (BLM), Northern Colorado Water Conservancy District (NCWCD), U.S. Forest Service (USFS), and Grand County, USGS

GRANBY PUMPING PLANT - WINDY GAP TRANSMISSION LINE REBUILD PROJECT

Table 3-3. Geologic Units within the Study Area and their Fossil Content and Paleontological Sensitivity using the PFYC.

Unit and Age	Typical Fossils	
Alluvium, Colluvium, Landslides, Terrace Gravels, Glacial Till (Pleistocene and Holocene)	Holocene: no in-situ fossils Pleistocene: typically scattered and poorly preserved vertebrates (primarily mammals), invertebrates, and plants	Holocene, Class 2 Pleistocene, Class 3A
Troublesome Formation (Oligocene and Miocene)	Uncommon but well preserved vertebrates (primarily mammals)	Class 4
Basalt and Trachyandesite (Oligocene)	no fossils	Class 1
Middle Park Formation (Cretaceous and Paleocene)	Plants	Class 3A

3.4.2.4 Quaternary Surficial Deposits

The bedrock geologic units within the study area are locally mantled by surficial deposits of Quaternary (Pleistocene and Holocene) alluvium, colluvium, landslide deposits, terrace gravels, and glacial till. These deposits vary locally significantly in both lithology and thickness.

In general, Pleistocene age sedimentary deposits may contain mineralized or partially mineralized animal bones, invertebrates, and plant remains of paleontological significance. With the exception of some caves, hot springs, and tar deposits, these fossils typically occur in low density and usually consist of scattered and poorly preserved remains. Nevertheless, many Pleistocene fossils provide important paleobiologic, paleobiogeographic, and paleoenvironmental information and are, therefore, scientifically important. The most common Pleistocene vertebrate fossils include the bones of mammoth, bison, deer, and small mammals; but other taxa including horse, lion, cheetah, wolf, camel, antelope, peccary, mastodon, and giant ground sloth, have been reported from the Rocky Mountain region (unpublished paleontological data, University of Colorado Museum [UCM] and Denver Museum of Nature and Science). Pleistocene surficial deposits in Colorado are generally considered to have low to moderate paleontological sensitivity (PFYC Class 3a; see Table 3-3).

Surficial sedimentary deposits of Holocene age are too young to contain in-situ fossil remains, and are considered to have low paleontological sensitivity (PFYC Class 2; see Table 3-3).

3.4.3 Museum Record Search

Three previously recorded UCM fossil localities occur within or immediately adjacent to the ROW for Alternative C1. UCM locality 83217 and UCM locality 83292 occur within the ROW of Alternative C1, while UCM 77030 is located just outside of the ROW. These localities have produced scientifically important fossil mammal remains of Oligocene and Miocene age (Izett 1974; Kron 1988; unpublished UCM paleontological data).

3.4.4 Field Survey

Only one fossil locality was recorded during the initial field survey conducted for this project (Evanoff 2006). This locality, discovered near the western end of Alternative C1 in the Middle

Park Formation, produced poorly preserved plant fossils that were unidentifiable and, therefore, not deemed scientifically important. The fossils were not accessioned by a museum, but were photographed (Evanoff 2006). No additional fossils were found at the previously recorded fossil localities discussed in Section 3.4.3 during the initial field survey.

During the field survey for Alternative D, an additional two fossil localities were recorded in the Troublesome Formation. Both of these yielded poorly preserved fragments of fossilized wood. These fossils were not collected, and were not considered to be scientifically important.

3.5 Cultural Resources

This section provides a description of the affected environment, including information concerning cultural resources in the Project Area.

3.5.1 Analysis Area

The analysis area for cultural resources investigations includes a corridor width of 200-300 feet for existing ROWs, a corridor width of 200-400 feet for new alignments, and a corridor width of 50-120 feet around access roads. The survey area was approximately 1,021 acres and crossed public lands administered by the BLM Kremmling Field Office; Forest Service, ARNF, Sulphur Ranger District, including portions of the ANRA; Colorado SLB; and private land.

3.5.2 Existing Conditions and Context

Cultural resources are fragile and nonrenewable remains of prehistoric and historic human activity, occupation, or endeavor as reflected in districts, sites, structures, buildings, objects, artifacts, ruins, works of art, architecture, and natural features that were of importance in human history. Cultural resources comprise the physical remains themselves, the areas where significant human events occurred even if evidence of the event no longer remains, and the environment surrounding the actual resource. The cultural resources inventory and analysis were prepared by RMC Consultants, Inc. Because of the sensitive nature of cultural resources, the technical report for this project is on file with Western in Loveland, Colorado, and is not included with the EIS. These reports are protected from public disclosure and are exempt from the Freedom of Information Act.

The NHPA of 1966 and the Archaeological Resource Protection Act of 1979 provide for the protection of significant cultural resources. Section 106 of the NHPA describes the process that federal agencies must follow to identify, evaluate, and coordinate their activities and recommendations concerning cultural resources. Significant cultural resources are defined as those listed on, or eligible for listing on, the National Register of Historic Places (NRHP). Significant cultural resources are generally at least 50 years old and meet one or more of the criteria presented in 36 CFR 60. Significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and (a) that are associated with events that have made a significant contribution to the broad patterns of our history; or (b) that are associated with the lives of persons significant in our past; or (c) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or (d) that have yielded, or may be likely to yield, information important in prehistory or history.

Prehistoric cultural resources are generally evaluated with respect to criterion (d), which pertains to a site's potential for yielding scientifically valuable information. The measure of the importance of the scientific data is based upon research questions widely recognized as appropriate by the scientific community. Sites most likely to yield these important data are those with intact cultural deposits, where artifacts and features are relatively undisturbed. In addition to retaining contextual integrity, sites with the highest research value are those likely to contain cultural features. Features such as hearths, storage or habitation structures, or living structures often yield charcoal for radiocarbon dating; macrobotanical, palynological, and faunal evidence of subsistence practices; and associated datable artifact assemblages. Sites with artifacts diagnostic of a particular temporal period or cultural group are also regarded as having higher research potential than those lacking diagnostic artifacts. Sites attributable to a specific unit can be used to address specific research questions and are regarded as important resources.

Historic sites can potentially meet any of the four criteria for eligibility to the NRHP. Frequently, however, the focus is upon architectural significance or association with events or individuals of historical importance. Although site-specific historical research is often warranted after a site is identified to determine whether it was associated with an important individual or event, a site's value as an archaeological resource should not be overlooked. When considering a historic site's archaeological value, the condition or structures or burial of cultural deposits are not as important as whether information exists on the site in the form of artifacts or cultural features that can answer questions of particular interest about the past. Sites that can be confidently ascribed to a particular historic theme and subtheme are generally regarded as having more research value than sites that cannot be ascribed to a theme. Significant historic archaeological resources are those that are relatively undisturbed, can be attributed to a specific theme, and retain sufficient artifacts and features to permit further study. Linear cultural resources such as roads, trails, and ditches generally possess little archaeological value, though in some instances they may retain engineering significance or be associated with important historic events. Roads, trails, and railroad grades, however, may have other historic site types associated with them that are important archaeological resources, the proper interpretation of which may depend upon identification of the linear site.

The significance of traditional cultural properties is usually assessed by talking with elders and other knowledgeable individuals of a cultural group and through historical documentation. Some traditional cultural properties may be significant to an entire cultural group, whereas others may be significant to an individual or family.

3.5.3 Regional Cultural Overview

The following discussion is based on the prehistoric context for the region (Reed and Metcalf 1999). The overview divides the archaeological record into four extended temporal units (eras). The various eras (Paleoindian, Archaic, Formative, Protohistoric) are subdivided into either traditions, periods, or phases depending upon which unit best describes the variability within that particular era. The new context summarizes the archaeology of the area, points out gaps in the data, and sets out a series of research questions based on models of subsistence and settlement in each era.

Table 3-4 presents the proposed chronology.

Table 3-4. Northern Colorado River Basin Prehistoric Chronology (Reed & Metcalf 1999).

Era	Tradition/Period/Phase	Dates
Paleoindian	Clovis Tradition	11,500 - 6400 B.C.
	Goshen Tradition	11,500 - 10,500 B.C.
	Folsom Tradition	10,800 – 9500 B.C.
	Foothill-Mountain Tradition	9500 – 6400 B.C.
Archaic	Pioneer Period	6400 – 4500 B.C.
	Settlement Period	4500 – 2500 B.C.
	Transitional Period	2500 – 1000 B.C.
	Terminal Period	1000 – 400 B.C.
Formative	Anasazi Tradition	A.D. 900 - 1100
	Fremont Tradition	A.D. 200 - 1500
	Gateway Tradition	400 B.C. – A.D. 1300
	Aspen tradition	400 B.C. - A.D. 1300
Protohistoric	Antero Phase	A.D. 1300 - 1650
	Canalla Phase	A.D. 1650 - 1881

The Paleoindian era in the Project Area began around 11,500 B.C. and extends to 6,400 B.C. These dates reflect a recent revision in the radiocarbon dates by Fiedel (1999). An analysis of radiocarbon determinations led Fiedel to conclude that the ages of the Paleoindian era were being underestimated by approximately 2,000 years (Reed and Metcalf 1999:56). The dates used in this report reflect the revised radiocarbon ages of Fiedel. However, a few of the sites in the Project Area were radiocarbon dated prior to this revision, and thus they were assigned to an older temporal component than they are under the revised radiocarbon ages. The net effect of this revision has been to assign components previously identified as Late Paleoindian to the early Archaic period (Pioneer period), components previously identified as Early Archaic have been assigned to the Middle Archaic period (Settlement period), and components previously identified as Middle Archaic are assigned to the late Archaic periods (Transitional or Terminal periods).

The first 2000 years of this era encompass the Clovis, Goshen, and Folsom traditions. Modeling of early Paleoindian subsistence and settlement patterns produced the following test implications (Reed and Metcalf 1999:64-66):

- Settlement during the warm season will be in the uplands and cold season settlement will be in lower elevation areas. However, mountain basins, such as Middle Park, may have been occupied on a year-round basis (Frison and Kornfeld 1995). If settlement mobility were restricted, this would differ from the early Paleoindian model of high residential mobility (Kelly and Todd 1988).
- Early Paleoindian components should be characterized by large mammal remains in the archaeofaunal assemblages; macrobotanical samples will be dominated by fruit, nut, and large seeds; and ground stone will occur in lower frequencies than later components.
- Early Paleoindian toolkits will contain higher relative frequencies of bifaces; higher relative frequencies of high quality, nonlocal tool stone; and higher incidences of the rejuvenation and reuse of formal tools.

- Artifacts at early Paleoindian sites will be similar and vary in frequency rather than by functional class; sites will reflect short-term occupations, but repeated use of site locations; and few storage structures will be found.

The later part of the Paleoindian era is the Foothill-Mountain tradition. This tradition was developed by Frison (1992) and appears to have applicability on Colorado's western slope. In this tradition, later Paleoindian groups in the foothills and mountain ecological zones employed a different subsistence strategy than Plains-oriented late Paleoindian groups. In this tradition, settlement areas were more restricted and projectile point styles became more diverse and were often made of local materials (Frison 1992; Pitblado 1994). Bison were hunted, but so were many other game animals. Foothill-Mountain groups also exploited a wider range of plants than plains-oriented groups. Test implications (Reed and Metcalf 1999:67-70) for the context area include:

- Foothill-Mountain components will contain evidence of a more restricted settlement pattern, as evidenced by a higher reliance on local tool stones and the presence of substantial habitation structures.
- Foothill-Mountain components will contain evidence of a broader spectrum subsistence patterns, including the exploitation of a wide range of animals, use of lower caloric return seed foods, and higher usage of ground stone implements.
- Lithic reduction technologies are more oriented toward core reduction than bifacial reduction.

The following Archaic era is well documented throughout the context and Project Area. Excavations and other investigations have produced over 700 radiocarbon ages. Reed and Metcalf (1999:6, 77-79) have abandoned the traditional three-part division of the Archaic into Early, Middle, and Late periods. Their analysis of the Archaic archaeological record resulted in four proposed periods: Pioneer, Settled, Transitional, and Terminal.

- Pioneer: The end of nomadic Paleoindian settlement patterns and the establishment of seasonal settlement systems in the major basins of the western slope characterize the Pioneer period. Paleoindian lanceolate projectile point forms were replaced by a diversity of stemmed and notched forms, and subsistence practices target a wide variety of plants and animals.
- Settled: Settled period attributes include well-established local populations. These groups may have a central place foraging strategy based on predictable winter habitation areas. Processing features are common and the use of pit and basin structures for habitation becomes established.
- Transitional: The Transitional period is much like the previous settled period, but trends in the record indicate greater material culture variability, possibly less sedentary settlement patterns, and possible greater seasonal use of higher elevations.
- Terminal: The Terminal period indicates intensification in subsistence practices, including a greater use of lower caloric return foods and early experiments in growing corn. This period also shows a shift to the use of the bow and arrow.

Throughout the context discussion on the Archaic era, the authors point out that this era is a time of cultural change and continuity, and no single defining characteristic separates the era from the preceding Paleoindian era or following Formative era. Archaic life ways were stable over a long period of time. Changes in settlement patterns, subsistence practices, and material culture are

discernable over space and time, but often these changes are a matter of frequency of use rather than replacement.

The Formative era is the time when horticulture became established in parts of western Colorado. This era also includes nonhorticultural groups who lived in the mountains and higher elevations unsuitable for horticulture. Horticultural groups in the context area have been divided into the Anasazi, Fremont, and Gateway traditions. Substantial habitation structures, cultigens, high-quality ceramics, two-handed manos, and specific types of rock art characterize sites within these traditions. Within the context region, these groups are clustered in western Rio Blanco and Moffat counties, in the lower San Miguel and Dolores River drainages in western Montrose County, and near Grand Junction in the Glade Park area. Limited evidence of limited trade or incursion by Plains Woodland people has been found in Grand County; however, several sites have been recorded including cord-marked pottery and the Crying Woman site located just west of the Continental Divide and in Middle Park, respectively (Reed and Metcalf 1999:130).

The Aspen Tradition (Reed and Metcalf 1999:140-145) is proposed for the nonhorticultural sites dating between 400 B.C. – A.D. 1300. This tradition is regarded as the taxonomic equivalent of the Uinta phase in the Wyoming Basin (Zier et al. 1983; Metcalf 1987; Thompson and Pastor 1995). Characteristics of the Uinta Phase include intensification in subsistence, particularly seed procurement (Smith 1988), episodic mass kills of pronghorn (Lubinski 2000), use of large number of pit features with associated ground stone, and a general increase in the number (or visibility) of sites. Aspen tradition occupations should display the following attributes:

- Shift in residential sites to lower elevations than those displayed by Archaic sites.
- Use of several types of structures including basin houses (Shields 1998), stone circles, wickiups, and informal brush and rock structures.
- Increase in the use of rock-filled basins and simple basin hearths over the preceding eras.
- A subsistence pattern similar to the Uinta phase in southwestern Wyoming.

The Protohistoric era begins around A.D. 1100-1300 when horticulture subsistence practices of Formative era groups end and Numic groups, such as the Ute, enter western Colorado. The Protohistoric ends with the removal of the Ute to reservations in A.D. 1881. The Protohistoric is divided into two periods, the pre-contact Antero phase and the post-contact Canalla phase. Attributes of Antero phase occupations include the use of Uncompahgre brown ware ceramics, Desert side-notched and Cottonwood projectile points, wickiups and other brush structures, and a pedestrian hunting and gathering subsistence pattern. The Canalla phase begins with Ute and Euroamerican contact and is characterized by the use of the horse and Euroamerican artifacts along with Uncompahgre brown ware and Desert side-notched and Cottonwood projectile points. Attributes of the Protohistoric subsistence and settlement system may include the following:

- Protohistoric groups engaged in a forager subsistence strategy, with higher relative frequencies of habitation sites and lower frequencies of specialized resource procurement locations than in the preceding periods.
- Use of fewer and less formalized storage features.
- Winter habitation sites were occupied for shorter periods of time, and are characterized by less substantial architecture, smaller site size, less patterned waste disposal, and less diverse and rich artifact assemblages.

Following the prehistoric occupation of the Project Area is the Historic period, including the early interactions of the Native American populations and early Euroamerican explorers and settlers. This brief history of the Project Area is taken from the *Colorado Mountains Historic Context* (Mehls 1984), *Colorado: A History of the Centennial State* (Abbott et al. 1994), *People of the Red Earth* (Crum 1996), *Historical Atlas of Colorado* (Noel et al. 1994), and *Colorado Place Names* (Bright 1993).

The first Europeans to enter western Colorado were Spanish explorers. Juan de Rivera searched western Colorado for mineral resources in 1765. In 1776, the Dominguez-Escalante expedition passed through western Colorado while searching for a route from Santa Fe to California. Neither of these expeditions entered the Project Area. While the Spanish were exploring parts of western Colorado, the Ute, Arapaho, and Cheyenne Indians occupied or used Middle Park in their subsistence rounds. While the Spanish did not venture into Middle Park, Native American culture and settlement systems were altered by the adoption of the horse, use of Euroamerican material culture, and serious demographic shifts caused by disease.

The first Americans to enter the area were fur trappers in the early 1800s. By the late 1830s, trapping ceased to be a viable economic pursuit due to dropping fur prices. Except for a few remaining trappers and scientific exploration and mapping expeditions, Euroamerican presence in Middle Park was minimal until the early 1870s. At that time, large ore deposits had been found in various areas of the Colorado mountains, and miners and their families were attracted to the mountains, including Middle Park. Mining never became a major industry in Middle Park, but the beginnings of the tourism and recreation industries were foreshadowed with interest in the Hot Sulphur Springs hot springs and the fishing at Grand Lake.

Settlement of Middle Park was inhibited by the presence of Native American groups, primarily the Ute, and the lack of roads into the area. The Utes were removed to reservations in 1881, but road development was slower. Wagon roads were established over Berthoud Pass in 1861 and Rollins Pass in 1862, but both of these roads were barely passable and were not used to any great extent until they were rebuilt for stage and mail traffic in 1875 and 1873, respectively. Roads suitable for automobile travel were developed in the 1920s. U.S. Highway 40 was built over Berthoud Pass in 1923 and the highway through Byers Canyon was completed in 1927. Fall River Road was constructed through RMNP (established 1915) in the 1920s.

Rail service was not established in Middle Park until the early 1900s. The completion of the Moffat Tunnel allowed the railroads to reach Hot Sulphur Springs in 1904 and Kremmling in 1906. The development of roads and rail transportation networks lead to the development of towns and commerce. Grand Lake was incorporated in 1885, followed by Hot Sulphur Springs in 1903, Kremmling in 1904, and Granby in 1905. The economy of Middle Park has changed little since the development of the towns. Farming, ranching, and tourism dominate the local economy. Kremmling and Granby serve as commercial centers for the surrounding area, while Hot Sulphur Springs and Grand Lake are primarily tourist destinations. After World War II, ski area development in eastern Grand County added to the tourism base.

Water and power development, beginning in the later 1930s, has contributed to the economic development of Middle Park and altered the landscape. The C-BT Project began in 1938 (Tyler 1992). This project was implemented to deliver water from the western slope to eastern slope cities of Fort Collins, Loveland, Longmont, Boulder, and Greeley. A number of reservoirs, power plants, trans-mountain tunnels, and miles of transmission line were constructed for this project, which was completed in 1957. Near the Project Area, Lake Granby, Shadow Mountain Reservoir, Willow Creek Reservoir and pumping plant, Adams Tunnel, Granby Pumping Plant

Switchyard, and the Granby pump canal were constructed or enhanced. Besides providing water and power to east slope cities, these facilities provide employment and recreational opportunities in Middle Park.

3.5.4 Class I Inventory

In order to assess potential impacts to significant cultural resources in the Project Area, a Class I inventory (site file search) was conducted for a 0.5-mile wide corridor around all project facilities at the Office of the State Archaeologist in Denver and at federal land managing agency offices in Fort Collins, Colorado (Forest Service, ARNF) and Kremmling, Colorado (BLM Kremmling Field Office).

The Class I research results are a direct reflection of previous cultural resource investigations; i.e., little or no site data exist for those portions of the Project Area that have not been previously inventoried. Numerous cultural resource inventories have been conducted within or adjacent to the Project Area. Most of these inventories were conducted for other linear projects, such as pipelines and highways. These previous projects have resulted in the recordation of numerous historic linear sites, such as irrigation canals and railroad grades.

A total of 52 projects have been conducted in the vicinity of the proposed project. The project types are both linear and block surveys as well as combinations of the two. Nearly all of the surveys are Class III (intensive) inventories, with some Class II (sample) inventories conducted recently by the Forest Service.

The earliest inventories were conducted in 1976 and 1977 by the University of Colorado associated with construction of the Windy Gap Dam, Reservoir, and Pipeline. In 1981 and 1982, Western Cultural Resource Management, Inc. (WCRM) conducted a program of mapping, sampling, testing, excavation, and monitoring at 10 sites along the Windy Gap Pipeline and its associated facilities for the NCWCD (Wheeler and Martin 1984:1). Relatively recent Class III block inventories have been conducted by the BLM, including inventory of the Granby Landfill (Project #GA.LM.R62), Windy Gap Cultural Resource Management Area (Project #GA.LM.R61), and Windy Gap Land Exchange (Project #GA.LM.R91). Recently, Class II inventories on and around Table Mountain and Willow Creek Reservoir have been conducted by the Forest Service for prescribed burns (Project #GA.FS.R.94), fuel reduction (Project #GA.FS.R75 & #GA.FS.R112), and pine beetle suppression (no project number) projects. All of the pole structures and access roads on federal lands along the existing alignment were inventoried in 2001 by RMC Consultants, Inc. (no State Historic Preservation Office [SHPO] project number).

A total of 71 previously recorded sites are located within 0.5 mile of the Project Area. The previously recorded sites consist of 53 prehistoric sites, 16 historic sites, and two prehistoric/historic sites. The prehistoric sites consist of 33 lithic scatters, 13 open camps, six quarry sites, two open architectural sites, and one isolated find (note: site types are categorized by the predominant activity or feature observed on the site). The historic sites consist of four transmission lines, one homestead, three ditches, three dumps, two isolated features, two artifact scatters, two isolated artifacts, and one road (note: the prehistoric/historic sites are counted as both a prehistoric site and a historic site). Twenty-two of the sites are located along the existing transmission alignment only; five are located along the alternate alignment only. The remaining four sites are located on two or more of the project facilities.

Official determinations and field recommendations of eligibility for inclusion in the NRHP have been made on 30 of the 42 previously recorded sites within the Area of Potential Effect (APE).

Of the 42 previously recorded sites within the APE of the current project, nine have been officially determined to be not eligible for inclusion in the NRHP and four sites located within the APE have been officially determined to be eligible. One site has been officially determined to need more data before NRHP eligibility determination can be made (5GA2312).

3.5.5 Class III Inventory

An intensive ("Class III") cultural resource inventory was conducted by RMC Consultants, Inc. in 2007 and 2009. The inventory included 12.45 miles of existing transmission lines, 13.7 miles of a proposed alternative transmission line alignment, 1.68 miles for a deviation of the alternative alignment, and 14.51 miles of access roads. The total acreage inventoried was approximately 1,021 acres.

The inventory of the Windy Gap transmission line resulted in the re-evaluation of 40 previously recorded sites, and the recordation and evaluation of 19 newly discovered sites and 17 isolated finds. Two previously recorded sites have been subsumed within the boundaries of larger sites and were not re-evaluated. Six sites were previously recorded along the existing transmission line, but could not be relocated during the field inventory. These sites were probably destroyed by construction projects or have been misplotted. In addition, four transmission lines, including the existing Granby Pumping Plant Switchyard to Windy Gap Substation 69-kV transmission line, have been recorded.

3.5.6 Native American Consultation

Western contacted Native American tribes with a potential interest in the project and historical ties to the Project Area to inform them of the proposal and request any comments or information they would like to provide. The letter was sent on August 3, 2007, by the following tribes:

- Cheyenne and Arapaho Tribes of Oklahoma
- Northern Arapaho Tribe
- Northern Cheyenne Tribe
- Northern Ute Tribe
- Shoshone Tribe (Eastern Band)
- Southern Ute Indian Tribe
- Ute Mountain Ute Tribe

One tribe responded (the Northern Cheyenne) and requested a field visit. A subsequent letter was sent on September 6, 2007 to the Native American tribes with regard to the identification of an Eagle Catch Trap site through the Class I Survey. The Eagle Catch Trap site is located closest to Alternatives C1 and C2. The letter requested attendance at a field trip that was conducted by Western's Native American Liaison. During the field trip and review of the area, the tribal representative determined that the site was not an eagle catch trap site.

3.6 Electric and Magnetic Fields (EMF)

3.6.1 Description of EMF

3.6.1.1 Units of Measure

Electric field values are reported in either volts per meter (V/m) or thousands of volts per meter (kV/m).

Magnetic field levels are reported in units of gauss (G), or more typically, in units of milliGauss (mG), which are equal to one-thousandth of a gauss (i.e., 1 mG = 0.001 G). Some technical reports also use the unit Tesla (T) or microTesla (µT; 1 µT = 0.000001 T) for magnetic flux densities. The conversion between these units is 1 mG = 0.1 µT and 1 µT = 10 mG.

3.6.1.2 Overview

EMF occur throughout nature and are one of the basic forces of nature. Any object with an electric charge on it has a voltage (potential) at its surface and can create an electric field. The change in voltage over distance is known as the electric field. When electrical charges move together (known as “current”), they create additional forces on each other. These additional forces are represented by magnetic fields. All currents create magnetic fields.

The strength of EMF is related to the voltage and current respectively, and to the distance away from the source. The strength of the electric field depends on the voltage (higher voltages create higher electric fields) and the distance (electric fields grow weaker as the distance from the source increases). The strength of the magnetic field depends on the current or load (higher currents or loads create higher magnetic fields) and the distance (magnetic fields grow weaker as the distance from the source increases).

EMF can be static/unchanging in direction (direct current) or changing/alternating in direction (alternating current [AC]). Static electric fields can result from taking off a sweater or walking across a carpet. Body voltages as high as 8,000-16,000 volts (8-16-kV) have been measured on a person as a result of walking across a carpet (Chakravarti and Pontrelli 1976). The earth has a natural static electric field of about 120-150 volts/meter (0.12-0.15 kV/m) at ground level due to the 300-400,000 volt potential difference between the ionosphere and the earth. This means that a 6-foot tall person would have a static potential of about 275 volts between the top and bottom of their body. Much stronger static electric potentials can exist underneath clouds, where the electric potential to earth can reach 10-100 million volts. Natural static electric fields under clouds, and in some dust storms, can reach 30-10 kV/m (NRC 1986; CRC 1981). Static magnetic fields also occur in nature. The earth has a natural static magnetic field of about 550 mG (0.550 G) in the general area of Granby, Colorado (Merrill and McElhinney 1983).

The electric power distribution system, wiring in buildings, and electrical appliances create AC EMF. In the United States, the power system uses current that alternates 60 times each second (60 Hertz [Hz]). Almost all household appliances create an electric field. This is due to the voltage on the appliance. To create an electric field, the appliance need not be operating, but just plugged into the electrical outlet. Typical reported values measured 1 foot away from some common household appliances are shown in Table 3-5 (Sheppard & Eisenbud 1977).

Overhead electric transmission lines and distribution lines also create 60 Hz electric fields. The strength of the electric field is primarily a function of line voltage, height of the conductors above

ground, the arrangement of the electrical wires, and distance away from the line. Unlike magnetic fields, electric fields can easily be shielded (or weakened) by the presence of conducting objects. For example, a typical house or building shields about 90-95 percent of electric fields from outside sources (Carnegie Mellon University 1995). Other objects, such as trees, shrubs, walls, and fences, will also provide electric field shielding.

Table 3-5. Typical Electric Field Values at 12" From Common Appliances.

Appliance	Electric Field (kV/m)
Electric Blanket	0.250*
Broiler	0.130
Stereo	0.090
Refrigerator	0.060
Iron	0.060
Hand Mixer	0.050
Phonograph	0.040
Toaster	0.040
Hair Dryer	0.040
Coffee Pot	0.030
Clock	0.015

* Electric fields can reach 1-10-kV/m next to blanket wires.

The characteristics of magnetic field attenuation can differ depending on the field source. A magnetic field due to a point source, such as an appliance, decreases rapidly with distance away from the device. The magnetic field also decreases with distance away from linear sources, such as overhead power lines, but not as rapidly as it does with appliances. Overhead transmission line magnetic fields attenuate at a rate that is inversely proportional to the distance squared, whereas magnetic fields from appliances and other point sources attenuate at a rate proportional to the distance cubed. Underground transmission line magnetic fields attenuate more rapidly than those produced by overhead transmission lines, since the current-carrying conductors are typically in closer proximity to each other, thereby increasing field cancellation and the attenuation rate.

The 60 Hz magnetic fields under most overhead transmission and distribution lines are usually smaller than values near many common household appliances. The main reason for this is the height above ground at which electric power lines are supported. Since the field decreases with distance away from the source, the line height above ground effectively reduces the magnetic field to levels that are less than many appliances. Since the magnetic field is caused by the flow of an electric current, a device must be operated for it to create a magnetic field. The magnetic field of a large number of typical household appliances was measured by the Illinois Institute of Technology Research (IITRI) for the U.S. Navy (IITRI 1984), and by Enertech Consultants (Silva et.al. 1989) for the Electric Power Research Institute (EPRI). Typical values for appliances are presented in Table 3-6.

Table 3-6. Magnetic Fields from Household Appliances.

Appliance	AC Magnetic Field (mG) 12" Away	Maximum
Electric Range	3 to 30	100 to 1,200
Electric Oven	2 to 5	10 to 50
Garbage Disposal	10 to 20	850 to 1,250
Refrigerator	0.3 to 3	4 to 15
Clothes Washer	2 to 30	10 to 400
Clothes Dryer	1 to 3	3 to 80
Coffee Maker	0.8 to 1	15 to 250
Toaster	0.6 to 8	70 to 150
Crock Pot	0.8 to 1	15 to 80
Iron	1 to 3	90 to 300
Can Opener	35 to 250	10,000 to 20,000
Mixer	6 to 100	500 to 7,000
Blender, Popper, Processor	6 to 20	250 to 1,050
Vacuum Cleaner	20 to 200	2,000 to 8,000
Portable Heater	1 to 40	100 to 1,100
Fans/blowers	0.4 to 40	20 to 300
Hair Dryer	1 to 70	60 to 20,000
Electric Shaver	1 to 100	150 to 15,000
Color Television	9 to 20	150 to 500
Fluorescent Fixture	2 to 40	140 to 2,000
Fluorescent Desk Lamp	6 to 20	400 to 3,500
Circular Saws	10 to 250	2,000 to 10,000
Electric Drill	25 to 35	4,000 to 8,000

Unlike electric fields, most ordinary objects cannot easily shield magnetic fields. Many common materials (wood, air, concrete, earth, people, etc.) do not shield magnetic fields. However, ferromagnetic materials, such as iron or steel, can shield them.

3.6.2 Analysis Area

The strength of EMF is related to the voltage and current respectively, and to the distance away from the source. The strength of the electric field depends on the voltage (higher voltages create higher electric fields) and the distance (electric fields grow weaker as the distance from the source increases). The strength of the magnetic field depends on the current or load (higher currents or loads create higher magnetic fields) and the distance (magnetic fields grow weaker as the distance from the source increases).

For the purposes of this analysis, the area of potential effect is defined as the transmission line ROW and areas immediately adjacent to the ROW.

3.6.3 Alternative-Specific Analysis Areas

3.6.3.1 Alternative A – No Action

The Granby Pumping Plant Switchyard-Windy Gap Substation transmission line is an existing single-circuit 69-kV transmission line. This existing power line is approximately 13.6 miles in length and connects the Granby Pumping Plant Switchyard to the Windy Gap Substation. The power line is a single-circuit, three-phase AC transmission line oriented in a horizontal phase configuration, as shown in Figure 3-1. Each phase is comprised of a single 0.56-inch diameter conductor. In addition, there are two 3/8-inch diameter steel shield wires located above the phase conductors. The transmission line is supported on existing wood H-frame structures within a 30-foot wide ROW and is assumed to be located at an average elevation of about 8,500 feet.

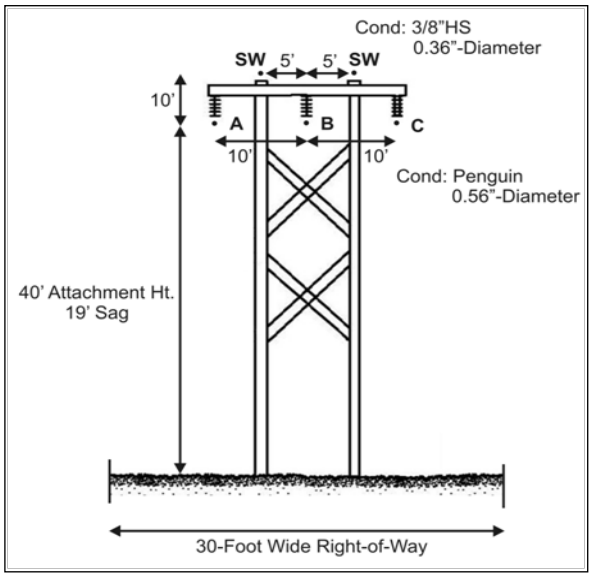


Figure 3-1. Diagram of the Existing 69-kV Transmission Line Configuration.

3.6.3.2 All Action Alternatives – B1, C1, C2, D

The proposed Granby Pumping Plant Switchyard-Windy Gap Substation transmission line would replace the existing single-circuit 69-kV transmission line with a double-circuit 69-kV and 138-kV transmission line. This proposed power line would be approximately 12 miles in length and would continue to connect the Granby Pumping Plant Switchyard to the Windy Gap Substation. The proposed power line would be a double-circuit, three-phase per circuit, AC transmission line oriented in a vertical phase configuration, as shown in Figure 3-2. One circuit would be energized at 69-kV, while the second circuit would be energized at 138-kV. Each phase would be comprised of a single 0.78-inch diameter conductor. In addition, there would be one 0.5-inch diameter steel shield wire located above the phase conductors. The transmission line would be supported on new steel monopole structures within a 100-foot wide ROW.

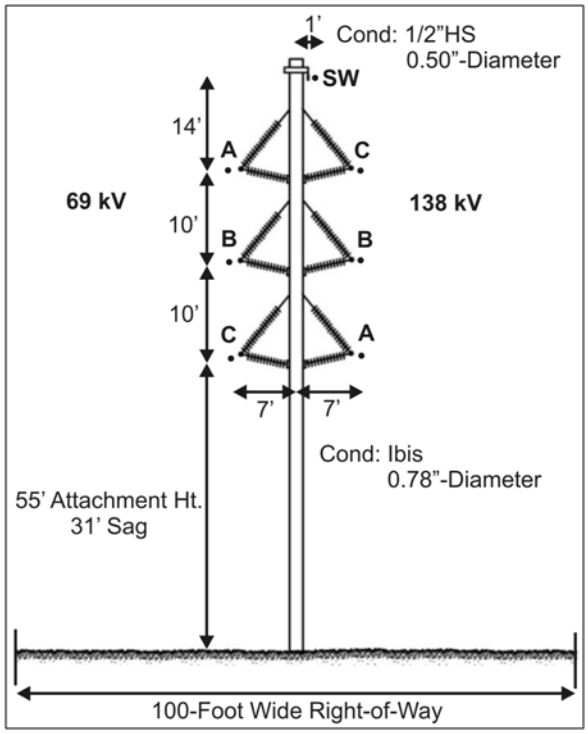


Figure 3-2. Diagram of the Proposed 69/138-kV Transmission Line Configuration.

3.6.4 Existing Conditions and Context

3.6.4.1 Pacemakers and EMF

Public concern has been expressed related to the EMF of transmission lines with the possibility of interference with cardiac pacemakers. There are two general types of pacemakers: asynchronous and synchronous (IITRI 1979). The asynchronous pacemaker pulses at a predetermined rate. It is practically immune to interference because it has no sensing circuitry and is not very complex. The synchronous pacemaker, on the other hand, pulses only when its sensing circuitry determines that pacing is necessary. The concern is that interference could result from transmission line electric or magnetic fields, and cause a spurious signal in the pacemaker's sensing circuitry (Sastre 1997). However, when these pacemakers detect a spurious signal, such as an induced 60 Hz current, they are programmed to revert to an asynchronous or fixed pacing mode of operation and return to synchronous operation within a specified time after the signal is no longer detected. The issue for pacemakers is if power line fields could adversely affect their operation.

The potential for pacemaker interference from power line fields depends on the manufacturer, model, and implantation method, among other factors. Studies have determined thresholds for interference of the most sensitive units to be about 2,000-12,000 mG for magnetic fields and about 1.5-2.0 kV/m for electric fields (University of Rochester 1985). Guidelines for occupational exposure suggest that electric field exposure should not exceed 1 kV/m or 1,000 mG for workers with cardiac pacemakers (ACGIH 2003). It is unclear that reversion to a fixed pacing mode is harmful, since pacemakers are routinely put into reversion with a magnet to test operation and battery life. Some new pacemaker models are dual chamber devices that can be more sensitive to external interference. Some of these dual chamber units may experience inappropriate pacing behavior (prior to reversion to fixed pacing mode) in electric fields as low as 1.2-2 kV/m, while other models appear unaffected in fields up to 20 kV/m. The biological consequences of brief, reversible pacemaker malfunction are mostly benign. An exception would be an individual who has a sensitive pacer and is completely dependent on it for maintaining all cardiac rhythms. For such an individual, a malfunction that compromised pacemaker output or prevented the unit from reverting to the fixed pacing mode, even brief periods of interference could be life-threatening (Sastre 1997). The precise coincidence of events (i.e., pacer model, field characteristics, biological need for full function pacing) would generally appear to be a rare event.

The World Health Organization references information on pacemakers from the National Radiation Laboratory and Ministry of Health in New Zealand (NRL 2008). Concerning pacemakers, they state:

> A very small proportion of cardiac pacemakers has been found to be sensitive to 50/60 Hz EMF close to the International Commission on Non-Ionizing Radiation Protection (ICNIRP) limits (ICNIRP 2003) for public exposure (5 kV/m for electric fields and 1,000 mG for magnetic fields). (These same devices are also likely to be sensitive to other sources of electromagnetic interference, such as car ignition systems.) It is most likely that they will revert to a fixed pacing mode, which poses no immediate threat to the wearer. Since the field levels at which these effects occur close to the ICNIRP limits for public exposure, the risk to members of the general public is thought to be extremely small. However, in workplaces where field strengths approaching the occupational limits are expected (10 kV/m for electric fields and 5,000 mG for magnetic fields), precautions may need to be taken to alert or exclude pacemaker wearers. There are no known instances of adverse

effects on pacemaker users around power lines, or in other areas where exposure limits comply with the ICNIRP reference levels for the public.

3.6.4.2 Audible Noise

Units of Measure

Audible noise is measured in decibels of sound pressure with respect to the threshold of human hearing. Audible noise levels are often reported in A-weighted decibels (dBA) or non-weighted (linear) decibels (dB); dBA weights sound frequencies in a manner approximating the sensitivity of the human ear.

Description of Audible Noise

High voltage transmission lines can experience the natural phenomenon of corona. Corona is a luminous discharge due to ionization of the air surrounding an electrode caused by a voltage gradient exceeding a certain critical value. The electrode may be conductors, hardware, accessories, or insulators on a transmission line. Any electrode or thin wire with a sufficiently strong electric gradient can experience corona. For example, corona is used on the thin bare wires inside a photocopy machine. For a photocopier to work, a field of positive charges must be generated on the surface of both the drum and the copy paper. These tasks are accomplished by the corona wires. These wires are subjected to a high voltage, which they subsequently transfer to the drum and paper in the form of static electricity. The corona wire uses static electricity to coat both the photoreceptive drum and the copy paper with a layer of positively charged ions.

Corona activity on high voltage transmission lines can generate a small amount of sound energy. Corona also results in a small amount of power loss to the transmission line. The audible noise level can increase during foul weather conditions (Figure 3-3). Water drops may collect on the surface of the conductors and increase corona activity so that a crackling or humming sound may be heard near a transmission line. Audible noise decreases with distance away from a transmission line.

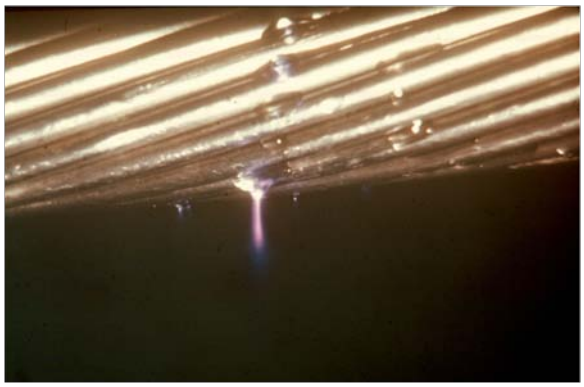


Figure 3-3. Close-Up of a Tiny Corona Discharge at the Surface of a Conductor.

Audible noise is measured in decibels of sound pressure with respect to the threshold of human hearing. The decibel is a dimensionless unit used to compare the level of some quantity to a reference level and it always needs a reference quantity to have meaning. The apparent loudness that we attribute to sound varies not only with the sound pressure but also with the frequency (or pitch) of the sound. The human hearing system is nonlinear and has a complex response. Corona-induced noise tends to be broadband and can sometimes have a pure tone as well (primarily at 120 Hz).

"Noise" is generally defined as unwanted sound. The effects of noise on people can range from annoyance and inconvenience to temporary or permanent hearing loss at very high levels. Since the human ear is not equally sensitive to sound at all frequencies, a specific frequency-dependent rating scale was devised to relate noise to human sensitivity. Sound wave

intensity is measured in dB, but a sound with multiple frequencies (broadband sound) can be perceived differently that a single level in dB might indicate. The dBA performs this compensation by discriminating against frequencies in a manner approximating the sensitivity of the human ear. The basis for compensation is the faintest sound audible to the average ear at the frequency of maximum sensitivity. The dBA has been chosen by most authorities for purposes of environmental noise regulation.

It is important to remember that transmission line audible noise is variable, and therefore it is characterized using statistics that estimate probability of a certain level of noise occurring. Statistical noise descriptors include what engineers call “exceedance levels”, for example, L10, L50, and L90. These descriptors indicate what percentage of time a certain noise level will be exceeded. For example, a L50 of 65 dBA indicates that 50 percent of the time, noise levels will be greater than 65 dBA at a certain location and, conversely, it could be less 50 percent of the time. The L10 level is high and would only be exceeded 10 percent of the time (i.e., 90 percent of the time, the level would be less than the L10 value).

Additional methods to characterize audible noise have been developed to evaluate the long-term characteristics of sound. The equivalent sound level, Leq, is the energy average of the level of a varying sound over a specified period of time (EPA 1974; Keast 1980). This value is a single-number equivalent representation of the fluctuating sound level in decibels over a specified period of time. The Leq of a time-varying sound is equivalent or equal to the level of a constant unchanging sound.

A number of government agencies have adopted a level similar to Leq called the day-night averaged noise level, which is an equivalent day-night sound level, or Ldn, and it is used as a noise metric to evaluate variable noise. The Ldn represents a time-weighted 24-hour average noise level based on the dBA for a variety of weather conditions. "Time-weighted" refers to the fact that noise occurring during certain sensitive time periods (nighttime, when other background sounds are relatively subdued) is adjusted for occurring at those times. Ldn includes an additional 10 dBA increase that is added to noise events occurring during nighttime (defined by the EPA as 10 p.m. to 7 a.m.). In effect, the Ldn is roughly equivalent to the Leq over a 24-hour period, with "penalties" added to noise events occurring late at night and early in the morning. The Ldn rating is intended to improve upon the Leq rating by adding a correction for nighttime noise, because people are more sensitive to noise at night when background levels may be lower.

The EPA has an outdoor activity Ldn noise guideline of 55 dBA (EPA 1974). This value represents the sound energy averaged over a 24-hour period; it has a 10 dBA nighttime weighting (between 10:00 p.m. and 7:00 a.m.) (EPRI 2005).

Typical sounds in a community may range from about 40 dBA (very quiet) to 100 dBA (very loud) or higher. Conversation is roughly 60 dBA at 3-5 feet. As background noise levels exceed 60 dBA, speech intelligibility becomes increasingly difficult. Noise becomes physically discomforting at 110 dBA. A 10 dBA change in a noise level is perceived by most people as a doubling of the sound level. The smallest perceivable change in noise levels is 3 dBA. An increase of 5 dBA is more clearly noticeable as a change by the human ear. The above sound levels are stated in terms of short-term maximum sound. Some typical noise levels range from the relative quiet of the library to the loud subway trains. Typical sound levels for various environments are presented in Table 3-7 (EPA 1974; IEEE 1974; Miller 1978).

Table 3-7. Typical Sound Levels for Common Sources in dBA.

Source/Location	Sound Level (dBA)
Threshold of Hearing	0
Motion Picture Studio- Ambient	20
Library	35
Chicago Suburbs- nighttime minimum	40
Wind in Deciduous Trees (2-14 mph)	36-61
Falling Rain (Variable Rainfall Rates)	41-63
Tomato Field on California Farm	44
Small Town/Quiet Suburb	47-53
Private Business Office	50
Light Traffic at 100 ft Away	50
Average Residence	50
Large Retail Store	60
Accounting Office	60
Boston Inside House on Major Avenue	68
Average Traffic on Street Corner	75
Inside Sports Car (50 mph)	80
Los Angeles - 0.75 mile from Jet Landing	86
Inside New York Subway Train	95
Loud Automobile Horn (at 1 meter)	115

Audible noise levels on well designed transmission lines are usually not noticeable, or very low in fair weather conditions. For example, a typical calculated fair weather audible noise for a 500-kV transmission line at the ROW edge is similar to or less than ambient levels in a library or typical daytime residential environments, and less than background noise for wind and rain. In foul weather, noise levels can rise and be noticeable near transmission line easements. The corona that causes audible noise results in some power losses on a transmission line. Because power loss is uneconomical and audible noise is undesirable, corona on transmission lines has been studied by engineers since the early part of this century. Many excellent references exist on the subject of transmission line corona. Consequently, corona is well understood by engineers and steps to minimize it are one of the major factors in transmission line design. Corona is an important design consideration for transmission lines rated at 345-kV and higher. The use of large diameter bundled conductors will lower the electrical stress on the air at the conductor surface so that corona activity is at low levels under most operating conditions. Other possible mitigation options (such as corona rings at hardware attachment points and other line hardware designed to avoid sharp edges) may also be considered to reduce audible noise.

In foul weather conditions, audible noise due to transmission lines can be in the range of sound levels created by wind and rain. Often rain and wind noise will mask sound from a transmission line, which will be further attenuated by building structures. The range of sounds from a light wind (2-14 mph) in deciduous trees has been reported to 36-61 dBA, and rain falling at variable rates is 36-63 dBA (Miller 1978). The sound level of rain falling depends on the rain rate and the terrain upon which the rain falls, as shown in Table 3-8 (EPRI 2005).

Table 3-8. Summary of Audible Noise Calculation Results on Different Types of Terrain for Various Rain Rates.

Rain Rate (mm/hr)	Rain Noise – dBA		
	Terrain A	Terrain B	Terrain C
0.10	28.0	34.0	40.0
0.20	31.0	37.0	43.0
0.50	35.0	41.0	47.0
1.00	38.0	44.0	50.0
2.00	41.0	47.0	53.0
5.00	45.0	51.0	57.0
10.00	48.0	54.0	60.0

Terrain A – Essentially bare, porous ground (i.e. plowed field or snow-covered ground); no standing puddles of water; relatively small-leafed ground cover vegetation, such as grass lawn, meadow, hay field shortly after mowing, field of small leafed plants.

Terrain B – A few small, fully leafed deciduous trees at 15-30m; a large, fully leafed tree at 30-90m.

Terrain C – Large area of fully leafed trees or large-leafed crops or vegetation entirely surrounding area of interest.

3.6.4.3 Radio and Television Interference

Description of Radio and Television Noise Interference

In the Granby area, there are approximately eight AM station signal coverage areas with primary coverage, five secondary signal coverage areas, and a few intermittent AM station signal coverage areas. Evaluation of the signal strengths reveals that AM stations would typically have good signal-to-noise ratios at the ROW edge for fair weather. This is not true for some stations with weaker signals. In rain, the radio noise is higher than fair weather, and many AM stations may experience interference if an AM radio is used on or close to the ROW in rain.

Overhead high voltage transmission lines do not, as a general rule, interfere with radio or television (TV) reception for most practical situations. There are two potential sources for interference related to power lines: corona and gap discharges. Corona is a tiny electrical discharge at the surface of a conductor that can occur mostly in foul or rainy weather when water drops form on the conductors. Corona can sometimes generate unwanted radio frequency electrical noise. It is usually not a problem for lower voltage lines, but is an important design consideration for high voltage transmission lines rated at 345-kV and higher. Corona-generated radio frequency noise decreases with distance from a transmission line and also decreases with higher frequencies. When it is a problem, it is usually for AM radio and usually not the higher frequencies associated with FM radio, cell phones, TV, or satellite signals. Gap discharges are different from corona. Gap discharges can develop on all power lines at any voltage and are more frequently found on smaller distribution lines in residential neighborhoods. They can take place at tiny electrical separations (gaps) that can develop between mechanically connected metal parts that are loosely connected or broken. A small electric spark discharges across the gap and can create unwanted electrical noise. The severity of gap discharge interference

depends on the nature of the gap, the strength and quality of the transmitted radio or TV signal, the quality of the radio or TV set and antenna system, and the distance between the receiver and power line, among other things. The source of interference that causes more than 90 percent of the interference complaints received by electric utilities is gap discharges. They tend to be found the most often on wood poles where hardware has a greater probability of becoming loose as the wood poles and wood cross arms dry out. Lattice steel structures, concrete poles, and tubular steel poles are much better structures from an interference standpoint than wood because the hardware on the structure usually stays very tightly connected, and the weight of the long spans tends to keep hardware well bonded. Unlike corona interference, which peaks in the rain, gap discharges often decrease or disappear in the rain because the "gaps" are electrically shorted out by water drops.

Radio and TV noise is statistical in nature and varies with many conditions, including surface condition of the conductor and climatic conditions. Levels are affected by size and condition of the conductors, line voltage, weather (higher in foul weather), distance from the line, characteristics of the measurement equipment, and altitude. At higher elevations, the effect of changing air density lowers the corona inception point and there is more corona activity; a rough estimate is that an additional 1 dB of radio noise is added for each 1,000 feet of elevation above sea level. The units used for measurement of radio or TV noise are dB, referenced to 1 microvolt per meter (µV/m) (or one-millionth of a volt per meter) and written as dBµV/m. Sometimes engineers simply use dB for radio or TV noise levels, but it is generally understood that the reference is electric field strength of 1 µV/m at some specific frequency. A decibel is a dimensionless unit and it always needs a reference quantity to have meaning. The level of radio noise is frequency dependent- it is the highest near the AM radio band and decreases with higher frequencies.

Other ambient sources of radio frequency noise can also affect reception quality. The most common measure to evaluate possible interference levels within the frequency band of interest is a quantity called the signal-to-noise ratio (SNR). In general, use of SNR to assess the effect of transmission line noise requires knowledge of the broadcast signal strength at a receptor location, radio frequency noise in the receptor's frequency band, and allowable SNR levels for the desired level of reception. Tolerable SNRs for radio and TV interference have been estimated for various signal strengths and conditions. For example, a SNR of at least 20-24 dB (or better) should produce a reasonable level of service for AM radio reception.

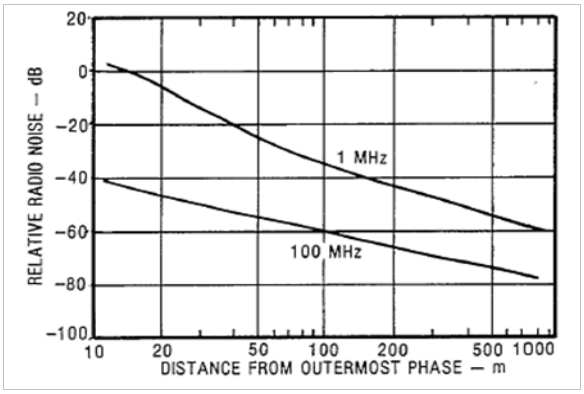


Figure 3-4. Radio/TV Noise: Levels Decrease with Distance Away and Increasing Frequency.

A survey of 19 TV station signal strengths near Granby found no digital TV (DTV) signals that meet the Federal Communications Commission (FCC) minimum threshold coverage level for over-the-air reception. TV stations in the local area are generally based near Denver, and the direction of service provided by their broadcast beam is highly directional and focused on the commercial market and population of the metropolitan Denver area rather than to mountain areas where Granby (and the proposed transmission line project) is located. Over-the-air TV signals are therefore problematic with or without the transmission line project, and adequate TV service would generally require cable or satellite TV service.

An important new issue is the TV conversion to digital broadcast systems. The SNR level for tolerable reception must be evaluated for the new generation of digital technology. In addition, the user of a DTV receiver will experience interference to over-the-air broadcast signals in a different way. Rather than a slowly degrading like TV picture quality for analog systems, DTV interference will have a threshold for performance that is essentially a go/no-go proposition. A digital receiver can function properly with interference without the user noticing anything until it gets so great that the picture breaks up or reception stops. In general, the new digital signal will be less sensitive to interference noise than an old analog signal. At this time, we are not aware of published SNR levels for good reception for the new DTV receivers. However, interference resulting from corona-generated noise would not be expected for digital signals broadcast at the higher frequencies used by FM radio, TV cell phones, and satellites. A possible problem could be a metallic transmission tower in the direct line-of-sight between a microwave dish antenna and a satellite or another ground based antenna, but this could be resolved by moving the dish antenna to a new location.

Global Positioning Systems Interference

The Global Positioning Systems (GPS) is a satellite-based radio navigation system designed to provide world-wide coverage and year-round navigation and positioning data. The space component of GPS presently has a constellation of 32 active satellites divided into six orbital planes located some 12,000 miles above the earth (GPS 1996). Each satellite has four atomic clocks on board and also has antennas that broadcast microwave signals in the 1,227-1,575 megahertz (MHz) range (one megahertz or MHz is one million cycles per second). These microwave signals are used by GPS receivers on earth to determine position, velocity, and time. The GPS signal is broadcast using a sophisticated spread spectrum technique, giving it additional immunity from interference and allowing GPS receivers to use very weak signals from the distant satellites. The GPS signal uses a special modulation method. Modulation is the manner in which information is encoded in a carrier frequency. GPS uses a complex method called code division multiple access to allow many satellites to transmit information (using a different code for each satellite) on the same carrier frequency without interfering with each other. A GPS receiver on earth uses these microwave signals (and a "navigation message" describing the satellites position in space) to compute the distance to each of at least four satellites. These distances are called "ranges" and are used by a GPS receiver to determine its position with respect to an earth centered reference coordinate system. Use of GPS requires an unobstructed view of the sky, and dense foliage or the walls of buildings can attenuate the signal so that a GPS receiver cannot maintain its "lock" on the various satellites.

Electromagnetic interference caused by a transmission line could be due to two sources: low level electromagnetic energy due to corona in rainy weather, or tiny gap discharges on broken or loose fitting line hardware such as insulators or clamps. These electromagnetic sources can differ by frequency, intensity, and occurrence. Especially during rain, corona can occur and create small amounts of electromagnetic energy that attenuates rapidly with increasing frequency and distance. The peak intensity of corona-related noise is located close to 1 MHz near the center of the AM radio band (a band is a range of frequencies) and drops to very low ambient levels above about 20-30 MHz (Ramie et. al. 2002). A gap discharge is a tiny electrical discharge between two surfaces at different voltages. It is most often found on lower voltage distribution lines. Gap discharges can be caused by broken or loose fitting line hardware and are generally active only during dry weather (rain tends to short out the gap and keep it quiet). Low level, intermittent gap discharge energy can extend above 100 MHz. Sources of gap discharges can be located on power lines and repaired.

There is extensive use of GPS signals by the cell phone industry for network synchronization using precise time information from the GPS satellite atomic clocks. GPS is also used for adjusting the cell phone base station clock drift and for processing the different, complex signal modulation schemes used by the cellular carriers. Even more GPS applications are growing such as cell phone locating and real time mapping information provided to subscribers with GPS equipped phones. Many cell phone base stations are now being installed directly on high voltage transmission line towers and have a GPS antenna for precise network operations described above. These GPS antennas are mounted directly on high voltage transmission line towers.

3.6.4.4 Induced Currents and Contact Voltage

Introduction to Induced Currents

Electric currents can be induced by EMF in conductive objects near to transmission lines. For magnetic fields, the concern is for very long objects parallel and close to the line. The majority of concern is related to the potential for small electric currents to be induced by electric fields in metallic objects close to transmission lines. Metallic roofs, vehicles, vineyard trellises, and fences are examples of objects that can develop a small electric charge in proximity to high voltage transmission lines. Object characteristics, degree of grounding, and electric field strength affect the amount of induced charge. An electric current can flow when an object has an induced charge and a path to ground is presented. The amount of current flow is determined by the impedance of the object to ground and the voltage induced between the object and ground. The amount of induced current that can flow is important to evaluate because of the potential for nuisance shocks to people and the possibility of other effects such as fuel ignition.

Agricultural Operations and Contact Currents

Agricultural operations can occur on or near a transmission line ROW. Long fences parallel to a transmission line can present an induced current situation, especially if the fence posts are nonmetallic and insulate wires from ground. This problem is solved by adequately grounding the fence with a ground rod connected to the fencing wire (usually done during power line construction). Electric company engineers typically provide grounding guidelines for objects, including fences, close to high voltage transmission lines.

Irrigation systems often incorporate long runs of metallic pipes that can be subject to field induction when located parallel and close to transmission lines (BPA 2007). Because the irrigation pipes contact moist soil, electric field induction is generally negligible, but annoying currents could still be experienced from electric field coupling to the pipe. However, caution should be used in storing, handling, and installing irrigation pipe near power lines. While moving irrigation pipe under or near power lines, equipment should be kept in a horizontal position to keep away from the overhead wires (never oriented vertically towards the wires). Pipe runs laid at right angles to the transmission line will minimize induced currents, although such a layout may not always be feasible. If there are induction problems, they can be mitigated by grounding or insulating the pipe runs. For example, the possibility of nuisance shocks can be eliminated by having metallic pipes touching ground or by the use of grounding straps for activities, such as unloading sections of pipe from a vehicle.

Operation of irrigation systems beneath transmission lines presents another safety concern. If the system uses a high-pressure nozzle to project a stream of water, the water may make contact with the energized transmission line conductor. Generally, the water stream consists of solid

and broken portions. If the solid stream contacts an energized conductor, an electric current could flow down the water stream to someone contacting the high-pressure nozzle. Transmission line contact by the broken-up part of the water stream is unlikely to present any hazard. Guidance on safe operation of irrigation systems near transmission lines can be provided by electric utility engineers.

3.6.5 Management Considerations

3.6.5.1 EMF Standards and Guidelines

Presently, there are no electric or magnetic field health-based standards for the state of Colorado or for the United States. Although there are no federal health standards in the United States specifically for 60 Hz EMF, two organizations have developed guidelines: the ICNIRP and the IEEE (ICNIRP 1998; IEEE 2002). Both of these guidelines are much higher than the calculated EMF levels for the proposed transmission line project. Table 3-9 and Table 3-10 present a summary of the EMF levels of these guidelines, respectively.

The American Conference of Governmental Industrial Hygienists recommends an occupational limit of 1 kV/m for electric fields for workers with cardiac pacemakers (ACGIH 2003); however, this level does not occur outside the transmission line ROW.

Table 3-9. ICNIRP Guidelines for EMF Exposure.

Exposure (60 Hz)	Electric Field	Magnetic Field
Occupational	8.3 kV/m	4.2 G (4,200 mG)
General Public	4.2 kV/m	0.833 G (833 mG)

ICNIRP is an organization of 15,000 scientists from 40 nations who specialize in radiation protection.

Table 3-10. IEEE Exposure Levels for 60 Hz EMF.

Exposure (60 Hz)	Electric Field	Magnetic Field
General public should not exceed	5,000 V/m (5 kV/m)	9,040 mG (9.04 Gauss)
Controlled environments should not exceed	20,000 V/m (20 kV/m)	27,100 mG (27.1 Gauss)

Note: Within the ROW, the general public limit is 10 kV/m.

Two states (New York and Florida) have adopted guidelines or standards for transmission line magnetic fields (NIEHS 2002). These standards are engineering-based since it has not yet been determined whether or not 60 Hz electric or magnetic field exposure constitutes a health hazard, it cannot be determined what levels of exposure are “safe” or “unsafe.” Table 3-11 presents a summary of state EMF standards. Calculated EMF levels for the proposed transmission line project are lower than these state guidelines.

Table 3-11. State Transmission Line Standards and Guidelines.

	Electric Field		Magnetic Field	
State	On ROW	Edge ROW	On ROW	Edge ROW
Florida	8 kV/m [a]	2 kV/m	___	150 mG [a] (max load)
	10 kV/m [b]			200 mG [b] (max load)
				250 mG [c] (max load)
Minnesota	8 kV/m	___	___	___
Montana	7 kV/m [d]	1 kV/m [e]		
New Jersey	___	3 kV/m		
New York	11.8 kV/m	1.6 kV/m	___	200 mG (max load)
	11.0 kV/m [f]			
	7.0 kV/m [d]			
Oregon	9 kV/m	___	___	

[a] For lines of 69-230-kV. [b] For 500 kV lines. [c] For 500-kV lines on certain existing ROW. [d] Maximum for highway crossings. [e] May be waived by the landowner. [f] Maximum for private road crossings.

3.6.5.2 Audible Noise Standards and Guidelines

The EPA has an outdoor activity Ldn noise guideline of 55 dBA (EPA 1974). This value represents the sound energy averaged over a 24-hour period; it has a 10 dBA nighttime weighting (between 10:00 p.m. and 7:00 a.m.) (EPRI 2005). Calculated audible noise levels were also performed with EPRI's EMF Workstation computer program to calculate Leq and then used to calculate a time-weighted daytime/nighttime 24-hour Ldn for audible noise. For foul weather, the calculated noise levels for the proposed transmission line configuration are about 39.1 dBA at the 69-kV ROW edge and 39.9 dBA at the 138-kV ROW edge, which correspond to an Leq of about 37.5 dBA and 38.2 dBA respectively. These are very low levels, as would be expected for a transmission line of this voltage class.

Ldn values can also be derived from daytime and nighttime Leq values using the following computational formula (Keast 1980 and EPRI 2005):

$$\text{Ldn} = 10 \log_{10}\left\{\left(\frac{1}{24}\right)\left[15 \text{ antilog}\left(\frac{\text{Ld}}{10}\right) + 9 \text{ antilog}\frac{\text{Ln} + 10}{10}\right]\right\}$$

where Ld = is the daytime Leq and Ln is the nighttime Leq.

Based upon this formula, Ldn values were calculated for proposed transmission lines using their respective Leq values. Calculated Ldn values for audible noise correspond to about 43.9 and 44.6 dBA for the proposed 69/138-kV transmission line at the ROW edges. These values are well below the EPA outdoor activity Ldn noise guideline of 55 dBA.

Often cities, counties, and other local governmental agencies may also specify noise limits. Although they are typically modeled after the EPA guidelines, local noise ordinances may also be applicable for this project.

3.6.6 Scoping Issues

Public scoping concerns primarily centered on potential human health effects as a result of increased EMF exposure. Additionally, agricultural interests expressed similar concerns about livestock exposure to increased EMF. Agricultural interests also expressed concern about safety hazards of machinery or ranch operations in the vicinity of the transmission line.

3.7 Land Use

This section describes the historical and existing land use patterns in the Project Area. Land use data was collected from Grand County, and local, state, and federal sources.

3.7.1 Analysis Area

The Project Area is entirely contained within Grand County, Colorado. The towns of Granby and Grand Lake are the largest communities in the Project Area. The Forest Service, BLM, SLB, and NCWCD manage large tracts of land within the Project Area. The remaining lands are privately owned, typically by individuals.

The southwestern portion of the Project Area consists primarily of shrub and grasslands used for grazing and ranching, which are either owned by the BLM or privately. Structures found within this portion of the Project Area are primarily associated with agricultural operations, such as outbuildings for storage of equipment or grains.

The analysis area also contains several residential subdivisions, the largest of which is the Scanloch Subdivision, which consists of 197 residential lots ranging in size from 0.1-1.2 acres along the southwest corner of Lake Granby. U.S. Highway 34 bisects a small portion of the subdivision, but mostly follows its eastern edge. The Grand County Assessor's data shows that 74 of the lots have been improved. Approximately 1.5 miles north of Scanloch is Stillwater Estates. Stillwater Estates contains 49 residential lots, 40 of which are shown to have improved structures.

The C Lazy U Ranch and Resort is a luxury guest ranch controlling approximately 11,000 acres that nearly surround Willow Creek Reservoir. The ranch provides lodging and dining and supports a variety of activities, including fly-fishing and horseback riding. The Orvis-certified ranch has been in operation for over 90 years. The southern boundary of the ranch is located less than 0.5 mile north of Western's Granby Pumping Plant Switchyard-Windy Gap Substation 69-kV transmission line. A portion of the ranch is the C Lazy U Preserves, an agricultural subdivision comprised of 30, 35-acre properties that are located approximately 0.5 mile southwest of the Stillwater Estates Subdivision. Fifteen of these properties have private conservation easements on them, which is roughly the southern half of the subdivision.

There are a number of other smaller subdivisions that are located towards the northern end of the Project Area. Colorado Anglers Club #1 and #2 are resort communities that are partially built. Club #1 is located on the west side of U.S. Highway 34 and consists of approximately 274 0.1-0.5 acre lots. Club #2 is located on the east side of U.S. Highway 34, north of the Cutthroat Trout Bay Campground, and has 7 larger lots, all of which are undeveloped at this time. The Lake Forest Subdivision is located adjacent to and east of the existing ROW that runs along County Road 642. This neighborhood appears to be built out and contains at least 82 homes, including three mobile homes. Other smaller subdivisions within this northern section of the

Project Area include Antler Ranchettes, the Lakeridge Mountain Valley Subdivision, Soda Springs Subdivision, and Fox Ridge Estates.

A 1,500-acre mixed-use development is planned north of the intersection of U.S. Highway 40 and 34. The development is proposed to include single-family residential, multi-family residential (medium density), residential/business, highway/general business, and open/recreation zoning districts. The development, formerly known as the Shorefox Development LLC, went into foreclosure in 2008. Improvements to the property prior to the foreclosure included extensive earthmoving for overlot grading, road construction, development of a golf course, creation of lakes or ponds for fly casting and fishing, and construction of a new bridge over the Colorado River. A new developer has since purchased the property and is moving forward with a new proposed plan for development, with some level of commercial development expected to commence in the next 2 years.

Federal lands within the Project Area are managed by the BLM's Kremmling Field Office and the Forest Service's Sulphur Ranger District. The Forest Service manages the land area surrounding Lake Granby and other surrounding reservoirs as part of the ANRA. Within the Project Area, the ANRA contains two campgrounds – the Stillwater Campground with 129 sites, and Cutthroat Trout Bay Campground with two group sites (30 people each). Camping ranges from tent camping to recreational vehicle (RV) sites with hook-ups, and both are open seasonally from late May through November. Further details can be found in Section 3.10, Recreation and Wilderness.

Agricultural lands, which include areas used for the cultivation of hay, are also an important land use. These areas are concentrated in the valley floor along major drainages, such as the Colorado River, Willow Creek, and Stillwater Creek.

There are approximately 13 miles of utility ROW that is managed by Western. The majority of this ROW has a width of 30 feet; however, within the northern quarter of the Project Area, there is a second parallel 69-kV transmission line that results in a combined 150-foot ROW. In addition, the NCWCD owns and manages the Windy Gap Water Pipeline ROW, which has a 100-foot ROW running through the southern half of the Project Area between Lake Granby and Windy Gap Reservoir.

Table 3-12 provides a summary of the land area and ownership pattern found within the Project Area.

The Grand County/Granby Airport is located on Granby Mesa on the northeast edge of the Town of Granby. This facility is located at an elevation of 8,200 feet and is approximately 2 miles southeast of Western's existing 69-kV transmission line.

Table 3-12. Land Ownership and Management within 2 Miles of All Alternative Alignments.

Owner-Manager	Acres
Forest Service - ANRA	7,025
BLM	4,778
NCWCD	3,137
National Park Service (NPS)	769
Grand County	316
Other - Private	22,854

3.7.2 Transportation Overview

Surface transportation in the area is provided by a network of primary, secondary, and local roads. U.S. Highway 34 connects the towns of Granby and Grand Lake, which are approximately 14 miles apart. Highway 34 is also the gateway into RMNP, as drivers continue north past Grand Lake. U.S. Highway 40 connects Granby with the towns of Fraser and Winter Park, approximately 13 miles to the southeast; and the towns of Hot Sulphur Springs and Kremmling, approximately 9 and 25 miles to the west, respectively.

State and county roads, local roads, and Forest Service roads also interlace the Project Area, including Colorado State Route 125 and Grand County roads CR 4, 64, 41, and 40. County roads provide access to the existing transmission line, as well as to area reservoirs and recreation areas. County roads infrequently bisect the alternatives while the U.S. Highways tend to run parallel to alternatives. Local roads connect the primary routes to the residential neighborhoods mentioned in the preceding section, and are bisected by the transmission line at those locations. Permitted uses of smaller roads in the area include for the maintenance of electrical power lines, substations, pipelines, communication towers and other utilities. Traffic volumes to these facilities are low and access to these facilities is infrequent.

The primary U.S. and state routes are hard surfaced and well maintained. Grand County roads are either paved or gravel and in good condition. Roads with direct access to the alternatives are not heavily used. Smaller unpaved dirt roads associated with the existing transmission line, substations and other linear facilities, such as utility ROW managed by Western, provide additional access. Local roads in residential areas are either paved or gravel/dirt, and well-maintained.

3.7.3 Alternative-Specific Analysis Area

3.7.3.1 Alternative A

Alternative A would maintain the existing transmission line and ROW that passes through the Scanloch Subdivision for 1 mile, as well as the Stillwater Estates Subdivision, the Lakeridge Mountain Valley Subdivision, and other smaller neighborhoods along the north end of the Project Area. A 1,500-acre mixed-use development is planned north of the intersection of U.S. Highway 40 and 34. The current alignment crosses through the northern end of the 1,500-acre parcel, which is being proposed for single-family residential zoning.

Approximately 20 homes within 60 improved residential lots are located within 100 feet of the current alignment. Two residential lots with mobile homes are also within 100 feet of the current alignment; an additional 60 improved residential lots and six condominiums are located within 100-300 feet. There are 55 vacant residential lots within 100 feet of the current alignment, and an additional 48 vacant residential lots within 300 feet.

Additionally, Alternative A extends through cultivated lands for a distance of approximately 1.3 miles.

3.7.3.2 Alternative B1

Alternative B1 follows the existing transmission line alignment, except for two locations. Alternative B1 does not cross through the Scanloch Subdivision; instead, it borders its western boundary for approximately 1 mile. Alternative B1 continues along the current alignment through the Stillwater Estates Subdivision, the Lakeridge Mountain Valley Subdivision, and other smaller neighborhoods along the north end of the Project Area, but diverges from the existing alignment for approximately 500 feet slightly northward along U.S. Highway 34 before heading back south at the project terminus. Also, should the planned 1,500-acre mixed-use development north of the intersection of U.S. Highway 40 and 34 eventually be built, Alternative B1 would cross through the northern end of the development, which is being proposed for single-family residential zoning.

Approximately 13 homes within 43 improved residential lots are located within 100 feet of the alignment of Alternative B1. Two residential lots with mobile homes are also within 100 feet of the current alignment; an additional 51 improved residential lots and six condominiums are located within 100-300 feet. There are 18 vacant residential lots within 100 feet of the current alignment, and an additional 55 vacant residential lots within 300 feet.

3.7.3.3 Alternative C1

This alternative does not directly pass through either the Stillwater Estates or the Scanloch subdivisions. At its closest points, Alternative C1 travels within approximately 0.5 mile of the Scanloch Subdivision's western boundary, and within 200 feet of Stillwater Estate's northwestern corner. Near Cutthroat Trout Bay, Alternative C1 diverges from the existing transmission line alignment for approximately 500 feet, turning slightly northward along U.S. Highway 34 before heading back south to the project terminus. Additionally, this alternative crosses the C Lazy U Preserves for 0.5 mile along its northeastern edge, including approximately 500 feet of the property that has a conservation easement on it. In the future, should the 1,500-acre mixed-use development north of the intersection of U.S. Highway 40 and 34 eventually be built, Alternative C1 would run along its northern boundary.

Approximately 13 homes within 35 improved residential lots are located within 100 feet of the C1 alignment, with an additional 30 improved residential lots, six condominiums, and two lots with mobile homes located within 100-300 feet. The alignment is also in proximity to a number of vacant residential lots, including 10 within 100 feet of the centerline and an additional nine vacant residential lots within 100-300 feet.

Additionally, Alternative C1 crosses through cultivated lands for a distance of approximately 1.8 miles.

3.7.3.4 Alternative C2-Options 1 and 2

Alternative C2, which has two options, differs from Alternative C1 only in the approximately 2-mile segment immediately east of the Windy Gap Substation. In the future, should the 1,500-acre mixed-use development north of the intersection of U.S. Highway 40 and 34 eventually be built, Alternative C2-Options 1 and 2 would cross through the northern end of the development, which is being proposed for single-family residential zoning.

Each of the Alternative C2 options cross through 1.8 miles of land under cultivation.

3.7.3.5 Alternative D-Options 1 and 2

Alternative D-Option 2, follows the existing transmission line alignment for most of its distance, and therefore crosses through an area with existing land uses very similar to those described for Alternative B1.

Alternative D-Option 1 is located north of Option 2 and follows the ROW of the Windy Gap pipeline for several miles. Both Options 1 and 2 have two fewer improved residential lots within 100 feet of the proposed alignment and three fewer improved residential lots within 300 feet, compared to Alternative B1. There are 41 improved residential lots, two lots with mobile homes, and 18 vacant residential lots within 100 feet of the alignment; an additional 50 improved residential lots, six condominiums, and 55 vacant residential lots are located within 300 feet of the alignment. In the future, should the 1,500-acre mixed-use development north of the intersection of U.S. Highway 40 and 34 eventually be built, both Options 1 and 2 would cross through the northern end of the development, which is being proposed for single-family residential zoning. Both options cross through the same distance of cultivated land, approximately 1.3 miles.

3.7.4 Existing Conditions and Context

3.7.4.1 Existing Land Uses and Regulations

Historic land use in the Project Area was primarily related to agriculture, ranching, and forestry. Today, these activities continue and are supplemented by recreation, tourism, and residential development. There are also portions of the Project Area that are permanently protected for conservation and areas used for utility and roadway ROWs.

The ANRA is the only federally designated recreation area in the Project Area and includes the campgrounds previously mentioned, as well as areas for recreational activities such as fishing, water-skiing and boating, hiking, cross-country skiing, wildlife viewing, and scenic driving.

As described previously, the existing alignment passes through Forest Service land in an identified utility corridor that is managed by Western. This area is managed for utility corridors that include electric power transmission lines, and includes lands used for grazing or irrigated hay production.

According to the NRCS, no prime farmland exists within the Project Area; however, there are approximately 9,500 acres of Farmland of Statewide Importance. The NRCS defines such lands as land that has been identified by criteria determined by the Colorado State Experiment Station, the Colorado State Department of Agriculture, and the Colorado State Soil Conservation Board. No management requirements exist for such lands.

Communities within the Project Area include the Town of Granby, Town of Grand Lake, and Three Lakes. Granby's current municipal boundary falls approximately 1.5 miles south of the project, with an Urban Growth Area (UGA) extending northward to U.S. Highway 34 within 1 mile of the project. Grand Lake's current town boundary is approximately 4 miles north of the project, bordering Grand Lake and Shadow Mountain Lake; however, the UGA extends to within the Project Area to the northern border of Lake Granby. This area, which is currently unincorporated, is home to a number of rural residential subdivisions and dispersed homes.

Land use on private lands in Grand County is subject to county zoning regulations administered by the Grand County Department of Planning and Zoning. The county is divided into zoning

districts that allow certain types of land uses, with additional zoning overlays to emphasize sensitivity to visual resources where appropriate. The majority of the study area is zoned as "Forestry / Open" to protect lands suitable for agriculture and related uses such as forestry, mining and recreation, and low density single-family residential uses. Small portions adjacent to Lake Granby are also zoned Mobile Home, Residential, and Tourist. All of these zoning districts permit public utility facilities under special review. The Three Lakes Design Review Overlay District applies to the study area, which identifies siting and building requirements and criteria to ensure that the built facilities in this overlay district blend into the natural environment (Grand County Planning and Zoning website).

According to Grand County's land use regulations, all proposed public utility lines should be routed and constructed to maximize the use of federal and state owned lands; minimize damages to private landowners over which the line passes and adjacent to the proposed line; avoid paralleling major transportation routes; cross any of the major routes at right angles; avoid "tunnel" effect of clearing vegetation; avoid clear stripping of ROW; avoid soils particularly subject to erosion; avoid cultural sites; avoid visually unique scenic vistas and unique natural phenomenon; avoid adverse impacts on wildlife and fish and their habitat; preserve the natural landscape as best as possible; minimize conflict with the existing and planned land uses as shown on the County master plan map; maximize the screening potential of vegetation and topography; avoid crossing or interfering with a fishery; avoid isolated stands of spruce, fir, and aspen, streams, lakes and ponds; avoid skylines visible from a population concentration or major transportation route and minimize alteration or aspect of any hillside (Zoning Regs 11.8(6)(e), last amended May 2009).

3.7.5 Management Considerations

3.7.5.1 Future Land Uses

The Grand County Master Plan (2011) was completed to help Grand County leaders and citizens make choices concerning future growth and growth implications in the county. The master plan consists of broad-based land use goals, policies, and strategies intended to guide future development in a manner consistent with a shared community vision. The document also identifies town and county growth areas, where growth will primarily be directed in the future. The zoning, subdivision, and building code requirements for Grand County are more specific documents and respectively deal with exact boundaries of districts and the uses permitted within such districts, the detailed standards subdivision design, and the maintenance of minimum standards of structural integrity, safety, and soundness. These documents are referred to as land use regulations and are intended to implement the goals, policies and land use proposals of the master plan.

Growth areas for each municipality within Grand County, including Grand Lake and Granby, are identified in the Grand County Master Plan. Growth areas are generally intended to provide land for future growth in a manner where it can best be accommodated and provided with necessary public facilities and services in an environmentally sensitive and fiscally responsible manner. This includes areas for new residential, as well as commercial, industrial, and other land uses. The Granby growth area extends beyond the current town limits and includes areas to the north and east of the intersection of U.S. Highway 34 and 40. The Grand Lake growth area generally extends south from Grand Lake to the north shore of Lake Granby and west from the shorelines of Shadow Mountain Reservoir and Lake Granby approximately 2 miles.

Major development projects on the horizon for Granby include a mixed-use (private/business) development on approximately 1,500 acres north of the intersection of U.S. Highway 34 and 40 (formerly known as the Shorefox Development).

3.7.6 Scoping Issues

- Consider impacts to airports/pilots
- Consider impacts to rural character of community and county
- Review project consistency with Grand County Zoning and Three Lakes Design Review Area
- Consider impacts to existing and proposed conservation easements
- Consider impacts to local real estate sales
- Concerns regarding towers placed near irrigation ditches
- Consider new subdivisions planned in/near potential alternatives

Some of these issues are addressed in other sections, including visual resources and EMF.

3.8 Visual Resources

3.8.1 Analysis Area

The visual resource analysis area is defined by Forest Service distance zones and by the distance at which visual effects can be mitigated. As defined by the Forest Service, the appearance of physical features is dependent on distance from an observer's position, which is divided in this analysis into the distance zones of foreground, middleground, and background. The foreground distance zone is defined as the area between zero and 0.50 mile from the viewer; the middleground, 0.5-4 miles; and the background, 4 or more miles.

Four miles is generally the distance at which typical visual effects of transmission lines and associated components can be mitigated. At 4 miles, vegetation changes and structures are apparent only in patterns or outlines; the texture and most colors of individual structures are no longer apparent in the landscape. Accordingly, mitigation measures that rely on texture or color to reduce effects are generally not effective beyond 4 miles from the proposed project.

Therefore, the visual resources analysis area for the Granby Pumping Plant Switchyard-Windy Gap Substation transmission line is from the proposed project facilities to 4 miles, or the middleground distance zone, within the viewshed of the project. The viewshed, or seen areas, were determined by Geographic Information System (GIS) terrain analysis to depict the extent of the potential line of sight distance of the facilities in the landscape. The analysis area primarily encompasses the ANRA, Willow Creek Valley, and the Upper Colorado River Valley from Lake Granby to Windy Gap.

3.8.2 Existing Conditions and Context

The analysis area occurs in the Southern Rocky Mountains physiographic region (Fenneman 1964). Lake Granby, Table Mountain, Willow Creek, the Colorado River Valley, and the high peaks of the Continental Divide dominate the visual landscape of the analysis area. Open valleys, grasslands, hayfields, and pastures comprise the lowland visual landscape, with

deciduous riparian and wetland systems creating meandering patterns throughout. The vegetation patterns of the upland foothills and mountains vary from sage and shrubland communities to dense conifer stands that offer both enclosed and panoramic views. The Colorado River Headwaters National Scenic and Historic Byway (U.S. Highway 34, or scenic byway) runs north-south through the analysis area, generally parallel to the existing ROW for approximately 12 miles; the scenic byway visually connects the area's features and attractions. Several existing transmission lines are located in the analysis area, including a 25-kV MPEI transmission line and Western's existing 69-kV line, both of which generally parallel the scenic byway. The existing Windy Gap Pipeline ROW is visible from the Colorado River Valley when snow is not present.

The analysis area is divided into three landscape units based on existing landscape character attributes (landform, water, vegetation, and land use).

1. Lake Granby Unit - including the Lake Granby portions of the ANRA.
2. Willow Creek Valley Unit - including the Willow Creek Reservoir portions of the ANRA.
3. Colorado River Valley Unit - southwest of the ANRA to Windy Gap.

3.8.2.1 Lake Granby Unit

Lake Granby, the second largest body of water in Colorado, is located approximately 4 miles northeast of the Town of Granby and includes the majority of the ANRA. When Congress created the ANRA, it directed that the area be administered primarily to provide high quality recreational opportunities, conservation of scenic and historic values, and stewardship of natural resources (16 U.S.C. §460jj). The ANRA provides a wide variety of land and water-based recreational opportunities.

The majority of users experience the Lake Granby Unit from the scenic byway, as well as from a diversity of recreational, residential, and commercial sites. Most foreground views are directed towards Lake Granby; background views consist of the rugged, snowy peaks of the Continental Divide further east. With the exception of distant views afforded by the lakeshore, visibility is limited to the foreground in many locations due to dense, mature stands of lodgepole pine, ponderosa pine, and Engelmann spruce. Extensive pine beetle infestations have affected large portions of these stands, resulting in a brown hue to the forest. Several mechanical and prescribed burn treatments are being implemented, which will increase visibility. In some places along the scenic byway, such as the northwest shore of Lake Granby, openings within the forested areas are created by highway and commercial uses, or by natural openings that provide views toward the lake or working landscapes to the east (north of CR 41).

Most middleground and background viewsheds enjoy a high degree of scenic integrity – especially the views of distant mountains, eastern slopes of Table Mountain, and working landscapes. The scenic integrity of the lakeshore and scenic byway foreground, around Fish Bay and Cutthroat Trout Bay, have been degraded to poor to moderate levels of scenic integrity by alterations of the natural landforms and vegetation. Commercial signage blocks views and creates visual clutter; commercial and residential development and design styles are out of character with the surrounding environment. As noted in the Colorado River Headwaters Byway Corridor Management Plan, some commercial operations located between the scenic byway and the lake are seen very critically by travelers, including those that are prominent, poorly maintained, or visually discordant (CDOT 1998).

One-quarter mile south of the intersection of U.S. Highway 34 and CR 64, Western's existing 69-kV line crosses the highway perpendicularly. More than 18 utility lines cross the scenic byway within a 0.5 mile of this intersection, more than any other segment from Grand Lake to Windy Gap. Western's existing 69-kV line also crosses through five residential subdivisions in the Lake Granby Unit, including the Lakeridge Mountain Valley Subdivision, Colorado Anglers #2 Club, Lake Forest Subdivision, Stillwater Tracts, and the Scanloch Subdivision.

Other deviations from the existing landscape character are a Reclamation maintenance building and the Granby Pumping Plant. The Reclamation maintenance building is the most visually intrusive object along this portion of lakeshore; it is inconsistent with the predominant forms and colors and is visible from many locations.

In general, the undulating terrain and forested condition provide for a high visual absorption capacity (VAC), or relative ability of the landscape to accept human alterations without loss of character or scenic quality. Forest openings and agricultural landscapes have a lower VAC.

3.8.2.2 Willow Creek Valley Unit

The western slopes of Table Mountain, Willow Creek, and Willow Creek Reservoir provide opportunities for biking, hiking, camping, picnicking, fishing, and cross-country skiing. Forest Service and BLM lands are confined to steeper slopes and lands adjacent to Willow Creek Reservoir. Most irrigable lands are privately owned for grazing and hay production.

Willow Creek Reservoir Road (CR 40) is the primary access road for recreationists visiting the Willow Creek Reservoir portion of the ANRA. In the spring and summer, the lush green bottomlands complement the undulating sage-covered foothills, which transition to timbered table-top mountains. In the broad Willow Creek Valley, linear features include CR 40 (oriented east-west), the Willow Creek Canal, and numerous north-south ditches and dirt roads. Due to the vertical architecture, the Willow Creek Pumping Plant and Grand County wastewater treatment facility are contrasting focal points from CR 40, although the latter is less visible from primary roads. Ranch houses and associated outbuildings complement the ranching theme of this unit, which has been more isolated from the fragmenting influences of mountain home development patterns common to the Lake Granby and Colorado River Valley units. However, recent and planned subdivisions may modify the visual cohesiveness of this unit. The Willow Creek Valley Unit has a high degree of scenic integrity, notwithstanding the linear elements. Due to the low vegetation profiles, this unit has a low VAC.

3.8.2.3 Colorado River Valley Unit

The Windy Gap Wildlife Watching Area is a dominant feature of this unit, including lands managed by the BLM. The majority of lands in this unit are privately owned. An important part of this unit's attraction stems from the scenic and historic interest found on the private, large working ranches. These open grasslands are bordered on the north and south by sage and pine-covered foothills, and visibility is high. Several commercial properties and a master planned residential/resort munity have developed or are approved west of the Town of Granby at the intersection of U.S. Highways 34 and 40, as described in Section 3.7, Land Use. With the exception of these developments, this unit has a high degree of scenic integrity and a moderate VAC, which results from a mosaic of landform and vegetation types.

3.8.2.4 Concern Levels

Concern levels refer to the level of public or agency sensitivity and importance over potential changes to the existing landscape character and scenic integrity (Forest Service 1996). Concern levels vary with landscape character, user types, user activity, and viewing distance. Concern levels can be measured by assessing public demands for scenery and related recreational activities through public scoping meetings, correspondence, and surveys such as the National Visitor Use Monitoring Results for the ARNF (Forest Service 2001). Each method used for the National Visitor Use Monitoring report found that residents and tourists are highly concerned with the condition of the natural environment and engage in scenery-dependent activities, such as sightseeing, hiking/walking, driving for pleasure, and picnicking. Therefore, the analysis area has a high concern level.

3.8.2.5 Key Observation Points

Key observation points (KOPs) are viewing locations that are representative of an area's landscape character and visual sensitivity, or locations where the view of the proposed project would be most revealing. Within the analysis area, 18 KOPs were identified by specialists from Grand County, Forest Service, BLM, and through public scoping (Table 3-13). They were limited to areas within view of a project alternative to include major and minor roads, designated and informal recreational areas and scenic viewpoints, dispersed rural residences, and private and public lands (see Map 3-6, Key Observation Points). Field surveys, and input from agency staff and public scoping defined the use frequency, duration of view, relationship to constituent information, and viewshed characteristics within the analysis area.

Table 3-13. Key Observation Points.

KOP Number, Location	Alternative A (No Action) Visible	Alternatives Visible	Visual Resource Issues	Management Objective
1: US 34 – Transmission line crossing looking north	X	B1, C1, C2, D (on same alignment)	Scenic Byway, Residential, ANRA	Grand County Three Lakes Design Review Area, Forest Service (High SIO)
2: US 34 / CR 64 looking southwest	X	B1, C1, C2, D (on same alignment)	Scenic Byway, Recreation, Residential, ANRA	Grand County Three Lakes Design Review Area, Forest Service (High SIO)
3: CR 64 at Cutthroat Trout Bay Campground looking northwest	X	B1, C1, C2, D (on same alignment)	Recreation, Residential, ANRA	Grand County Three Lakes Design Review Area, Forest Service (High SIO)
4: CR 41 – 2 miles west of US 34 looking southeast		C1, C2 (on same alignment)	Residential	Grand County Three Lakes Design Review Area, Forest Service (Moderate SIO)

KOP Number, Location	Alternative A (No Action) Visible	Alternatives Visible	Visual Resource Issues	Management Objective
5: Stillwater Campground looking northeast	X	B1, C1, C2, D (on same alignment)	Scenic Byway, Recreation, ANRA	Grand County Three Lakes Design Review Area, Forest Service (High SIO
6: US 34 / CR 41 looking northwest	X	B1, D (on same alignment) C1, C2 (on same alignment)	Scenic Byway	Grand County Three Lakes Design Review Area
7: CR 41 – 1 mile west of US 34 looking north	X	B1, D (on same alignment) C1, C2 (on same alignment)	Residential	Grand County Three Lakes Design Review Area
8: CR 4106 – East of Three Lakes wastewater facility looking west		C1, C2 (on same alignment)	Residential	Grand County Three Lakes Design Review Area, Forest Service (Moderate SIO)
9: Sunset Point Campground looking west	X	B1, D (on same alignment)	Scenic Byway, Recreation, ANRA	Grand County Three Lakes Design Review Area, Forest Service (High SIO)
10: Willow Creek Road – 1 mile east of Willow Creek Campground looking east		C1, C2 (on same alignment)	Recreation	
11: Willow Creek Pumping Plant looking east		B1, D (on same alignment) C1, C2 (on same alignment)	Recreation, Residential	
12: Granby Substation – US 34 / Willow Creek Road looking southwest to north	X	B1 D	Scenic Byway, Recreation, ANRA	Grand County Three Lakes Design Review Area, Forest Service (High SIO)
13: Windy Gap Watchable Wildlife Area (SWA) looking north	X	B1, C1, C2, D (on same alignment)	Scenic Byway, Recreation	BLM (Class II)
14: US 34 – 1.5 miles north of US 34 / 40 looking north		C1 B1, C2-Option 2, D-Option 2 (on same alignment) C2-Option 1, D-Option 1 (on same alignment)	Scenic Byway	BLM (Class III)
15: Lake Granby (Norton) Marina looking southwest	X	B1, D (on same alignment)	Scenic Byway	Grand County Three Lakes Design Review Area, Forest Service (High SIO)

KOP Number, Location	Alternative A (No Action) Visible	Alternatives Visible	Visual Resource Issues	Management Objective
16: US 34 / Colorado River crossing near CR 620 looking northwest	X	B1 C1, C2, D (on same alignment)	Scenic Byway	BLM (Class III)
17: US 34 at the former Shorefox Development looking northwest	X	B1, C2-Option 2, D-Option 2 (on same alignment) C1 C2-Option 1, D-Option 1 (on same alignment)	Scenic Byway, Master Planned Community	BLM (Class III)
18: US 34 – 1 mile south of CR 41 looking west	X	B1, D (on same alignment)	Scenic Byway, Residential, ANRA	Grand County Tree Lakes Design Review Area, Forest Service (High SIO)

3.8.3 Management Considerations

3.8.3.1 Forest Service

The 1997 Forest Plan (Forest Service 1997b) uses the Scenery Management System to evaluate and assign management objectives on Forest Service managed lands (see Map 3-7, SIO / VRM Areas). There are 'Predominant' and 'Secondary' Scenic Integrity Objectives (SIO) listed in the Final EIS of the Forest Plan (Table 3.136, p. 402) that describe the degree of acceptable alteration of the landscape. Generally, the Predominant Scenic Integrity Objective (SIO) applies to the entire management area. However, some on-the-ground situations may require a Secondary, or less restrictive SIO. Consequently, the ANRA, which is managed for High, allows for a Secondary SIO of Moderate or Low. The goal is to hold the deviations to a level subordinate to the whole management area, and to allow the activity or use to occur and meet other important goals and objectives desired in the management area. Standard 154 in the amended Forest Plan states: “Prohibit management activities that are inconsistent with the scenic integrity objective unless a decision is made to change from the scenic integrity objective. A decision to change from the scenic integrity objective will be documented in a project level NEPA decision document” (Forest Service 1997b). Because the Forest Plan allows flexibility in SIO as long as the change from Predominant SIO is documented in the project level NEPA, a change in SIO to Low will not violate Forest Plan standards and guidelines.

Forest Service lands in the analysis area are predominantly managed for either High or Moderate SIOs. A High SIO “retains a natural appearing environment with no evident human alterations” (Forest Service 1997b). However, an exception occurs on Forest lands along U.S. Highway 34. These lands are classified in the Forest Plan Final EIS as “remarkable and outstanding,” and managed to a High SIO in the ANRA. Referring to the scenic byway, the 1997 Forest Plan Final EIS further states that, “existing facilities, such as power lines, roads, campgrounds, and picnic grounds, in these areas may be obvious,” but are designed to be less evident and more natural in appearance than in many other portions of the Forests.

Smaller portions of Forest Service lands north and northwest of the ANRA are managed to a Predominant SIO of Moderate. Moderate SIO "manages the environment with human alterations evident but subordinate to the character of the natural landscape." Within the ANRA, a Secondary SIO of Moderate "manages the environment with human alterations evident but subordinate to the character of the natural landscape." As an example of how Moderate SIO is applied, "A power line that uses flat, low reflectivity, natural colors that blend with the background could meet this level, as could irregularly shaped timber harvests with some trees left and feathered edges, or ski slopes in areas with natural openings that allow some blending" (Forest Service 1997b).

Within the ANRA, a Secondary SIO of Low also "manages the environment with human alterations evident and somewhat dominating the natural landscape's character." As an example of how Low SIO is applied, "Roads that are evident, created openings from some timber harvests, and ski slopes on completely forested slopes are examples of this level" (Forest Service 1997b).

3.8.3.2 Bureau of Land Management

The 1984 BLM Kremmling Resource Management Plan provides the framework for land use decisions on public lands managed by the BLM (see Map 3-7, SIO / VRM Areas). In order to evaluate scenic resources on public lands, the BLM uses a system similar to the Forest Service: the Visual Resource Management system (VRM). Like the Forest Service, BLM VRM classifies lands according to five levels, ranging from very high (Class I) to very low (Class V), as shown in Table 3-14. VRM Class II and III lands are located within the analysis area.

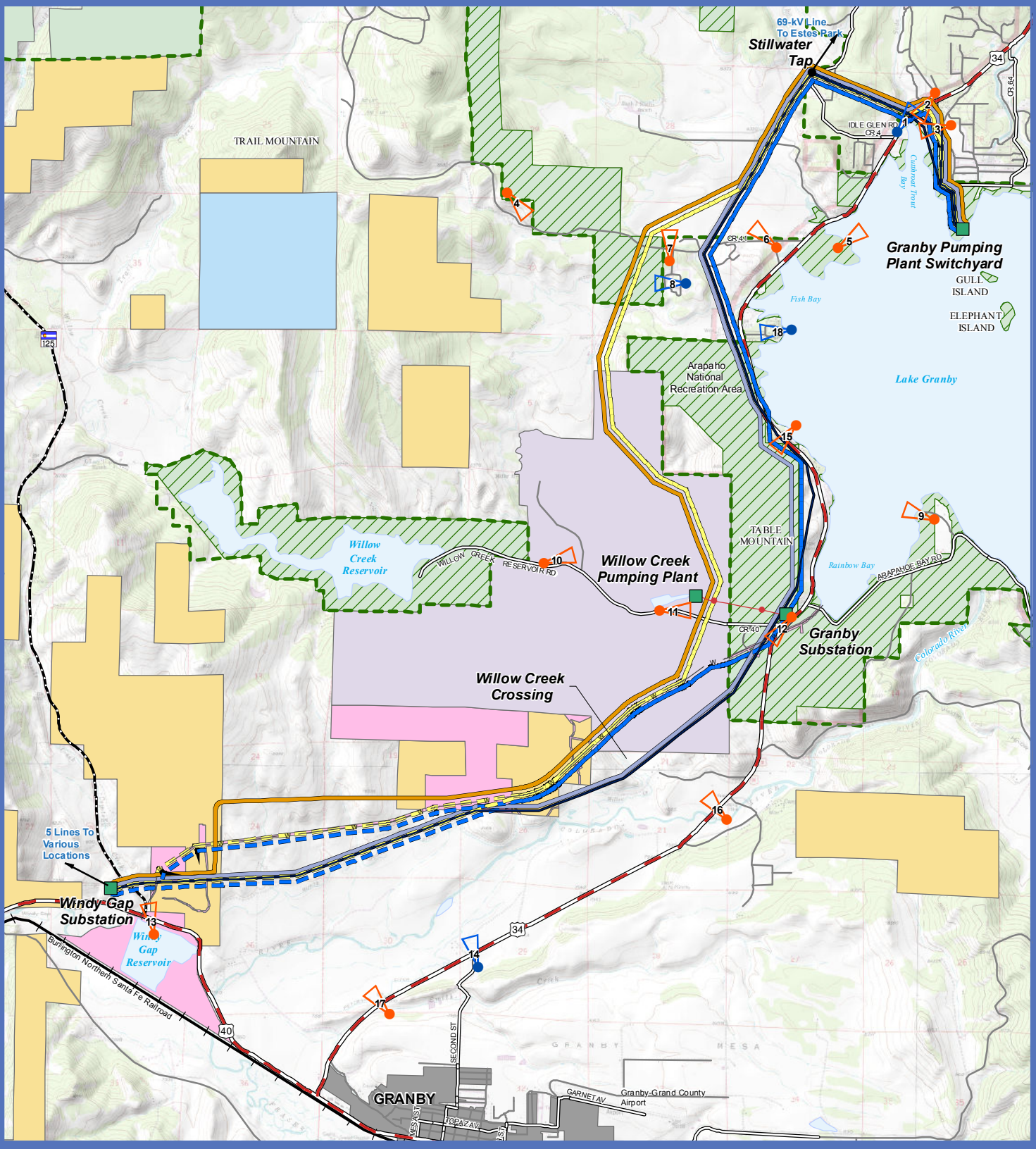
Table 3-14. Crosswalk between Forest Service SIO and BLM VRM Classes.

Forest Service SIO Classes	BLM VRM Classes
Very High	Class I
High[+]	Class II[+]
Moderate	Class II and III[+]
Low	Class IV
Very Low	Class V

[+]Management objectives of public lands crossed by alternatives.

VRM Class II lands "should retain the existing character of the landscape. The level of change to the characteristic landscape should be low; that is, they may be seen but should not attract the attention of the casual observer" (BLM 2010). VRM Class II lands crossed by the alternatives occur immediately east of the Windy Gap Substation.

The remainder of BLM land in the analysis area is managed to a VRM Class III objective. Class III lands "should partially retain the existing character of the landscape. The level of change to the characteristics of the landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape" (BLM 1986). VRM Class III lands crossed by the alternatives occur southwest of Willow Creek.



Map 3-6

Legend

Base Data
- Existing Willow Creek Tap (69-kV)
- Windy Gap Water Pipeline (NCWCD)

Key Observation Points
- Photosimulation Points
- KOPs Not Simulated

Transmission Line Alternatives
- Alternative A - Existing
- Alternative B1
- Alternative C1
- Alternative C2
- Alternative C2 - Options 1 and 2
- Alternative D
- Alternative D - Options 1 and 2

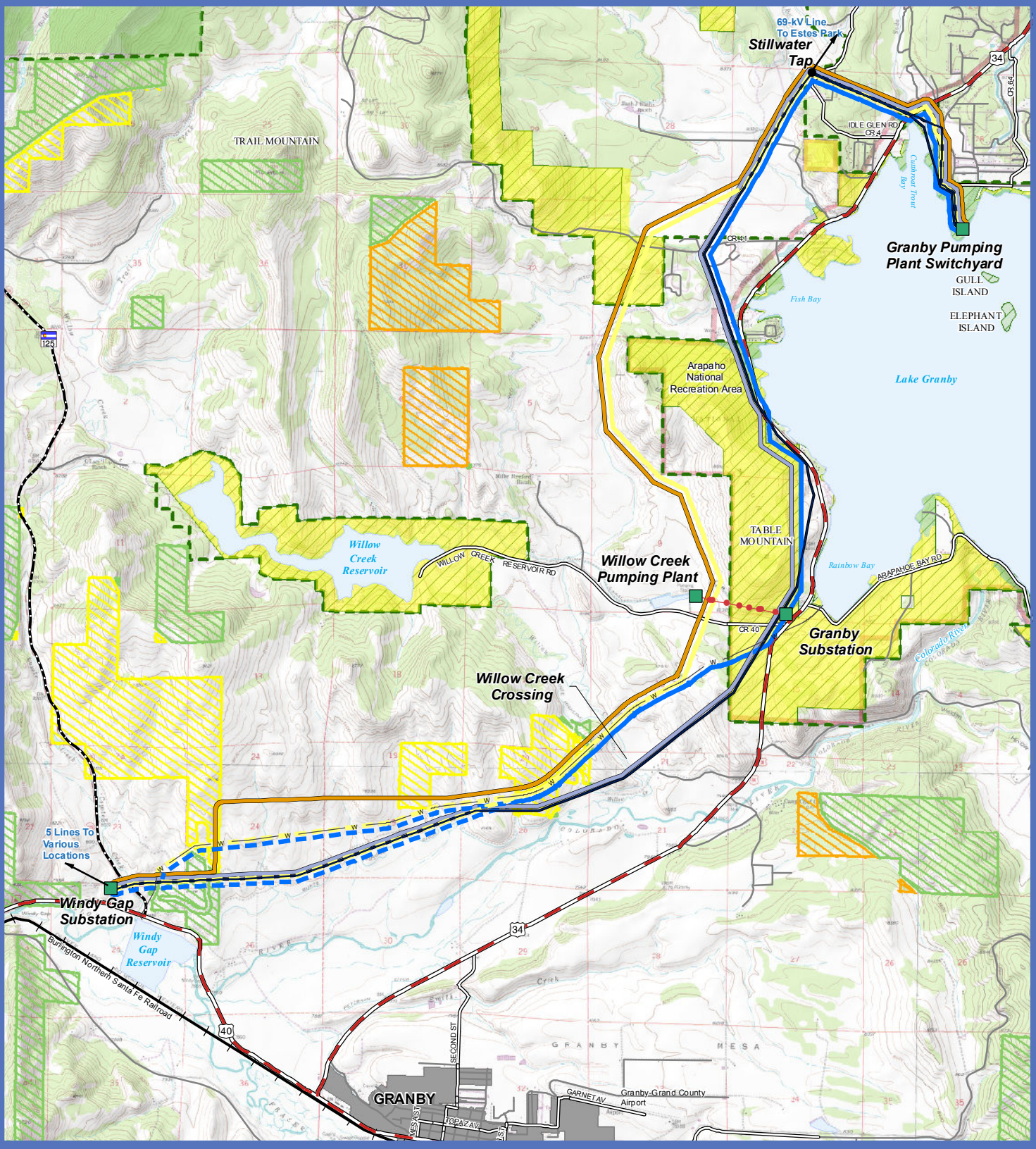
Land Status
- Northern Colorado Water Conservancy District (NCWCD)
- Municipal Subdistrict - Northern Colorado Water Conservancy District (MS-NCWCD)
- Forest Service Land within Arapaho National Recreation Area
- Bureau of Land Management (BLM)
- Colorado State Land Board (SLB)
- U.S. Forest Service (USFS)
- Private or Other Land Ownership
- U.S. Forest Service Boundary

Key Observation Points

November 7, 2011

Source: Source: Bureau of Land Management (BLM), Northern Colorado Water Conservancy District (NCWCD), U.S. Forest Service (USFS), Grand County Wetland Field Delineation, and Colorado State University

GRANBY PUMPING PLANT - WINDY GAP TRANSMISSION LINE REBUILD PROJECT



Map 3-7

Legend

Base Data

- Existing Willow Creek Tap (69-kV)
- Windy Gap Water Pipeline (NCWCD)

Land Status

- Forest Service Land within Arapaho National Recreation Area
- Private or Other Land Ownership
- U.S. Forest Service Boundary

Transmission Line Alternatives

- Alternative A - Existing
- Alternative B1
- Alternative C1
- Alternative C2
- Alternative C2 - Options 1 and 2
- Alternative D
- Alternative D - Option 1 and 2

Visual Resource Objectives

BLM	*USFS SIO*
VRM Class II	Very High
VRM Class III	High
VRM Class IV	Moderate
	Low

SIO/VRM Areas

November 7, 2011

Source: Source: Bureau of Land Management (BLM), Northern Colorado Water Conservancy District (NCWCD), U.S. Forest Service (USFS), Grand County, and Colorado State University

3.8.3.3 Grand County Master Plan

As discussed under Section 3.7, Land Use, the Grand County Master Plan (2011) was completed to help Grand County leaders and citizens make choices concerning future growth and growth implications in the county. The master plan includes policy guidelines for the preservation of unique and scenic vistas, specifically minimizing visual impacts resulting from development along Highways 34 and 40 and encouraging energy development that compliments the County's rural character.

3.8.3.4 Grand County Zoning Regulations

Land use on private lands in Grand County is subject to county zoning regulations administered by the Grand County Department of Planning and Zoning. Section 14.5 of the Zoning Regulations establishes the Three Lakes Design Review Area as an overlay area upon the existing zoning districts along the U.S. Highway 34 corridor (see Map 3-7, SIO / VRM Areas). The Three Lakes Design Review Area applies design criteria to the unique natural area formed by the three lakes – Grand Lake, Shadow Mountain Lake, and Lake Granby. Grand County Zoning Regulations (Grand County 2009) establish the visual landscape as a basic resource that needs to be conserved, stating that "the protection and perpetuation of panoramic mountain and scenic views from parks and public spaces within the Design Review Area is required in the interests of pride, enjoyment, environmental enrichment and maintenance development." Relevant visual resource design principles for electric utilities and communication facilities in this overlay district include: avoiding duplication by coordinating utilities; using nonreflective structures; following an appropriate permit review process; maximizing the use of public lands and minimizing damage to private landowners; avoiding paralleling major transportation routes; avoiding the "tunnel" effect of clearing vegetation; avoiding cultural sites; and minimizing conflict with existing and planned land uses.

3.8.3.5 Grand County Land Conservation Plan

The Grand County Land Conservation Plan (Grand County 1999) provides the community with a guide for realizing future land conservation; outlines an approach for protecting sensitive natural, scenic, and cultural resources; and promotes compatible land use practices throughout Grand County. One of the plan's main objectives is to provide direction to the county for encouraging developers and landowners to conserve significant views and visual corridors. The plan identifies specific scenic resources within the county, including visible wildlife, unobstructed views from roadways, and natural landscapes. The plan identifies specific visual concerns within the county as the loss of scenic agricultural lands to insensitive and overwhelming residential development, and the need to protect character-defining viewsheds and foreground views along transportation corridors.

3.8.3.6 Colorado River Headwaters Scenic and Historic State Byway Management Plan

The Colorado River Headwaters Scenic and Historic Byway, designated as a national scenic byway on September 22, 2005, parallels the entire length of the alternatives (NSBP 2009). To be designated a national scenic byway, U.S. Secretary of Transportation recognizes an Identified Intrinsic Quality; U.S. Highway 34's Intrinsic Quality is historic, owing to the historic water diversion projects, museums, railroads, and roadside parks (NSBP 2009). A corridor management plan was prepared in 1998, which established goals and objectives for resource protection and interpretation (CDOT 1998). Relevant goals include the following:

- Maintain the integrity of the byway's intrinsic qualities, both public and private.
- Enhance the intrinsic qualities of the byway, where appropriate, in ways consistent with the overall objectives of the State Scenic Byways Program, to better protect, rehabilitate, develop, maintain, interpret, or provide accessibility to these sites and features; and enhance the visual quality of other lands and developments along the byway.

3.8.4 Scoping Issues

- Potential incompatibility with the following management policies:
  - Forest Service High or Moderate Predominant SIOs in the ANRA
  - BLM VRM Class II managed lands
  - Three Lakes Design Review Area (Section 14.5) of the Grand County Zoning Regulations
  - Colorado River Headwaters Byway Corridor Management Plan
- Compromised recreational experience and scenic vistas at the following designated use areas within 4 miles of the alternatives (from north to south):
  - Cutthroat Trout Bay Group Campground
  - Stillwater Campground and Boat Launch
  - Sunset Point Boat Launch
  - Quinette Picnic Area
  - Rainbow Bay Picnic Area
  - Willow Creek Canal Picnic Area
  - Continental Divide National Scenic Trail and other designated trails
  - Colorado River Headwaters Scenic and Historic Byway (U.S. Highway 34)
  - Compromised experience approaching the above use areas on access roads
- Potential improvements to the scenic integrity of the ANRA and Cutthroat Trout Bay Campground through removal of the existing line

3.9 Socioeconomics and Environmental Justice

The purpose of the socioeconomic analysis is to address the economic impacts of the proposed project and alternatives, including employment and labor income, on the major sectors of the local economy; and to examine potential impacts to property values. Particular emphasis will focus on the reliability of the electrical system and short-term construction impacts as related to the tourism industry.

3.9.1 Analysis Area

The analysis area lies entirely within Grand County and within close proximity to both Granby and Grand Lake; these areas are the focus of the following social and economic analysis. The portion of the system affected by this transmission system includes approximately 7,000 customers in the area, including the towns of Hot Sulphur Springs, Granby, Grand Lake; and rural areas, particularly those along U.S. Highway 34. Many residents of the county depend directly

and indirectly upon recreation-oriented activities for their economic livelihood. Because the demand for recreational activity and second homes in mountain environments continues to grow in Grand County, electrical service reliability is increasingly important.

3.9.2 Alternative-Specific Analysis Area

The analysis area is the same for all alternatives; however, Alternatives C1 and C2 would affect more agricultural land uses within the analysis area.

3.9.3 Existing Conditions and Context

3.9.3.1 Population, Employment, and Income

The main population centers in Grand County consist of the six communities of Fraser, Granby, Grand Lake, Hot Sulphur Springs, Kremmling, and Winter Park and their surrounding areas. Socioeconomic characteristics throughout the county are dominated by recreation and tourism, with service industries and suppliers to the tourism industry largely driving the local economy. Agriculture (hay production and cattle ranches) and logging-related employment are present, but these two categories account for only a very small percentage of jobs. The 2010 population of Grand County was 14,843 (U.S. Census Bureau 2011). Grand County population data within the analysis area is summarized in Table 3-15.

Table 3-15. Population, 1990-2015.

	Census 1990	Census 2000	Census 2010	Forecast 2015
Grand County	7,966	12,442	14,843	14,852
Granby	966	1,525	1,864	NA
Grand Lake	259	447	471	NA

Source: U.S. Census Bureau 2011a,b,c; CODOLA, State Demography Office 2011

From 1990-2010, Grand County grew by 86 percent, from 7,966 to 14,843 (U.S. Census Bureau 2011). The two main communities within the Project Area are Grand Lake and Granby, both of which also experienced significant population growth in the period 1990-2010: population increased nearly 82 percent in Grand Lake from 259 to 471 people, and nearly 93 percent in Granby from 966 to 1,864 people (U.S. Census Bureau 2011). Population growth slowed between 2000 and 2010, primarily after 2007; as the county and Grand Lake experienced only minor increases in population, and Granby lost more than 3 percent of the population. From 2010 to 2015, population within the county is expected to grow slowly. From 2010 to 2030, forecasted population increases for Grand County are 66.8 percent, which is a substantially lower growth rate than the increases experienced between 1990 and 2010. Census population does not take into consideration the growing number of second homeowners in the Three Lakes Area. Assuming a 2.28 household size (average household size of owner-occupied unit in 2010 census) for second homeowners, an additional population of 1,217 to 1,472 lives in the Grand Lake area at least part of the year. Countywide, the second homeowner population is even larger.

Seasonal homes are a small percent of the total housing units in Colorado, but in Grand County, these homes make up 52 percent of total housing units. The percentage of seasonal homes

shows a census increase of 73 percent in the last 10 years; second homes comprise the largest portion of the market in Grand Lake and the surrounding area. According to the Grand County Master Plan (2011), 63 percent of homes in Grand Lake are not locally owned. The majority of these homes are second homes. The Grand County assessor estimates that second home ownership in Grand Lake represents 82 percent of total units based on where property valuation and tax notices are mailed.

Employment in Granby is provided by the town, school district, federal government, and local service industries. Granby has a recreation-based economy that does not fluctuate seasonally as much as nearby Winter Park, and is therefore considered less transient. Employment in Grand Lake is directly related to the recreation and tourist industries. Grand Lake offers year-round recreational opportunities and amenities; it is widely regarded as the "Snowmobile Capital" of Colorado. In addition, RMNP and the ANRA draw a large number of visitors to Grand Lake and the surrounding area.

The 2009 median household income in Grand County was $58,981; 2009 per capita income was $39,023 (U.S. Census Bureau 2011). The unemployment rate in Grand County was estimated at 8.3 percent in 2009. From 2003 to 2009, total non-farm job growth was 5.0 percent, from 10,088 to 10,588 jobs. Accommodations/food and retail trade (2,717 jobs) comprise approximately 25.7 percent of total wage and salary employment in Grand County; government 12.5 percent (1,323 jobs); and recreation/entertainment related, real estate, and construction 34.6 percent (3,661 jobs) (CODOLA 2011). These employment figures show the dependence of the county economic base on the tourism and second home industries.

Table 3-16. Grand County Census Data: Population, Households, and Employment.

	Grand County	Colorado
Home Ownership rate, 2010	68.9%	65.5%
Households, 2010	6,469	1,972,868
Persons per household, 2010	2.26	2.49
Per capita money income, 2009	$39,023	$41,895
Median household income, 2009	$58,981	$56,222
Persons below poverty, %, 2009	8.1%	11.9%
Non-farm proprieters, 2009	3,510	750,214
Private non-farm employment, 2009	9,265	2,664,525
Private non-farm employment, % change, 2001 to 2009	4.83%	6.41%

Source: U.S. Census 2011a.

Wage rates in Grand County reflect the typical tourist-based economy with many jobs in lower paying positions, such as restaurants, accommodations, and retail trade ($10-$14 per hour). These rates are competitive with other tourist areas, but the overall countywide income levels reflect lower hourly rates.

3.9.3.2 Housing

In 2010, there was an estimated total of 16,061 housing units in Grand County, of which 6,469 units were owner occupied; 2,012 units were renter occupied; and the remainder were vacant (Table 3-17). Of the vacant housing units, 8,273 were for seasonal, recreation, or

occasional use. These units include those that are owned by non-residents (second homes) as well as seasonal and recreational rentals.

Table 3-17. Housing Occupancy and Tenure.

	1990	2000	2010
Total Housing Units	9,985	10,894	16,061
Occupied Housing Units	3,168	5,075	6,469
Vacant Housing Units	6,817	5,819	9,592
For Seasonal, Recreational, or Occasional Use	5,800	4,783	8,273
Vacancy Rate	68.3%	53.4%	61.37%
Owner-Occupied Units	1,828	3,461	4,457
Renter-Occupied Units	1,340	1,614	2,012
Owner-Occupied Household Size	2.62	2.43	2.28
Renter-Occupied Household Size	2.31	2.25	2.21

Source: U.S. Census 2011

Housing prices have fluctuated through the period 2004 through 2009, as shown in Table 3-18, which tracks the average sales price of single family homes in Granby and Grand Lake. The mountain pine beetle epidemic and the sluggish economy in the past 2 years have had an effect on property sales and sales prices in the Grand County area, particularly in development areas within severe lodgepole mortality areas. The area has been experiencing lodgepole pine mortality since 1997 at increasing rates, with peak mortality occurring in 2001 and 2002 (Forest Service 2004). Most of the infested lodgepole pines are now dead and have shed their needles in the Three Lakes area. The change in viewshed and economic downturn in 2008 have affected the real estate market in the area. Total sales of Multiple Listing Service (MLS) listed single family units declined 25 percent in Granby and 45 percent in the Three Lakes Area from 2004-2008. Condo sales increased by 17 percent in Granby and declined by 21 percent in the Three Lakes Area. Average sales prices have ranged from $352,000 (2004) to $435,938 (2006) in the Granby market, and $287,469 (2009) to $488,850 (2007) in the Three Lakes market for single family units. Average condo sales price ranged from $147,991 (2006) to $196,430 (2007) in Granby, and $183,094 (2006) and $225,851 (2005) in the Three Lakes area.

Table 3-18. Average Sales Price of Residential Property 2004 through 2009 (year-to-date 8/1/09).

	2004	2005	2006	2007	2008	2009
Granby Residential						
Active Residential Units	240	328	356	430	347	289
Sold Units	75	69	76	90	56	28
Average Sales Price	$352,198	$361,516	$435,938	$401,158	$379,124	$363,898
Median Sales Price	$345,000	$348,106	$367,250	$392,686	$383,450	$370,000
Average Days on Market	216	250	192	223	180	137
Active Condo Units	216	250	192	223	146	178
Sold Units	29	33	54	88	34	14
Average Sales Price	$148,141	$152,724	$147,991	$196,430	$177,270	$358,036
Median Sales Price	$158,000	$147,500	$151,735	$189,500	$182,500	$426,500
Average Days on Market	210	328	195	189	149	163

	2004	2005	2006	2007	2008	2009
Three Lakes Area Residential						
Active Residential Units MLS	240	271	291	302	273	241
Sold Units	71	72	67	65	39	32
Average Sales Price	$334,359	$363,261	$344,492	$488,850	$366,510	$287,469
Median Sales Price	$274,000	$328,000	$306,000	$365,000	$269,000	$235,000
Average Days on Market	196	204	177	232	225	233
Active Condo Units	54	58	55	50	43	37
Sold Units	14	18	16	16	11	1
Average Sales Price	$219,875	$225,851	$183,094	$187,727	$217,364	$325,000
Median Sales Price	$274,000	$328,500	$306,000	$365,000	$269,000	$235,000
Average Days on Market	155	156	173	152	292	1
Non-MLS Residential and Condo Sales Grand Lake	197	133	133	84	42	2

Source: Grand County Realtors (Brosh 2009, pers. comm.; Maki 2009, pers. comm.)

Six subdivisions are within close proximity of the transmission line. These predominately single family subdivisions include Lake Forest, Colorado Anglers Club, Lakeridge Mt. Valley (Idle Glen), Scanloch, Stillwater Estates, and Y-Lee. Recent sales of single family dwellings in these subdivisions range from $250,000-$550,000, with most sales prices in the upper $200,000 and $300,000 range, depending on location and other amenities such as views and proximity to water. Despite a decline in units sold, sales values are holding steady overall.

There are often concerns of the potential impacts of overhead electric transmission lines on property values. Studies related to these impacts conclude that other factors, such as location, property size, and real estate supply/demand factors are more important criteria in determining residential real estate values. As noted earlier, the existing transmission line travels through or adjacent to six housing subdivisions.

Sixty-two residential properties are within 100 feet of the existing transmission line ROW, 92 are within 200 feet, and 120 are within 300 feet. Some studies suggest that transmission lines appear to have little impact at distances beyond 300 feet; however, substantial differences in selling prices may exist between 50 and 300 feet from the transmission line (Colwell and Foley 1979, p. 498). The properties located within the 0-300-foot range within the study area are older properties that were built at their present location after the transmission line was already in service. These property values have been well established over the years. Table 3-19 shows the number of residences within 100 and 300 feet of the transmission line ROW.

Table 3-19. Residences in Proximity of Existing Transmission Line ROW Centerline.

Distance	Residences
100-foot distance from ROW	62
200-foot distance from ROW	92
300-foot distance from ROW	120

There is an abundance of affordable short-term accommodations, rental units (motels, condos, cabins, cottages), and campground sites available in Grand Lake, Granby, and the Three Lakes region that would provide adequate housing for construction workers.

In summary, Grand County has experienced growth in employment and income, although wages are lower on average than Colorado average weekly wages by sector. The economy in the county has slowed in the past several years due to the effects of the mountain pine beetle on forest health and the economic recession, with a reduction in visitors and residential and land sales and development. However, as the economy improves, it is anticipated that Grand County will recover.

3.9.3.3 Community Facilities and Services

Public services throughout the Project Area are provided by various private and public entities, including counties, municipalities, special districts, and private interests. Because of the minimal level of population impacts anticipated during the construction phase of the project, only public facilities, which might potentially be impacted by accidents of transmission line construction, will be covered in this section.

It is assumed that all necessary public services and facilities are available within the study area. In most cases, adequate capacities and service levels exist.

In Grand County, public services are provided by the county and the incorporated towns, or special districts. Grand County, municipal governments, and special districts provide general government and administrative services, sheriff and police protection, road and bridge construction and maintenance, ambulance and fire protection, medical services, and social services.

Grand Lake and Granby provide various city/town services for their local residents. Service capacities are generally adequate for the existing population in all towns. The Town of Grand Lake has maintained a stable financial situation in spite of the economic downturn, drought, and fire conditions that have prevailed in the past years.

Granby provides basic services to the population and is currently in a stable financial condition.

3.9.3.4 Public Safety and Fire Protection

Grand County Sheriff provides public safety throughout Grand County, with the main office in Hot Sulphur Springs. The sheriff's department has 23 sworn positions, including sheriff, undersheriff, two lieutenants, two patrols, three investigators, and 14 patrol deputies. There are also two detention sergeants and 14 detention officers, three animal control officers, eight communications officers, and four administrative professionals. The department offers boat, snowmobile, bicycle, DUI patrols, and search and rescue.

The Granby Police Department has a staff of 28 department members and five dispatchers.

The Grand Lake Fire Protection District (FPD) and Grand FPD provide volunteer fire fighting in the study area. The Grand Lake FPD is a small combination fire and rescue agency that provides service from CR 4 to Trail Ridge, a service area of 105 square miles.

Grand Lake FPD has employed staff members in support of 22 volunteer firefighters. The firehouse in Grand Lake is staffed seven days a week (7:00 a.m. to 6:00 p.m.) with a crew of four paid staff, while all department members are available via pager to respond to emergency calls 24/7. The department has nine firefighting apparatus.

Grand FPD covers a 150-square-mile area, from Stillwater Curve to U.S. Highway 40. The fire department is staffed by volunteer and resident firefighters and staff (currently 30), operating out of two stations and running 12 firefighting apparatus. They are responsible for all phases of fire protection and fire prevention services.

Grand County Emergency Medical Services provides pre-hospital care and medical transportation in Grand County, with a service area of 1,800 square miles. Grand County Emergency Medical Services employs 39 full-time staff members and operates a fleet of eight ambulances, two paramedic quick response units, and five command staff quick response units. The staff and fleet operate from four stations strategically located throughout the county.

Granby Medical Center (St. Anthony's hospital) in Granby, Mountain Valley Medical Center in Kremmling, and Kremmling Memorial Hospital provide medical care within the study area. Kremmling Memorial is a short-term care service hospital with 19 beds.

3.9.3.5 Environmental Justice

Grand County is predominantly white; however, minority groups have more than doubled in the last two decades, with African American and Asian populations showing the most growth. Table 3-20 provides a breakout of persons by race and the number of persons below poverty level in Grand County.

Table 3-20. Census Community Statistics for Environmental Justice, 1990-2010.

	1990		2000		2010	
	Number	%	Number	%	Number	%
Persons Below Poverty Level	735	9.2	1,704	7.3	1,053	7.1
Hispanics	243	3.05%	543	4.36%	1,116	7.52%
White*	7,641	95.92%	11,577	93.05%	13,313	89.69%
Black*	16	0.20%	60	0.48%	51	0.34%
American Indian & Eskimo*	28	0.35%	47	0.38%	52	0.35%
Asian*	37	0.46%	82	0.66%	121	0.82%
Hawaiian & Pacific Islander*	-	-	10	0.08%	7	0.05%
Other*	1	0.01%	15	0.12%	10	0.07%
Two or More Races*	-	-	108	0.87%	173	1.17%
Total Population	7,966	100.00%	12,442	100.00%	14,843	100.0%

* Non-Hispanic only; in 1990 "Asian" includes Hawaiians and Pacific Islanders.
Source: U.S. Census Bureau 2011

3.9.4 Management Considerations

Grand County seeks to implement policies that promote a stable, diversified, year-round economic base that encourages a range of employment opportunities for area residents. County goals with regard to community and public facilities are to: (1) work with towns and other jurisdictions to develop plans to address community and public facility infrastructure issues, and (2) ensure infrastructure is planned, funded, and built to support new development (Grand County 2011).

3.9.5 Scoping Issues

Scoping concerns identified for socioeconomics included the potential effects of the proposed project on the following:

- Electric rates
- Property values, including rural character, views, and concerns about structure heights
- Cost-effective electric service reliability
- Costs of undergrounding line over time compared to other alternatives' costs

3.10 Recreation and Wilderness

This section provides a description of the affected environment for recreational opportunities, resources, and activities in the Project Area.

3.10.1 Analysis Area

The analysis area for recreation includes the entire Project Area for all alternatives as well as recreation on surrounding lands, including tracts of land managed by the BLM Kremmling Field Office; Forest Service, ARNF, Sulphur Ranger District, including portions of the ANRA; Colorado SLB; and private land.

3.10.2 Existing Conditions and Context

In general, recreation in the Project Area consists of a wide range of high quality, year-round recreational opportunities including, but not limited to, hot-air ballooning, biking, boating/jet skiing, camping, canoeing/sailing, cross-country skiing, fishing, golfing, hiking/backpacking, horseback riding, hunting, ice fishing, ice skating, jeep tours, kayaking/rafting, mountaineering/rock climbing, outfitter and guide services, scenic driving, scenic/wildlife viewing, alpine skiing/snowboarding, snow sledding/tubing, sled dog rides/races, snowmobiling, and snowshoeing (Grand County 2006).

3.10.2.1 Recreational Opportunities on Federal Lands

BLM

The majority of recreational opportunities on BLM land in the Project Area are dispersed activities, including camping, hunting, hiking, ATV use, and wildlife viewing. Opportunities for developed recreation in the Project Area exist, but are more limited. The Windy Gap Watchable Wildlife Site is located along the Colorado River Headwaters Scenic Byway (U.S. Highway 40) approximately

1 mile west of Granby. This location provides an opportunity to view migratory birds and nesting waterfowl. The site provides restrooms, picnic tables, and a 0.25-mile interpretive trail.

Arapaho-Roosevelt National Forest

Recreational opportunities on Forest Service land in the Project Area occur entirely on the Sulphur Ranger District. Forest Service lands support a variety of developed and dispersed recreation facilities and activities for a broad range of user groups. The Sulphur Ranger District encompasses over 442,000 acres in Grand County, and provides numerous recreational opportunities including, but not limited to, hiking, mountain biking, hunting, fishing, nature and wildlife viewing, ATV use, snowshoeing, and Nordic skiing.

Arapaho National Recreation Area

Within the Project Area, the majority of Forest Service land is within the ANRA. The ANRA is located approximately 4 miles northeast of the Town of Granby and adjacent to the Town of Grand Lake. The ANRA was established by Congress in 1978 and contains five major lakes: Lake Granby, Shadow Mountain, Monarch, Willow Creek Reservoir, and Meadow Creek Reservoir. Grand Lake, adjacent to the ANRA, is the largest natural lake in Colorado. Together, the lakes and reservoirs are often referred to as the "Great Lakes of Colorado." National Recreation Areas are showcases for excellence in outdoor recreation, and environmental and economic assets to the state and local communities where they are located. When Congress created the ANRA, it directed that the area be administered to provide for public recreation and enjoyment. The Forest Service manages the ANRA to provide high quality recreation, conservation of scenic and historic values, and stewardship of natural resources. Maintenance of water quality and quantity are paramount in the multiple-use management of the ANRA and surrounding National Forest lands (Forest Service 2006b).

The ANRA is adjacent to RMNP and the Indian Peaks Wilderness. The ANRA consists of 35,802 acres, of which 3,981 acres are privately owned (Forest Service 1997a). Elevations range from 8,035 feet along U.S. Highway 34 near Granby to 11,831 feet near Columbine Lake. There is a wide range of public recreation facilities, such as campgrounds, boat launches, picnic grounds, and trails, including the Continental Divide National Scenic Trail, all on or adjacent to one of the area's lakes. Lake water surface comprises one-quarter of the ANRA; the major tributaries and rivers in the ANRA include Meadow, Arapaho, Stillwater and Willow creeks, and the Colorado River (Forest Service 1997a).

The Forest Service has developed methods for describing recreation settings and opportunities and quantifying the amount of participation in different recreational activities, called the Recreation Opportunity Spectrum (ROS). ROS provides a framework for describing and defining classes of outdoor recreation environments. ROS classes are delineated and mapped to identify which areas of the Forest provide certain types of recreation environments, ranging from urban settings to unmodified primitive settings. The only ROS class currently applicable to the ANRA is the "roaded natural" class. The roaded natural class is characterized by a predominately natural-appearing environment with moderate evidence of the sights and sounds of humans; conventional motorized use is allowed in this ROS class. Evidence of humans usually harmonizes with the natural environment. The interaction between users may be moderate to high and evidence of other users is apparent. Resource modification and utilization practices are evident but harmonize with the natural environment (Forest Service 2006a).

Water-based recreation is the main attraction in the ANRA. The five lakes within the ANRA offer a variety of recreational opportunities, as shown in Table 3-21. Lake Granby is the second largest body of water in Colorado and provides motorized and nonmotorized recreational opportunities. Monarch Lake and the surrounding lands were acquired by the Forest Service in 1962 for public recreation; it provides a high quality, nonmotorized recreational experience. Shadow Mountain Lake is maintained at a constant level at the same elevation as Grand Lake. This shallow reservoir is connected to Grand Lake by a canal that allows boat passage between the two bodies of water. Willow Creek Reservoir is located west of U.S. Highway 34 and is oriented toward fishing and canoeing recreational opportunities. Motorized boats are allowed, but are restricted to a "no wake" speed. Meadow Creek Reservoir is located at 10,000 feet elevation in the most remote part of the ANRA. It is open to nonmotorized watercraft, and is popular with visitors who prefer camping and fishing in an undeveloped area (ANRA 2006).

Table 3-21. Water-Based Recreational Opportunities in the ANRA.

Lake	Size	Recreational Opportunities
Lake Granby	7,256 acres	▪ Power boating ▪ Sail boating ▪ Water-skiing ▪ Windsurfing ▪ Fishing
Monarch Lake	150 acres	▪ Non-motorized recreation
Shadow Mountain	1,400 acres	▪ Power boating ▪ Sail boating ▪ Water-skiing ▪ Windsurfing ▪ Fishing
Willow Creek Reservoir	750 acres	▪ Fishing ▪ Canoeing ▪ “No wake” speeds
Meadow Creek Reservoir	50 acres	▪ Non-motorized recreation

There are four developed campgrounds open for public use. The four campgrounds within the ANRA offer a variety of amenities and recreational opportunities, as shown in Table 3-22. Cutthroat Trout Bay Campground is a large, group-only campground located on the north shore of Lake Granby in Cutthroat Trout Bay. The campground is open Memorial Day to Labor Day with full services. After Labor Day, camping is available on a first come, first serve basis with reduced services while weather permits. There are two group sites that can accommodate 20-50 each. The campground offers vault toilets, fire grates, picnic tables, drinking water, horseshoe and volleyball pits, and a covered pavilion. Nearby recreational activities include boating, fishing, ATV trails, mountain biking, and hiking. Use at Cutthroat Trout Bay Campground has been steady over the past few years. In 2007, approximately 1,695 campers used Cutthroat Bay Campground. Between 2001 and 2006, the following use levels (number of campers) were recorded at Cutthroat Trout Bay Campground: 1,941 (2001); 2,107 (2002); 1,783 (2003); 2,078 (2004); 2,001 (2005); and 2,266 (2006) (Kruse 2006, pers. comm.; Orr 2007, pers. comm.).

Stillwater Campground is located on the west shore of Lake Granby, adjacent to Fish Bay. The campground is open Memorial Day to Labor Day with full services. After Labor Day, camping is available on a first come, first serve basis with reduced services while weather permits. The

campground has 129 individual tent and RV sites. The campground offers modern restrooms, fire grates, picnic tables and drinking water, a boat ramp, a courtesy dock, an amphitheater, RV dump station, flush toilets, showers, 2 double sites, and tent pads. Nearby recreational activities include fishing, scenic drives, boating, ATV use, and mountain biking. No use data is available for Stillwater Campground.

Sunset Point Campground is located on the south shore of Lake Granby adjacent to Rainbow Bay. The campground is open Memorial Day to mid-October, while weather permits. The campground has 25 individual tent and RV sites on a first come, first serve basis. The campground offers vault toilets, fire grates, picnic tables, drinking water, an ADA accessible site, three double sites, lakeside sites on Lake Granby, a boat launch, a courtesy dock, tent pads, and lantern posts. No use data is available for Sunset Point Campground. Nearby recreational activities include boating, fishing, and mountain biking.

Willow Creek Campground is located on the south shore of Willow Creek Reservoir, approximately 3 miles west of U.S. Highway 34. The campground is open from Memorial Day to mid-October, while weather permits. The campground has 33 individual tent and RV campsites, as well as one group site capable of accommodating up to 20 people. The campground offers vault toilets, fire grates, picnic tables, bear-proof lockers, drinking water, boat ramps, a picnic ground, a scenic overlook pavilion, trails, lantern posts, tent pads, and 3 double sites. Nearby recreational activities include fishing, boating, an osprey platform for bird watching, and hiking. No use data is available for Willow Creek Campground (Sulphur Ranger District 2006).

Table 3-22. Developed Campgrounds within the ANRA.

Campground	Campsite Types	Dates of Operation	Amenities	Nearby Recreation Activities
Cutthroat Trout Bay	▪ 2 group sites accommodating 20-50 persons	Full services Memorial Day – Labor Day; as weather permits with reduced services	▪ Vault toilets ▪ Fire grates ▪ Picnic tables ▪ Drinking water ▪ Horseshoe and volleyball pits ▪ Covered pavilion(s)	▪ Fishing ▪ Boating ▪ ATV trails ▪ Mountain biking ▪ Hiking
Stillwater	▪ 129 individual sites ▪ 2 double sites	Full services Memorial Day – Labor Day; as weather permits with reduced services	▪ Modern restrooms/flush toilets/showers ▪ Fire grates ▪ Picnic tables ▪ Drinking water ▪ Boat ramp ▪ Courtesy dock ▪ Amphitheater ▪ RV dump station ▪ Tent pads	▪ Fishing ▪ Scenic driving ▪ Boating ▪ ATV trails ▪ Mountain biking

Campground	Campsite Types	Dates of Operation	Amenities	Nearby Recreation Activities
Sunset Point	▪ 25 individual sites, 1 ADA accessible site ▪ 3 double sites, Lakefront sites on Lake Granby	Memorial Day – mid-October, weather permitting	▪ Vault toilets ▪ Fire grates ▪ Picnic tables ▪ Drinking water ▪ Boat launch ▪ Courtesy dock ▪ Tent pads ▪ Lantern posts	▪ Boating ▪ Fishing ▪ Mountain biking
Willow Creek	▪ 33 individual campsites ▪ 1 group site for up to 20 people ▪ 3 double sites	Memorial Day – mid-October, weather permitting	▪ Vault toilets ▪ Fire grates ▪ Picnic tables ▪ Bear-proof lockers ▪ Drinking water ▪ Boat ramp(s) ▪ Picnic ground ▪ Scenic overlook pavilion ▪ Trails ▪ Lantern posts ▪ Tent pads	▪ Fishing ▪ Boating ▪ Bird watching ▪ Hiking

*Source: Kruse 2006, pers. comm.

There are also several developed picnic areas within the ANRA. These picnic areas are described below in Table 3-23.

Table 3-23. Developed Picnic Areas within the ANRA.

Picnic Area	Period of Use	Amenities
Quinnette	Daily until 10pm, year-round	▪ 7 individual sites ▪ Picnic tables ▪ Vault toilet ▪ Fire grates ▪ Fishing access
Rainbow Bay	Daily until 10pm, year-round	▪ 6 individual sites ▪ Picnic tables ▪ Vault toilet ▪ Canoe/kayak launch ▪ Fishing access

Picnic Area	Period of Use	Amenities
Sunset Point	Daily until 10pm, year-round	▪ 4 individual sites ▪ Picnic tables ▪ Vault toilets ▪ Boat launch ▪ Courtesy boat dock
Willow Creek Boat Launch	Daily until 10pm, year-round	▪ 3 individual sites ▪ Picnic tables ▪ Vault toilets ▪ Fire grates ▪ Boat launch
Willow Creek Canal	Daily until 10pm, year-round	▪ 6 individual sites ▪ Picnic tables ▪ Vault toilets ▪ Fire grates ▪ Fishing access

Source: Sulphur Ranger District 2006, use data not available.

3.10.2.2 Local Recreational Opportunities

Winter recreation is very popular in the Project Area; the Town of Grand Lake is widely regarded as the "snowmobile capital of Colorado" and is consistently ranked in the top twenty of best places to snowmobile in the United States. In addition to snowmobile trails, the forest and ANRA is available for snowshoe and cross-country ski excursions. Ice fishing on the lakes within the ANRA is also popular, and Grand Lake annually hosts a major ice fishing derby.

3.10.2.3 Other Recreational Opportunities

Scenic driving along the Colorado River Headwaters Scenic Byway is also a popular recreational activity in the Project Area. The byway provides motorists with a scenic 80-mile route along the Colorado River from Grand Lake to State Bridge, Colorado (Sulphur Ranger District 2006).

3.10.3 Management Considerations

A number of land management plans and policies exist in the Project Area. These include the ARNF 1997 Forest Plan, the 2008 Colorado Statewide Comprehensive Outdoor Recreation Plan (SCORP), and county land use regulations. These plans and policies, as they relate to recreational opportunities, are described further below.

3.10.3.1 1997 Revision of the Land and Resource Management Plan for the Arapaho and Roosevelt National Forests

The 1997 Forest Plan provides desired conditions (goals or objectives) and guidelines and standards for recreation. Specific guidelines state that "…utility corridors and electronic sites will be located and designed to blend with the landscape. They will be compatible with the scenic integrity objectives of adjacent management areas" (Forest Plan Chapter 3.0, Section 8.3, Goal 2). The desired scenic condition for developed recreation areas is that biological communities will be maintained or improved to provide a pleasing appearance for visitors,

complement the recreational values, and provide a variety of vegetation structural stages and plant communities. Furthermore, the health, sustainability, and appearance of these communities will be emphasized to maintain their desirability for recreational use, including manipulating vegetation to accommodate both existing and new facilities. The Forest Plan also states that evidence of disturbance and human use may be present, but a healthy and attractive appearance of these ecosystems should be maintained because of their desirability for recreational use (Forest Service 1997b).

3.10.3.2 2008 State Comprehensive Outdoor Recreation Plan

The 2008 SCORP states that over 75 percent of Coloradans participate weekly in outdoor recreational activities. The most popular forms of recreation participation are walking, family gatherings, viewing/photographing natural scenery, sightseeing, pleasure driving, and wildlife viewing/photography. Outdoor recreation and tourism, of all types, is a highly popular and very important component of both Grand County's identity and economy, which falls within the SCORP Northwest Region. The Northwest Region is anticipated to experience an 80 percent increase in population, which is anticipated to significantly impact the demand for recreation in the area. Grand County alone is anticipated to experience a 75 percent increase in population by 2030. Spending related to recreation and tourism in the Northwest Region is also highly important. It is estimated that in 2006 alone, recreation and tourism contributed more than $3.8 billion to the economy of the Northwest Region.

3.10.3.3 2011 Grand County Master Plan

The 2011 Grand County Master Plan consists of broad-based land use goals, policies, and proposals intended to guide future development in the county (Grand County 2011). The master plan generally recognizes that recreation is an important asset of the county. The master plan identifies several recreation-related goals under wildlife, water quality, land use, transportation, and visual resources, and a section entitled Recreation and Tourism Based Industry, which include the following applicable policies:

- Encourage and support high quality year-round recreation and tourist activities, facilities and services and make efforts to retain Grand County's unique rural, western and scenic character that is so appealing to tourists.
- Preserve public access to public lands.

3.10.4 Wilderness

There are no federally designated wilderness areas in the study area. The closest wilderness area, Indian Peaks Wilderness, is located approximately 5 miles east of the Project Area.

3.11 Aquatic Resources

3.11.1 Analysis Area

The analysis area for aquatic resources includes the western portion of Lake Granby, as well as streams and man-made canals that drain into the lake and the Colorado River north of Granby. Three perennial streams (Willow, Stillwater, and Soda creeks) and two reservoirs or lakes (Willow Creek Reservoir and Lake Granby) are located within the study area (Map 3-8).

3.11.2 Alternative-Specific Analysis Area

The alternative-specific analysis area for aquatic resources includes the specific water bodies that are crossed by each of the alternatives. Three perennial streams (Willow Creek, Stillwater Creek, and Soda Creek/Cutthroat Trout Bay) would be crossed by all alternatives, although the crossing location is different for some alternatives. Most of the intermittent streams and canals are associated with the Bunte and Willow Creek canal systems.

3.11.3 Existing Conditions and Context

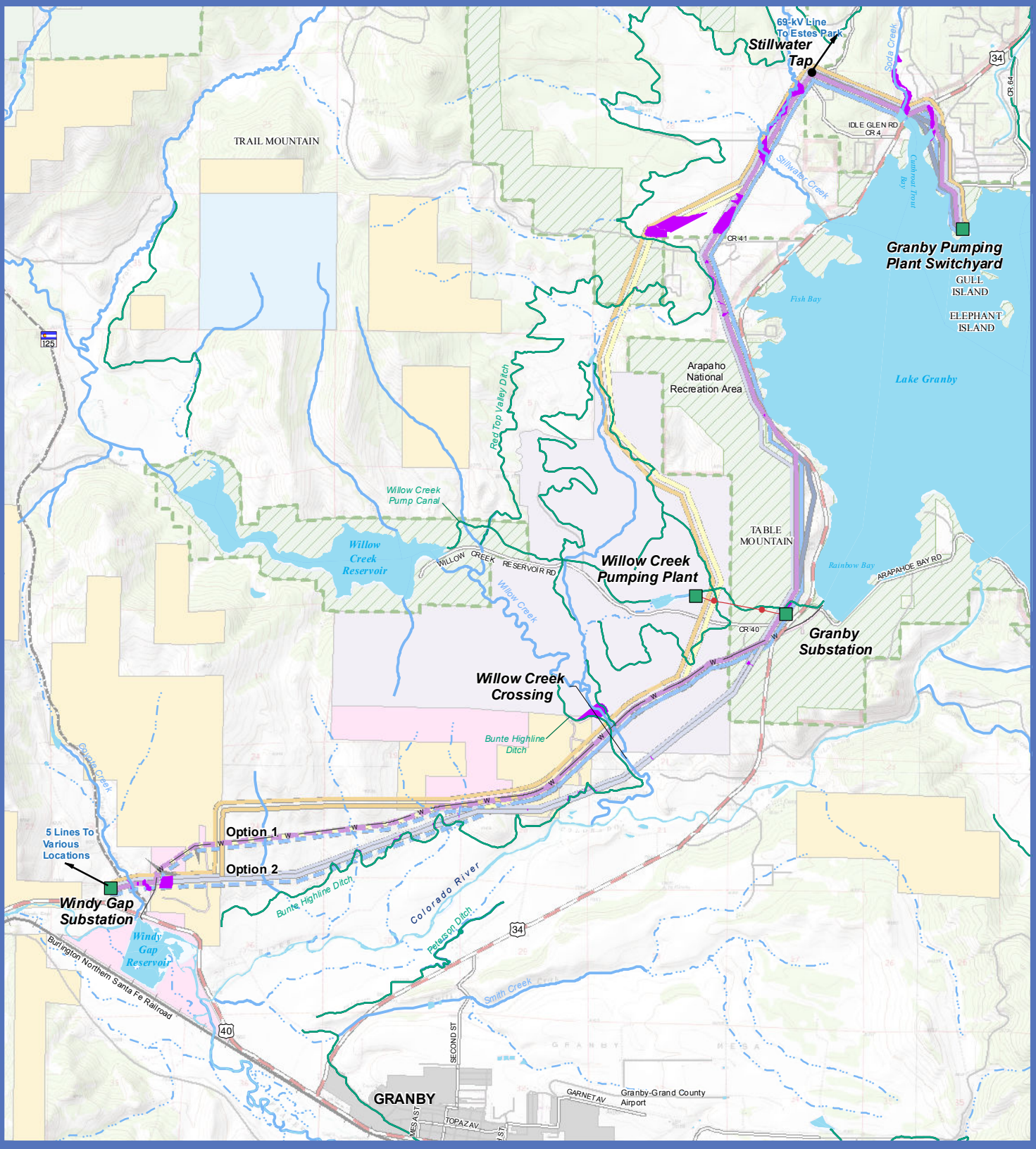
Aquatic resources in the Project Area include fish, invertebrates, plants, amphibians, and their habitat (i.e., perennial and intermittent streams, ditches/canals, lakes, and wetlands). The description of aquatic resources focuses on perennial streams and the Cutthroat Trout Bay portion of Lake Granby, since these types of water bodies provide persistent habitat for aquatic species. Three man-made ditches or canals (Bunte Highline Ditch, Willow Creek Pump Canal, and an unnamed ditch) would also be crossed by the transmission line route alternatives, but these water bodies do not support recreational game fish species. Fish of particular interest for this analysis include species with recreational value (i.e., game fish) or special status species in terms of federal or state listing. All special status fish species are discussed in Section 3.16. Since amphibians use both terrestrial and aquatic habitat during their development, their occurrence in the Project Area is discussed in Section 3.15.

In total, the proposed transmission line route alternatives would cross three perennial streams in the study area, including Willow Creek, Stillwater Creek, and Soda Creek/Cutthroat Trout Bay. These three streams are considered coldwater fisheries by CDOW and contain game fish species. The following summarizes the type of habitat in the vicinity of the crossings, as well as descriptions of fish species occurrence.

Federal Emergency Management Agency (FEMA) flood insurance rate maps were reviewed for the Project Area. According to the FEMA maps, no FEMA floodplains occur on the southwestern half of the no action and action alternative alignments. FEMA flood insurance rate maps are not available for the areas north of the Granby Substation. Flooding, although possible north of the Granby Substation, does not pose a high risk to the proposed project facilities because of reservoir spillways and relatively smaller drainages. The existing and proposed alignments are or would be designed to safely span all drainages capable of flooding.

3.11.3.1 Willow Creek

The portion of Willow Creek at the proposed route alternative crossings contains a mixture of riffles and pools with sand-dominated substrate. Some large pools exist in this section of the stream as a result of beaver activity. Streamside vegetation consists of dense willows in scattered locations.



Map 3-8

Legend

Base Data
- Existing Willow Creek Tap (69-kV)
- Windy Gap Water Pipeline (NCWCD)

Hydrology
- Perennial Stream
- Intermittent Stream
- Canal/Ditch
- Wetlands Field Delineated
- Waterbodies

Transmission Line Alternatives
- Alternative A - Existing
- Alternative B1
- Alternative C1
- Alternative C2
- Alternative C2 - Options 1 and 2
- Alternative D
- Alternative D - Options 1 and 2

Land Status
- Northern Colorado Water Conservancy District (NCWCD)
- Municipal Subdistrict - Northern Colorado Water Conservancy District (MS-NCWCD)
- Forest Service Land within Arapaho National Recreation Area
- Bureau of Land Management (BLM)
- Colorado State Land Board (SLB)
- U.S. Forest Service (USFS)
- Private or Other Land Ownership
- U.S. Forest Service Boundary

Hydrology

November 7, 2011

Source: Source: Bureau of Land Management (BLM), Northern Colorado Water Conservancy District (NCWCD), U.S. Forest Service (USFS), Grand County, Wetland Field Delineation, USGS Land Cover, and Colorado State University

Fish species in this stream contain a mixture of trout and nongame species. Trout numbers are dominated by brown trout (*Salmo trutta*) and rainbow trout (*Oncorhynchus mykiss*), with low numbers of brook trout (*Salvelinus fontinalis*) and kokanee salmon (*Oncorhynchus nerka*) (Ewert 2007, pers. comm.; CDOW 2007). Rainbow trout populations are sustained by CDOW stocking of catchable size fish, while natural recruitment from spawning maintains numbers for brown trout and brook trout (Ewert 2007, pers. comm.). Brook and brown trout are fall spawning species. Kokanee salmon do not spawn in Willow Creek. The proposed stream crossing areas do not contain trout spawning habitat, as indicated by the general lack of gravel substrates. Nongame fish species include Paiute sculpin (*Cottus beldingi*), mottled sculpin (*Cottus bairdi*), fathead minnow (*Pimephales promelas*), longnose dace (*Rhinichthys chrysogaster*), longnose sucker (*Catostomus catostomus*), and white sucker (*Catostomus commersoni*) (CDOW 2007). Previous studies have also detected the presence of whirling disease in brown trout in Willow Creek downstream of Willow Creek Reservoir (Thompson 2006).

Recreational fishing in this portion of Willow Creek is limited to activity controlled by private landowners. A high use recreational area exists in Willow Creek Reservoir and the outlet stream, which is managed as the ANRA. The ANRA boundary is located approximately 1.5-2 miles upstream, depending on the particular proposed crossing.

3.11.3.2 Stillwater Creek

The portion of Stillwater Creek crossed by the proposed transmission line route is a relatively small meandering stream, with a mixture of riffles and pools and gravel-dominated substrates. Dense riparian vegetation exists at the proposed crossing. The adjacent areas to the stream are pastureland. Cattle grazing has occurred within the channel and floodplain.

Fish information is not available for Stillwater Creek. Due to its connection with Lake Granby, the lower portion of the stream could support brown trout and rainbow trout. Brook trout also could occur in the stream based on the stream size and available habitat. The gravel-dominated substrates at the proposed crossing could be used by trout for spawning. No trout stocking occurs in Stillwater Creek (Ewert 2007, pers. comm.). Other nongame species, such as fathead minnow, longnose dace, sculpin, and suckers, could be present in the stream.

3.11.3.3 Soda Creek/Cutthroat Trout Bay

The proposed crossing of Cutthroat Trout Bay is located in Lake Granby just below the confluence with Soda Creek. The bay is approximately 100 feet wide at the crossing, with a mixture of silt, gravel, and cobble substrates and scattered boulders. Water levels are highest in the spring and summer and then decrease in late summer through winter. The bay likely provides foraging habitat for fish species, including trout during moderate to high water levels. The bay may be used as a movement corridor for fish into Soda Creek for spawning in the spring (e.g., rainbow trout). Relatively low water levels in the bay during the fall may limit movements into the creek for fall spawners, such as brown trout.

Lake Granby contains a coldwater fishery consisting of rainbow trout, brown trout, cutthroat trout (*Oncorhynchus clarki*), lake trout or mackinaw (*Salvelinus namaycush*), and kokanee salmon. Kokanee salmon comprise the largest portion of fish numbers in the lake (Johnson and Martinez 2000). Other nongame species include white sucker, longnose sucker, mottled sculpin, and johnny darter (*Etheostoma nigrum*) (Johnson and Martinez 2000). Of the game fish species, only lake trout spawns in the lake. Numbers for the other trout species are sustained by stocking

of fry (kokanee salmon) or catchable size fish (brown and rainbow trout). Brown and rainbow trout also may use tributary streams to the lake for spawning.

3.11.3.4 Macroinvertebrates

Since site-specific data are lacking for macroinvertebrate occurrence in the project study area water bodies, the discussion for this aquatic group is based on general information. It is assumed that macroinvertebrates are present in all perennial streams, ditches, and wetlands crossed by the proposed transmission line routes. Macroinvertebrate communities that occur in the water bodies crossed by the proposed transmission line alternatives likely include a mixture of worms, immature and adult insect groups, beetles, and other groups. Streams similar to those in the project study area typically contain a variety of mayfly, caddisfly, and stonefly larvae, with mayflies often representing a dominant group in terms of abundance and number of taxa. Chironomid midges also are abundant in these types of streams. Wetland areas likely contain species such as snails and beetles that are adapted to abundant vegetation and standing water. Macroinvertebrates serve important roles in the aquatic environment through their food web dynamics. They also represent important food sources for fish and are used as indicators of water quality conditions (Barbour et al. 1997).

3.11.3.5 Special Status Aquatic Species

An evaluation of special status aquatic species occurrence was conducted through discussions with the USFWS and CDOW, and a review of Colorado Natural Heritage Program (CNHP) data. No special status fish species were identified as occurring within project study area streams (see Section 3.16). In addition, discussions with the Forest Service did not identify any fish Forest Service Sensitive (FSS) Species or Management Indicator Species (MIS) for the project study area (see Section 3.16). Special status amphibian species are discussed in Section 3.16.

Management objectives for aquatic resources within the project study area focus on protection and regulation of game and nongame species, as described in CDOW Regulations Chapters 01 and 10, as well as Colorado Revised Statutes, Title 33: Wildlife and Parks and Recreation, 33-1-1-1 through 33-15-114. In addition to implementation of fishing regulations by CDOW, aquatic resources also are managed to avoid effects of nuisance organisms (whirling disease and invertebrates such as zebra mussel). Management of aquatic resources in Willow Creek Reservoir and the outlet stream is the responsibility of the ANRA. Management focus is on protection of habitat and game fish species.

3.11.4 Scoping Issues

The following scoping issues were identified for aquatic resources:

- Effects on riparian, wetlands, or other aquatic habitats as a result of construction
- Assess floodplain risks

3.12 Vegetation Resources

A list of all species observed in the alternative ROWs is available in Appendix G.

3.12.1 Analysis Area

Vegetation resources for the Project Area are described for the area north of the Town of Granby, stretching generally from Lake Granby on the northeast to the Windy Gap Reservoir on the southwest. Elevations in the project study area range from a low of approximately 7,900 feet to a highpoint of approximately 8,520 feet.

3.12.2 Existing Conditions and Context

The project lies within the Southern Rockies Ecoregion, and may be further divided into two mapped level 4 ecoregions: Sagebrush Parks and Sedimentary Mid-Elevation Forest (Chapman et al. 2006). Sagebrush Parks dominate the south and west-facing slopes in the southern portion of the Project Area. North and east-facing slopes are dominated by the Sedimentary Mid-Elevation Forest ecoregion.

Sagebrush parks occupy high intermontane valleys from approximately 7,500-9,500 feet. These parks are typified by moderate gradient streams and are underlain by Quaternary alluvium, colluviums, and loess. Sagebrush Parks are dominated by mountain big sagebrush (*Seriphidium vaseyanum*), western wheatgrass (*Pascopyrum smithii*), bottlebrush squirreltail (*Elymus elymoides*), and elk sedge (*Carex geyeri*). Bunchgrasses typically include Arizona fescue (*Festuca arizonica*) and mountain muhly (*Muhlenbergia montana*). Precipitation averages 10-16 inches and there are normally 60-90 frost free days.

The Sedimentary Mid-Elevation Forest ecoregion is a partially glaciated landscape of low mountain ridges, slopes, and outwash fans. This ecoregion has forested areas with moderate to high gradient perennial streams. The streams have boulder, cobble, and bedrock substrates. In the Project Area, they are found at elevations ranging from 8,200-8,900 feet. Tertiary sediments of limestone, siltstone, shale, and sandstone underlay the forested terrain. The dominant forest types are lodgepole pine (*Pinus contorta*) and aspen (*Populus tremuloides*), with lesser amounts of mixed conifer stands that contain Douglas-fir (*Pseudotsuga menziesii*), blue spruce (*Picea pungens*), and limber pine (*Pinus flexilis*).

A general floristic survey was accomplished during the course of field work for this project in the summers of 2007, 2008, and 2009. Results of the floristic survey are provided in Appendix G. A total of eight general plant community types were observed during the field work and were mapped. Vegetation communities are shown on Map 3-9. Acreage of the vegetation communities in each ROW is provided in Table 3-24.

Table 3-24. Transmission Line ROW Acreage Calculations

Community Type	Alternative A-Existing	Alternative B1	Alternative C1	Alternative C2-O1	Alternative C2-O2	Alternative D-O1	Alternative D-O2
Aspen	0	4.8	0	0	0	4.8	4.8
Disturbed	10.1	9.6	6.3	6.3	6.3	9.6	9.6
Grassland	8.6	11.4	8.9	8.9	8.9	9.4	9.4
Highway	0.3	0.8	0.8	0.8	0.8	0.8	0.8
Lodgepole	12.1	17.7	14.4	14.4	14.4	17.3	17.3
Man Made Pond	0.9	0.8	0.1	0.1	0.4	0.2	0.5
Sagebrush	31.9	75.0	95.4	92.4	87.2	80.1	78.1
Weedy Shoreline	2.0	0	0	0	0	0	0
Wetland	8.4	23.2	22.8	21.6	21.8	20.7	21.7

O1 = Option 1; O2 = Option 2

*Acreage calculations are based on National Land Cover Dataset (NLCD) and do not account for mortality including mountain pine beetle logged areas

Lodgepole pine forest (*Pinus contorta*) forests and woodlands are the most extensive conifers in the Project Area. Lodgepole pine is typically found at elevations ranging from 8,400-10,500 feet. This species can be either a succession species promoted by fire or a climax species under certain combinations of soils and topography. Other species commonly found in this community include common juniper (*Juniperus communis*), bitterbrush (*Purshia tridentata*), kinnikinnik (*Arctostaphylos uva-ursi*), lupine (*Lupinus argenteus*), sulfur buckwheat (*Eriogonum umbellatum*), and junegrass (*Koeleria macrantha*). The Project Area has recently experienced a mountain pine beetle (*Dendroctonus ponderosae*) infestation over numerous lodgepole stands, which has resulted in the death of many of the pines. Lodgepole pine stands have been affected throughout the Project Area.

Other conifer communities in the Project Area may be described as **mixed conifer forest** and include combinations of lodgepole pine, Douglas-fir, blue spruce (*Picea pungens*), limber pine, and aspen. The blue spruce tends to occur in proximity to riparian areas and at lower elevations in the project study area. Limber pine was observed rarely and in locations such as exposed ridgelines.

Sagebrush shrublands are found on drier terraces, benches, and foothill areas in much of the Project Area. This vegetation type is dominated by mountain big sagebrush with an understory of mixed grasses and forbs. Common understory grass species include western wheatgrass, bluebunch wheatgrass (*Pseudoroegneria spicata* ssp. *Spicata)*, Idaho fescue (*Festuca idahoensis*), junegrass, needleandthread (*Hesperostipa comata*), blue grass (*Poa pratensis*) and elk sedge. Common understory forbs include lupine, Drummond's milk vetch (*Astragalus drummondiana*), locoweed (*Oxytropis sericea*), sulfur buckwheat, Indian paintbrush (*Castilleja occidentalis*), and Mariposa lily (*Calochortus nuttallii*), and arrowleaf balsamroot (*Balsamorhiza sagittata*). Other shrubs found with mountain big sagebrush include bitterbrush, green rabbitbrush (*Chrysothamnus viscidiflorus*), and fringed sage (*Artemisia frigida*). More mesic areas of these shrublands included some snowberry (*Symphoricarpos rotundifolius*), serviceberry (*Amelanchier alnifolia*), Rocky Mountain maple (*Acer glabrum*), and wax currant (*Ribes cereum*). Extensive sagebrush areas are located primarily along the southern reaches of the Project Area and are interspersed among other communities towards the north end of the Project Area.

Aspen forest communities are typically found as minor components of much larger conifer (lodgepole pine) stands in the Project Area. They are perhaps most common in the Project Area along the east side of Table Mountain. Bitterbrush and common juniper were common understory components of this forest community.

Grassland communities in the Project Area are commonly dominated by annual and perennial grasses, including needle and thread, western wheatgrass, Kentucky bluegrass, and bluebunch wheatgrass. Nonnative species, such as smooth brome (*Bromus inermis*), are also common throughout grasslands in the Project Area. This community is a minor component within the Project Area.

Riparian areas were observed in and along several creeks in the Project Area. Willow species were common dominants in this community type. Willow species include mountain willow (*Salix monticola*), Geyer's willow (*S. geyeriana*) and Booth's willow (*S. boothii*). **Herbaceous riparian** communities are found as understory vegetation or as small patches within the general riparian areas, and can include various sedges such as beaked sedge (*Carex utriculata*), water sedge (*C. quatilis*), Nebraska sedge (*C. nebrascensis*), as well as spikerush (*Eleocharis palustris*) and arctic rush (*Juncus arcticus*). Narrow stands of willows occur occasionally along the irrigation ditches crossed along the alignment, as well as along the riparian area of Willow Creek and several small ephemeral draws in the southern portion of the Project Area. Patches of willows are also found at the margins of wetland areas found along the northern portion of the Project Area. The **riparian shrub** community is a minor community that is sometimes interspersed with or adjacent to the willow community. Shrub species may include red-osier dogwood (*Swida sericea*), Woods' rose (*Rosa woodsii*), water birch (*Betula fontinalis*), and currant (*Ribes lacustre*). The **riparian cottonwood** community is also a minor component in the Project Area, found along Willow Creek, and is dominated by narrowleaf cottonwood (*Populus angustifolia*), scouring rush (*Equisetum arvense*), and cattails (*Typha angustifolia*).

Wetlands/wet meadows exist within several portions of the project study area. One of the most significant areas is located north of CR 41. All five project alternatives cross these wetlands. These wetlands and wet meadows form a mosaic, with some of the wetlands displaying characteristics of rich diversity of vegetation, hydrology, and peat formation typical of fens. Fen wetlands are designated by USFWS as Resource Category 1. This means that impacts to fens are considered nonmitigable. The USACE also designates fens as special aquatic sites, which complicates permitting for dredging or fill in fen wetlands. Additional emergent wetlands/wet meadows are crossed by Alternatives C1 and C2. Dominant species in these wet meadows include smooth brome, timothy (*Phleum pretense*), meadow foxtail (*Alopecurus aequalis*), and redtop (*Agrostis* spp.). There are wetlands associated with the riparian zones of Willow Creek and Stillwater Creeks. All project alternatives cross both of these riparian systems. There is a wetland complex associated with a pond and stream course on the west side of U.S. Highway 34 and immediately west of the northern reach of Cutthroat Trout Bay. These wetlands are on Forest Service land. There are also wetlands associated with the shoreline of Lake Granby in the vicinity of the Granby Pumping Plant. See also Section 3.14, Wetland Resources.

Rock and talus slopes and rock outcrops are in areas where vegetation is less than 10 percent ground cover. These areas make up minor components of the Project Area and are typically associated with ridgelines.

There are no designated special management areas for the conservation of rare or sensitive habitats or species known in the Project Area. Special Status Plant Species are discussed in Section 3.13.

3.12.2.1 Noxious Weeds

State-listed noxious weeds identified in the Project Area are shown in Table 3-25.

The following state-listed noxious weeds were identified in the project area:

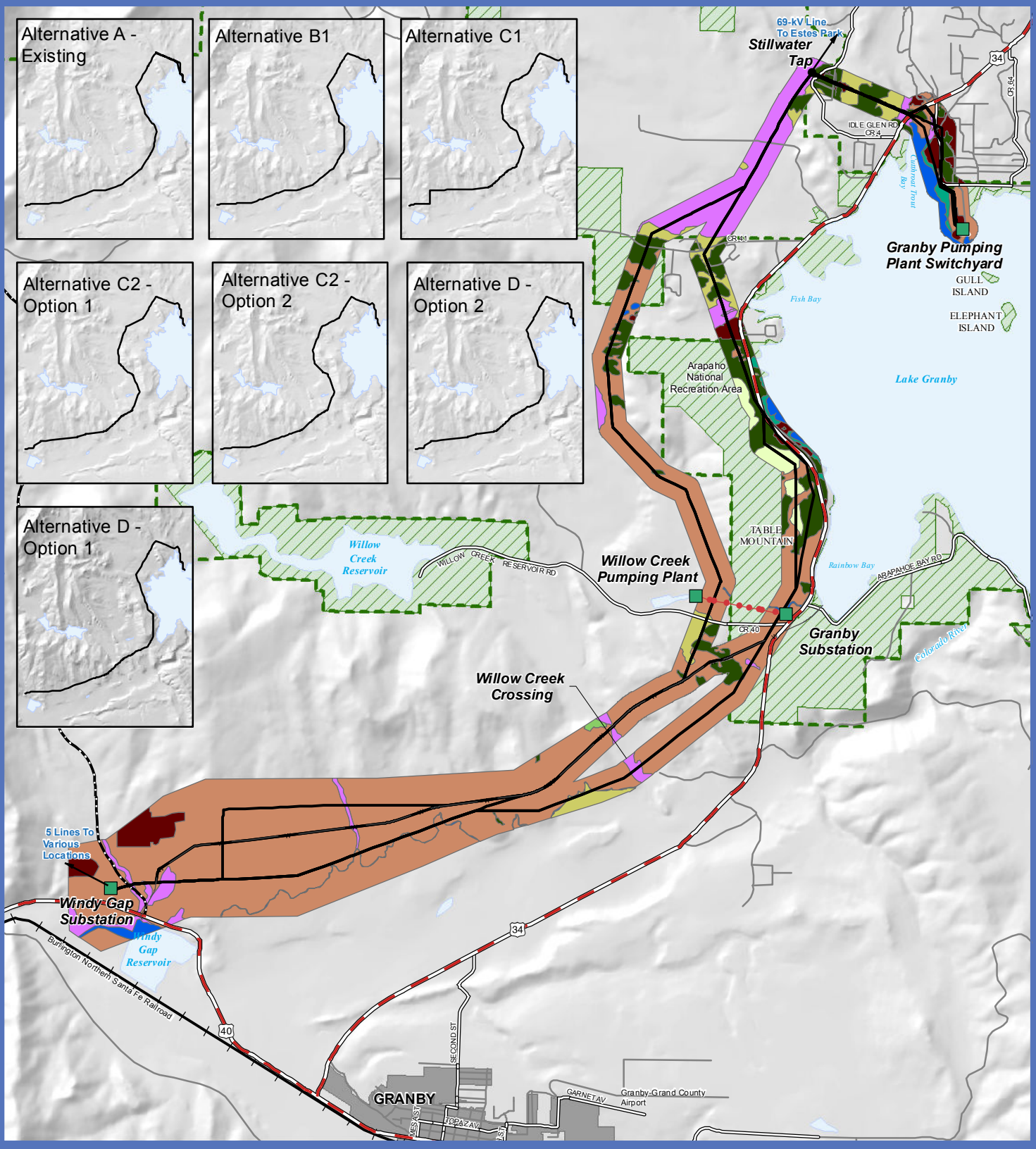
- black henbane (*Hyoscyamus niger*)
- Canada thistle (*Breea arvensis*)
- cheatgrass (*Anisantha tectorum*)
- common mullein (*Verbascum thapsus*)
- field bindweed (*Convolvulus arvensis*)
- hoary cress (*Cardaria draba*)
- houndstongue (*Cynoglossum officinale*)
- musk thistle (*Carduus nutans*)
- scentless chamomile (*Matricaria perforata*)

Occurrences of these weeds are generally more common in the disturbed ROW corridor of the NCWCD Windy Gap buried pipeline. The two areas of greatest concern include a stretch of the revegetated existing water pipeline site south of CR 40 and immediately west of U.S. Highway 34 (where *Cardaria draba, Breea arvensis*, and *Carduus nutans* occur), and the exposed shoreline of Lake Granby and adjacent uplands at Cutthroat Bay (where *Breea arvensis and Matricaria perforata occur*). Several small polygons of weed populations were mapped for the water pipeline area totaling 0.1 acres within the ROW for Alternative D-Options 1 and 2. The weedy shoreline and adjacent upland site was mapped and the resultant polygon covered 2.1 acres. This area encroaches in ROWs for all five project alternatives (A, B1, C1, C2, and D). Locations of noxious weeds are shown on Map 3-10.

Table 3-25. State-Listed Noxious Weeds Observed in the Project Area ROW.

Common Name	Scientific Name	State List
black henbane	*Hyoscyamus niger*	B
bindweed	*Convolvulus arvensis*	C
Canada thistle	*Breea arvensis*	B
chamomile, scentless	*Matricaria perforata*	B
cheatgrass	*Anisantha tectorum*	C
field bindweed	*Convolvulus arvensis*	C
hoary cress (Whitetop)	*Cardaria draba*	B
houndstongue	*Cynoglossum officinale*	B
Common mullein	*Verbascum thapsus*	C
musk thistle	*Carduus nutans*	B

Source: Colorado Noxious Weed Act, 35-5.5-101-119 C.R.S.



Map 3-9

Legend

Base Data

- Existing Willow Creek Tap (69-kV)
- Windy Gap Water Pipeline (NCWCD)

Land Status

- Forest Service Land within Arapaho National Recreation Area
- Private or Other Land Ownership
- U.S. Forest Service Boundary

Transmission Line Alternatives

- Transmission Line Alternatives

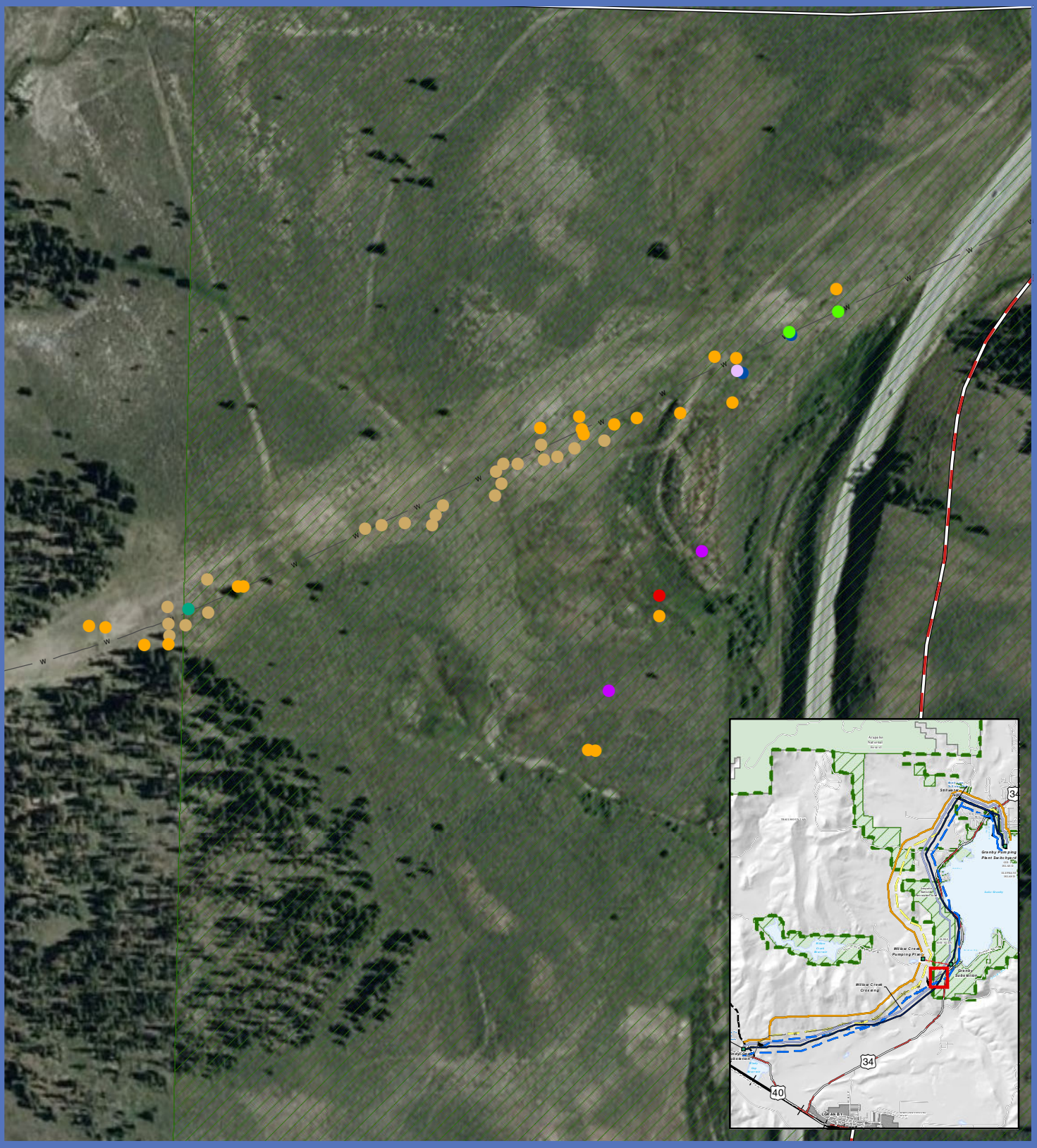
Vegetation Communities

- Aspen
- Developed
- Disturbed
- Grassland
- Highway
- Lodgepole
- Man Made Pond
- Mixed Conifer
- Sagebrush
- Weedy Shoreline
- Wetland

Vegetation

November 7, 2011

Source: Source: Bureau of Land Management (BLM), Northern Colorado Water Conservancy District (NCWCD), U.S. Forest Service (USFS), Grand County, and Colorado State University



0 100 200 Feet

Map 3-10

Legend

Base Data
- Existing Willow Creek Tap (69-kV)
- Windy Gap Water Pipeline (NCWCD)

Land Status
- Forest Service Land within Arapaho National Recreation Area
- U.S. Forest Service (USFS)
- Private or Other Land Ownership
- U.S. Forest Service Boundary

Transmission Line Alternatives
- Alternative A - Existing
- Alternative B1
- Alternative C1
- Alternative C2
- Alternative C2 - Options 1 and 2
- Alternative D
- Alternative D - Option 1 and 2

Weeds
- Canada Thistle
- Elongated Mustard
- Horay Cress (Whitetop)
- Houndstongue
- Leafy Spurge
- Lenspod (Whitetop)
- Mayweed Chamomile
- Musk Thistle

Weeds

November 7, 2011

Source: Source: Bureau of Land Management (BLM), Northern Colorado Water Conservancy District (NCWCD), U.S. Forest Service (USFS), Grand County, and Colorado State University

GRANBY PUMPING PLANT - WINDY GAP TRANSMISSION LINE REBUILD PROJECT

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3.13 Special Status Plant Species

3.13.1 Analysis Area

Surveys for federally listed and FSS plants and species of local concern were conducted in spring 2009 using a methodology approved by the Forest Service. The federally listed species Osterhout's milk vetch (*Astragalus osterhoutii*) and Penland beardtongue (*Penstemon penlandii)* were surveyed for in each of the alternative ROWs. The surveys for FSS and species of local concern were confined to the alternative alignments that transected Forest Service lands in the project study area. More general vegetation surveys were conducted for all ROW lands and for all alternatives during the summers of 2007, 2008, and spring of 2009.

In addition to the project specific surveys performed by AECOM, a Forest Service Botanist conducted several surveys between 2007 and 2011 in the area where the current ROW crosses the intersection of County Road 40 (Willow Creek Reservoir Road) and U.S. Highway 34, including several hundred yards within the ROW on either side of the road intersection. The surveys were to detect presence of the globally rare lichen Idaho xanthoparmelia lichen (*Xanthoparmelia idahoensis*) and the rare to locally common rim lichen (*Aspicilia fruticulosa*), both known to occur northwest of Kremmling in habitat similar to habitat found in the surveyed area. The survey was also intended to determine the presence of locally rare vascular plants associated with tall (*Artemisia tridentata*) and low (*Artemisia arbuscula*) sagebrush sites. Among other common non-vascular plants, the common lichens *Aspicilia hispida* and *Xanthoparmelia chlorochroa* were found. Additionally, the locally rare form of a common lichen, *Dermatocarpon reticulatum* vagrant "form", was found. It may be the first occurrence of the vagrant form known in Colorado (Popovich 2011, pers. comm.) .The locally uncommon vascular plants *Penstemon cyathophorus* and *Penstemon crandallii* (if recognized as distinct from *P. caespitosum*) and *Pediocactus simpsonii* were also encountered.

3.13.2 Existing Conditions and Context

The special status plant discussion analyzes impacts to federally listed species as well as FSS and species of local concern. The analysis area for special status plants includes the proposed ROW for the preferred alternative and other project alternatives. The analysis area was expanded in suitable habitat for federally listed species to be in compliance with the USFWS survey requirements. Federally listed species and FSS species with potential to occur in the Project Area that were surveyed for are listed in Table 3-26

The species included in Table 3-26 were determined based on the List of Threatened, Endangered, and Proposed Species in Grand County, the Region 2 Regional Forester's Sensitive Species list, communications with ARNF botanist Steve Popovich, and data gathered from the CNHP. A detailed discussion of species considered for analysis is provided in the project's Biological Report (BR) (AECOM 2011). The BR includes the project Biological Assessment (BA), Biological Evaluation (BE), Management Indicator Report, and Review of State and Local Species of Concern. The BR includes detailed accounts for the species considered for this project.

Table 3-26. Sensitive Plant Species Considered for Survey Analysis in the Project Area.

Scientific Name	Common Name	Status	Habitat	Elevation	Observed During Field Surveys?
Federally Listed Plant Species					
Astragalus osterhoutii	Osterhout's milk vetch	E	Grows on high-selenium grayish-brown clay soils derived from the Niobrara and Troublesome Formations. On moderate slopes sometimes growing up into sagebrush.	7,400-7,900	N
Penstemon penlandii	Penland beardtongue	E	Strongly seleniferous clay-shales of the Troublesome formation. It grows on steep barrens with sparse plant cover, sagebrush badlands.	7,500-7,700	N
Forest Service Sensitive Species					
Astragalus leptaleus	Park milk vetch	FSS	Riparian willow carrs	6,500-9,500	N
Botrychium campestre	Prairie moonwort	FSS	Aspen/limber pine forest	3,700-10,800	N
Botrychium lineare	Narrow-leaved moonwort	FSS	Aspen	7,900-9,500	N
Carex diandra	Lesser panicled sedge	FSS	Fens/boggy wetlands		N
Carex livida	Livid sedge	FSS	Fens	9,000-10,000	N
Cypripedium parviflorum	Yellow lady's slipper	FSS	Shaded moist habitat, aspen, rich humus and decaying leaf litter in wooded areas, moist creek sides.	7,400-8,500	N
Eriogonum exilifolium	Dropleaf buckwheat	FSS	Clay hills and flats or granitic sandy slopes, mixed grassland and sagebrush communities	7,500-9,000	N
Penstemon harringtonii	Harrington's penstemon	FSS	Sagebrush	6,800-9,200	N
Rubus arcticus var. *acaulis*	Dwarf raspberry	FSS	Riparian edges, fens	8,600-9,700	N
Salix candida	Hoary willow	FSS	Fens, willow carrs	8,800-10,600	N
Salix serissima	Autumn willow	FSS	Fens, willow carrs	7,800-9,300	N
Utricularia minor	Lesser bladderwort	FSS	Fens, slow moving waters	5,500-9,000	N
Viola selkirkii	Selkirk's violet	FSS	Aspen forests, moist woods, thickets	8,500-9,100	N

Scientific Name	Common Name	Status	Habitat	Elevation	Observed During Field Surveys?
Forest Service Species of Local Concern					
Botrychium hesperium	Western moonwort	LC	Disturbed sites, aspen/limber pine forest	8,300-12,000	Y
Botrychium minganense	Mingan moonwort	LC	Disturbed sites, aspen/limber pine forest	8,300-12,000	Y
Cypripedium fasiculatum	Purple lady's slipper	LC	Limber pine forest	8,000-10,500	N
Fern Species/all except *Cystopteris fragilis*		LC	Moist, rich soil in forests, bases and cracks of rock cliffs	5,000-11,000	N
Petasites sagittatus	Arrowhead colt's foot	LC	Wetlands, moist meadows	8,000-10,500	N
Penstemon cyathophorus	Cupped penstemon	LC	Sagebrush	7,000-8,500	Y
Primula incana	Bird's eye primrose	LC	Fens	Upper montane	N

Key: E = Federally Endangered; FSS = Regional Forester's Sensitive Species; LC = Local Concern.

3.13.2.1 Federally Listed Species

Section 7 of the ESA of 1973, as amended, requires federal agencies to ensure that their actions (authorized, funded, or carried out) are not likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of their critical habitats. In order to document project effects on federally listed species, a Biological Assessment (BA) is required if listed species or critical habitat may be present in the Project Area. The BA determinations included in this document apply only to federally listed species and their designated and proposed critical habitat (AECOM 2011).

Because the USFWS botanist for the region is located in the USFWS's Grand Junction office, this office was designated as the lead on the project. Western's consultant, AECOM, met with the USFWS in their Grand Junction office on April 20, 2009 to discuss project updates, the species of federal concern in the Project Area, and to discuss survey protocols for threatened and endangered plant species.

Federally listed species, including the Colorado butterfly plant (*Gaura neomexicana ssp. Coloradensis*), Ute ladies'- tresses orchid (*Spiranthes diluvialis*), and the western prairie fringed orchid (*Platanthera praeclara*), are not included in this analysis because no suitable habitat occurs in the project area and there are no anticipated water depletions associated with this project.

Osterhout's milk vetch (Astragalus osterhoutii)

Osterhout's milk-vetch is a perennial herbaceous species in the family Fabaceae (Pea). Osterhout's milk-vetch occurs in scattered colonies over a 15-mile range in Middle Park near Kremmling, Colorado (USFWS 1992). The USFWS Recovery Plan for this species documented approximately 25,000-50,000 plants as of 1992. These plants were spread among populations

north of the Town of Kremmling, in the vicinity of Muddy Creek, and another population on Troublesome Creek northeast of Kremmling.

Plants are restricted to badlands of shale and siltstone sediments in seleniferous soils derived from shales of the Niobrara, Pierre, and Troublesome formations. Osterhout's milk-vetch is considered to be an obligate selenophyte (O'Kane 1988). The badland habitats are characterized by open, grassy vegetation with scattered shrubs of big sagebrush, (*Artemisia tridentata*), rabbitbrushes (*Chrysothamnus* spp.), bitterbrush (*Pursia tridentate*), winterfat (*Ceratoides lanata*), snowberry (*Symporicarpos* spp.), and/or mountain mahogany (*Cercocarpos montanus*) (USFWS 1992). This species can be found on moderate slopes, sometimes growing up through sagebrush, and may be found at elevations around 7,500 feet (50 CFR 17).

Flowering in this species is typically June through August. Osterhout's milk-vetch shares generalist pollinators with other milk-vetches, but is also more self-compatible than related species and thus has higher fruit set.

This species is federally listed as endangered. It is ranked as globally imperiled (G1) and state imperiled (S1) in Colorado.

A rare plant survey was conducted for this project in 2008 and 2009 using an approved USFWS protocol. This species was not found in the Project Area, nor was habitat identified. The Project Area generally lacked the badlands expanses of known sites. Immediately prior to the rare plant survey on site, project botanists did positively identify this species along with Penland beardtongue approximately 16 air-miles west of this project's location.

Penland's beardtongue (Penstemon penlandii)

Penland's beardtongue is a perennial herbaceous plant in the figwort family (*Scrophulariaceae*). This species is federally listed as endangered. It is ranked as globally imperiled (G1) and state imperiled (S1) in Colorado.

Penland's beardtongue is found in habitat similar to that described for Osterhout's milk-vetch (relatively barren expanses of seleniferous soils with sparse plant cover) and shares a common USFWS recovery plan (USFWS 1992). The recovery plan estimates the plant's population at approximately 5,500 individuals in two populations along Troublesome Creek northeast of the Town of Kremmling. Little is known about the reproductive biology of the Penland's beardtongue, except that it must be visited by animals (including several native bee species) to reproduce sexually (50 CFR 17).

A rare plant survey conducted for this project in 2008 and 2009 did not detect this species, nor was suitable habitat identified. The Project Area generally lacked the badlands expanses of known sites. Immediately prior to the rare plant survey on site, project botanists did positively identify this species along with Osterhout's milk-vetch approximately 16 air-miles west of this project's location.

3.13.2.2 Forest Service Sensitive Species

Forest Service Manual (FSM) 2600, Chapter 2670 *Threatened, Endangered and Sensitive Plant and Animals*, provides additional guidance on habitat management for all sensitive species (Forest Service 2007). The direction establishes the process, objectives, and standards for conducting a Biological Evaluation (BE) and ensures that all FSS will receive full consideration in

the decision making process. Region 2 Manual Supplement 2600-94-2 provides additional direction for conducting the analysis required of the BE. The Biological Report (BR) for the project was finalized in September 2011. It includes a BE that provides additional detail on FSS plant species, including a discussion on species distribution, natural history, environmental baseline, and direct, indirect and cumulative impacts to each species.

It is Forest Service policy to analyze impacts to sensitive species in a BE (FSM 2670.31-32: Forest Service 1995). Sensitive species are identified by the Forest Service Regional Forester as "those...for which population viability is a concern, as evidenced by…significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution." (FSM 2670.5; Forest Service 1995). Western reviewed the Region 2 FSS list received from the Regional Forester in March 2009. The following list includes current FSS potentially found within the ARNF. A complete list for Region 2 and for the forest/grassland can be obtained by contacting the ARNF, Sulphur Ranger District. The following species are carried forward for evaluation:

Autumn willow (Salix serissima)

Autumn willow is a perennial woody shrub species in the willow family (Salicaceae). This species is found in wetland areas, including marshes, fens, and bogs. Autumn willow ranges from Canada to the northern United States. In the Rocky Mountains, it is found in Montana, Wyoming, and Colorado. In Colorado where the species reaches its southernmost distribution, autumn willow is known from Custer, Park, Larimer, and Routt counties. Elevational range varies from 7,800-10,200 feet. Globally, the species is secure (G4). In Colorado, autumn willow is critically imperiled (ranked S1). Population trends are unknown (Decker 2006).

A rare plant survey in the Project Area in late spring of 2008 and 2009 did not detect this species. There are several locations in the project ROW with wetlands, riparian fringe, and willow communities; therefore, suitable habitat for this species exists in the Project Area.

Dropleaf buckwheat (Eriogonum exilifolium)

Dropleaf buckwheat is a perennial herbaceous species in the buckwheat family (Polygonaceae). In Middle Park, dropleaf buckwheat is reported most frequently on clay soils of the Troublesome Formation. It is also known from a location underlain by the Coalmont Formation and other Cretaceous and Tertiary strata at Hot Sulphur Springs (Anderson 2006). Dropleaf buckwheat is a regional endemic whose global distribution is limited to 26 occurrences in Carbon and Albany counties, Wyoming; and Jackson, Grand, and Larimer counties, Colorado. In Colorado, dropleaf buckwheat is known from 14 occurrences in Middle Park (Grand County), North Park, and the upper Laramie River Valley. The plant is typically found at elevations of 7,500-9,000 feet.

Dropleaf buckwheat is ranked globally vulnerable (G3) by NatureServe (NatureServe 2010h), and is considered imperiled (S2) in Colorado by the CNHP. The Forest Service Region 2 considers dropleaf buckwheat to be a sensitive species (Forest Service 2003). It is not considered sensitive by the BLM in Colorado (BLM 2000).

Because the species is a long-lived perennial, changes in population size may occur gradually and be difficult to detect. There is evidence to suggest that dropleaf buckwheat numbers are trending downward as the result of human activities and habitat loss. Reservoir filling may have destroyed large areas of dropleaf buckwheat in Colorado, including nearby Willow Creek

Reservoir (Anderson 2006). Other activities such as residential development, energy exploration, and road construction can also threatened populations

A rare plant survey in the Project Area in late spring of 2008 and 2009 did not detect this species. Many portions of the Project Area are underlain by the Troublesome Creek Formation; therefore, suitable habitat for this species exists in the Project Area.

Dwarf raspberry (Rubus arcticus var.acaulis)

The dwarf raspberry is a perennial herbaceous species in the family Rosaceae (Rose). The plant typically flowers from late June through early July. It will set fruit in late July through August. The species apparently seldom produces fruit in Colorado. Dwarf raspberry can be found in riparian fringes, fens, and willow carrs. The plant can be found in association with shrubby cinquefoil, dwarf birch, diamondleaf willow, water sedge, and alpine meadowrue. The species has a circumboreal distribution. Elevation range is normally 8,600-9,700 feet. Dwarf raspberry is ranked globally as secure (G5), but is critically imperiled in Colorado (S1; fewer than 5 occurrences).

A rare plant survey in the Project Area in late spring of 2008 and 2009 did not detect this species. There are several locations in the project ROW with wetlands, riparian fringe, and willow communities; therefore, suitable habitat for this species exists in the Project Area.

Harrington's beardtongue (Penstemon harringtonii)

Harrington's beardtongue is a perennial herbaceous species that is in the figwort family (Scrophulariaceae). This is a large showy penstemon that occurs between 6,800 and 9,200 feet in open sagebrush habitat or sagebrush habitat with encroaching pinyon-juniper woodland trees (Dawson and Grant 2002). Associated soils are typically rocky loams and rocky clay loams derived from coarse calcareous parent materials, especially Pleistocene gravels, but also limey shales, limestones, and other parent rocks. Scattered populations occur in Eagle, Garfield, Grand, Pitkin, Routt, and Summit counties.

This species is ranked as vulnerable throughout its range (G3) and vulnerable in the state (S3). It is designated as FSS and BLM sensitive. This species was formerly a Category 2 Candidate for ESA listing.

Harrington's penstemon populations can vary from year to year and may peak every 4-5 years due to its short-lived perennial life cycle. Population numbers seem to have declined from the early 1980s and may be a response to drought (Panjabi and Anderson 2006).

A rare plant survey in the Project Area in late spring of 2008 and 2009 did not detect this species. There are extensive areas of sagebrush habitat within the applicable elevational range for this species. For this reason, it is assumed that suitable habitat for this species does exist in the Project Area.

Hoary willow (Salix candida)

The hoary willow is a low to medium-sized shrub in the plant family Salicaceae. The species typically grows to 4 feet tall. It may be readily distinguished by densely white-tomentose ventral leaf surfaces and a revolute leaf margin (Hitchcock and Cronquist 1964). Habitat for this species occurs on hummocks in nutrient-rich (alkaline) fens, and thickets at the edges of ponds and on

river terraces. The species grows in association with many other willow and sedge species and with dwarf birch (*Betula glandulosa)*. Hoary willow flowers from May through June. Hoary willow is distributed from Alaska, northern Canada, and the northern United States down through Colorado. In Colorado, the plant is found in Gunnison, Hinsdale, La Plata, Lake, Larimer, and Park counties. Elevational range for this species is approximately 8,800-10,600 feet. The species is ranked as globally secure (G5), but is imperiled in Colorado (S2).

Rare plant surveys were conducted in the Project Area in 2007, 2008, and late spring 2009 and did not detect this species. There are several locations in the project ROW with wetlands, including probable fen wetlands that would be suitable habitat for this species; however, the transmission line project would be sited below the typical elevational range for this species (i.e., below 8,800 feet).

Lesser bladderwort (Utricularia minor)

Lesser bladderwort is a perennial herbaceous plant in the family Lentibulariaceae (bladderwort family). The plant is an aquatic species that is carnivorous, producing bladders that facilitate the trapping of small animals, such as paramecium (Weber and Wittmann 2001). The plant is widely distributed throughout Canada and the northern United States. The species reaches its southern limits in California, Colorado, and North Carolina. In Colorado, the plant has been documented in Boulder, Delta, Jackson, La Plata, Larimer, Montezuma, and Park counties (NatureServe 2010l). Altitudes range from approximately 5,500-9,000 feet. Lesser bladderwort is ranked globally secure (G5) and imperiled in Colorado (S2; due to rarity).

Rare plant surveys were conducted in the Project Area in 2008 and late spring 2009 and did not detect this species. There are several locations in the project ROW with wetlands and riparian ecosystems. For this reason, it is assumed that suitable habitat for this species does exist in the Project Area.

Lesser panicled sedge (Carex diandra)

The lesser panicled sedge is a perennial graminoid in the family Cyperaceae. This plant is a tussock-forming species that may be distinguished by red dots on the inner band of its leaf sheaths. It occurs in wet peaty meadows, calcareous fens, and the peaty or marly shores of lakes and ponds (Hipp 2008). The species flowers May to June, sets fruit in June, and the perigynia fall in July or August (Hipp 2008). This sedge is widely scattered throughout Canada and the northern two-thirds of the United States. It is relatively common in the northern portions of its range, becoming uncommon to rare in much of its distribution southward in the United States. In Colorado, the species appears limited to six counties, including Boulder, Garfield, Grand, Jackson, Larimer, and Saguache. The species is ranked as globally secure (G5), but is imperiled in Colorado (S2).

Rare plant surveys were conducted in the Project Area in 2008 and late spring 2009 and did not detect this species. There is at least one location in the project ROW with fen wetlands. For this reason, it is assumed that suitable habitat for this species does exist in the Project Area.

Livid sedge (Carex livida)

Livid sedge is a perennial plant in the family Cyperaceae. It is commonly found in rich fen wetlands. These ecosystems are mineral-rich and dominated by graminoid species. This sedge typically flowers in June and July in Colorado, and produces fruit in July and August. It

may be found at elevations in Colorado of 9,000-10,000 feet, which is slightly higher than the elevation of this Project Area. The species is ranked as globally secure (G5), but is critically imperiled in Colorado (S1).

Rare plant surveys were conducted in the Project Area in 2008 and late spring 2009 and did not detect this species. There is at least one location in the project ROW with fen wetlands. For this reason, it is assumed that suitable habitat for this species does exist in the Project Area.

Narrow-leaved moonwort (Botrychium lineare)

The narrow-leaved moonwort is a small fern in the adder's tongue family (Ophioglossaceae). The plant reproduces by means of spores that are normally produced in June in Colorado. Habitat for this species includes grassy slopes and along the edges of streamside forests. It may be associated with previously disturbed ground. The species may be found at elevations ranging from 7,900-11,000 feet. Narrow-leaved moonwort is known to occur in Alaska, Colorado, California, Minnesota, Montana, Oregon, South Dakota, Washington, and Wyoming. It has also been documented from Alberta and Yukon Territory, Canada. Historically, it has also been found in California, Nebraska, Idaho, and Utah; Quebec and New Brunswick, Canada. In Colorado, the species has been documented in Boulder, Clear Creek, El Paso, Grand and Lake counties (NatureServe 2011f). The species is ranked as globally imperiled (G2) and critically imperiled in Colorado (S1).

Rare plant surveys were conducted in the Project Area in 2008 and late spring 2009 and did not detect this species. There are many locations in the project ROW with grassy slopes and several streamside or riparian habitat locations. For this reason, it is assumed that suitable habitat for this species does exist in the Project Area.

Park milkvetch (Astragalus leptaleus)

The Park milk vetch is a perennial herbaceous species in the pea family (Fabaceae). This species inhabits wetlands, including sedge-dominated meadows, swales, and hummocks. The plant may also be found in aspen glades and riparian willow communities. This species typically flowers and sets fruit from June through August. Distribution for this plant includes occurrence in Montana, Idaho, Wyoming, and Colorado. In Colorado, Park milk vetch has been documented in Gunnison, Jackson, Park, and Summit counties. It has not been documented in Grand County (NRCS 2009). The plant occurs between 6,550 and 9,500 feet in elevation.

The species is ranked as apparently secure globally secure (G4), but is imperiled in Colorado (S2). The population trend for the species is unknown, but it may be in decline. Historically, the species was described as locally abundant. Many herbarium voucher specimens have been collected but few plants are being collected currently, and several historic occurrences have not been rediscovered (Ladyman 2006). This milk vetch produces relatively few flowers and seeds, thus contributing to its rarity.

Rare plant surveys were conducted in the Project Area in 2008 and late spring 2009 and did not detect this species. There are many locations in the project ROW with aspen glades and riparian willow communities. For this reason, it is assumed that suitable habitat for this species does exist in the Project Area.

Prairie moonwort (Botrychium campestre)

The prairie moonwort is a diminutive spore-bearing plant in the Grape Fern family (Ophioglossaceae). The leaves of the prairie moonwort are produced in early spring. Spores are produced from early spring through July. This plant may be found on dry, gravelly hillsides, frequently in association with little bluestem (*Schizachyrium scoparium*). This species has been found in portions of Canada and through much of the northern United States. It has been documented to occur in Clear Creek and Yuma counties in Colorado (Wagner and Wagner 1994; NatureServe 2011g). These plants may be found over a wide range of elevations from 3,700-10,800 feet. The species is ranked as globally threatened (G3) and critically imperiled in Colorado (S1).

Rare plant surveys were conducted in the Project Area in 2008 and late spring 2009 and did not detect this species. There are many locations in the project ROW with dry gravelly hillsides, especially in the southern and western areas, but no documentation of prairie moonwort could be made. Suitable habitat in the project vicinity is assumed to be marginal.

Selkirk's Violet (Viola selkirkii)

The Selkirk's violet is a perennial herbaceous plant species in the family Violaceae. The species occupies habitat in aspen forest or other relatively moist woods, such as alder thickets at elevations typically ranging from 8,500-9,100 feet (NatureServe 2010u). The plant is distributed in Alaska and Canada, south through the Northeastern United States and the upper Midwest, and Washington state. There are populations as far south as New Mexico and Colorado. The plant is only known from three locations in Colorado, including RMNP, the base of Devil's Head in the Pike National Forest, and the Wet Mountains. The species is ranked as globally secure (G5), but is critically imperiled in Colorado (S1).

Rare plant surveys were conducted in the Project Area in 2008 and late spring 2009 and did not detect this species. There are many locations in the project ROWs with aspen forest and other moist forest habitats. For this reason, it is assumed that suitable habitat for this species does exist in the Project Area.

Yellow lady's-slipper (Cypripedium parviflorum)

The yellow lady's-slipper is a perennial herbaceous plant species in the lady's slipper family (Cypripediacea). This species flowers in Colorado from June through July. Yellow lady's slipper habitat in Colorado typically includes aspen groves and mixed ponderosa pine/Douglas-fir forests (FNA 2002). This species is widely distributed throughout Canada and the United States. In Colorado, the species is found in 12 counties, including Clear Creek, Custer, Douglas, El Paso, Garfield, Huerfano, Jefferson, La Plata, Larimer, Las Animas, Park, and Pueblo. The species has not been documented in Grand County (Weber and Wittmann 2001; Spackman et al. 1997). Elevation range for the species is between 7,400 and 8,500 feet. The species is ranked as globally secure (G5), but is imperiled in Colorado (S2).

Rare plant surveys were conducted in the Project Area in 2008 and late spring 2009 and did not detect this species. There are many locations in the project ROW with aspen glades and some mixed conifer stands, but no documentation of ponderosa pine/Douglas-fir forests. For this reason, it is assumed that suitable habitat for this species does exist in the Project Area.

3.13.2.3 Forest Service Plant Species of Local Concern

Plant species that are categorized as species of local concern include those plants tracked on a Forest or District level because of potential rarity or their importance to local biodiversity. These species may represent plants that were previously listed on the Region 2 Sensitive Species List. These species may also be of local concern because there is currently insufficient information on their distribution or population viability.

Western moonwort (Botrychium hesperium)

The western moonwort is a small, erect perennial fern in the family Ophioglossaceae (Adder's Tongue Family). It produces spores in July. It is documented from several counties in Colorado including, Grand County (NatureServe 2011h). In the mountains, the species occupies habitat in the forested montane zone in open canopy sites with periodic disturbance evident. The plant is also found in subalpine meadows, snowfields melt areas, mesic grassy slopes, and on coarse, gravelly soils. This species is typically found at elevations ranging from approximately 3,300-11,500 feet. The species is ranked as apparently globally secure (G4), but is imperiled in Colorado (S2).

The rare plant survey conducted in spring 2008 and 2009 did detect and document the location of a *Botrychium* believed to be western moonwort. The location is within the ROW of the preferred proposed action alternative, and it occupied a site in an old drainage ditch that appears to no longer be used. A detailed description of this individual and its habitat is available in the project *Biological Report (*AECOM 2011*)*.

Mingan moonwort (Botrychium minganense)

The Mingan moonwort is a small perennial fern in the plant family Ophioglossaceae. It typically produces spores in July in Colorado. The plant has been documented from several counties in Colorado, including Grand County (NatureServe 2010n). The plant is found in a variety of habitat types, including meadows, prairies, woods, sand dunes, and riverbanks. The species is ranked as apparently globally secure (G4), but is critically imperiled in Colorado (S1).

The rare plant survey conducted in spring 2008 and 2009 did detect and document the location of a *Botrychium* believed to be Mingan moonwort. The plant was found in the ROW of Alternative D, and it occupied a site in an old drainage ditch that appears to no longer be used. A detailed description of this individual and its habitat is available in the project *Biological Report* (AECOM 2011).

Purple Lady's Slipper (Cypripedium fasciculatum)

Purple lady's slipper is a perennial plant in the family Cypripediaceae (Lady's Slipper Family). This species is typically in flower from mid-June through mid-July. It occupies habitat in lodgepole pine stands or spruce-fir forests from approximately 8,000-10,500 feet above mean sea level. The purple lady's slipper may occur in sites with no competing vegetation, either in pine needle duff, or simply bare ground under the canopy of conifer trees. The plant produces several small purple flowers that tend to droop and are often hard to see (CONPS 1997). The species is distributed through the Rocky Mountain States, California, and the Pacific Northwest. In Colorado, the species has been documented from Boulder, Eagle, Gilpin, Grand, Jackson, Larimer, Routt, and Summit counties (NatureServe 2011d). The species is ranked as apparently globally secure (G4), but is vulnerable in Colorado (S3).

Rare plant surveys were conducted in the Project Area in 2007, 2008, and late spring 2009 and did not detect this species. There are many locations in the project ROW with lodgepole pine forest featuring an understory dominated by pine duff, but few if any other plant species. These sites could provide suitable habitat in the Project Area for this species.

3.13.2.4 Fern Species

There are many species of ferns in Colorado; all but brittle bladderfern (*Cystopteris fragilis)* are tracked by the Forest Service as species of local concern. Plant surveys conducted in spring of 2009, as well as summer 2007 and 2008, did detect at least two species of moonworts, and the common brittle bladderfern was identified in a number of rocky outcrop locations in aspen forest stands in the project ROW. Otherwise, no fern species were detected during field surveys for this project. It is likely that suitable habitat for other fern species exists within the alternative ROWs.

Arrowhead Colt's Foot (Petasites sagittatus)

Arrowhead colt's foot is a perennial herbaceous plant species in the family Asteraceae (Sunflower). The plant is an obligate wetland species occupying habitats such as marshy meadows. Arrowhead colt's foot typically flowers in May-June. In Colorado, the plant is known to be distributed in Boulder, Gunnison, Jackson, Mineral, and Park counties. The species is ranked as globally secure (G5); it is not ranked at the state level (NatureServe 2011a).

Rare plant surveys were conducted in the Project Area in 2008 and late spring 2009 and did not detect this species. There are many locations in the project ROW with marshy meadows that are crossed by various alternatives. These wetland sites could provide suitable habitat for the arrowhead colt's foot.

Cupped Penstemon (Penstemon cyathophorus)

The cupped penstemon is a perennial herbaceous species in the figwort family (Scrophulariaceae). This species occupies dry sagebrush habitats in North and Middle Park, Colorado, and was documented from several locations in the project ROW. The cupped penstemon is ranked G3 (vulnerable), and has a state rank of S3 (vulnerable). The species is ranked as globally vulnerable (G3) and vulnerable within the state (S3).

The rare plant survey in spring 2008 and 2009 documented a substantial population in the ROW immediately north of the Farr (Granby) Pumping Plant. Several other populations were observed in the proposed action ROW in sagebrush communities. These occurrences are documented in greater detail in the *Biological Report* (AECOM 2011).

Bird's Eye Primrose (Primula incana)

The bird's eye primrose is a perennial herbaceous species in the primrose family (Primulaceae). The plant has a characteristic farinose (mealy covering) flowering stem. Weber and Wittmann (2001) describe habitat for this species as wet meadows and intermountain parks. It has a wetland indicator status of facultative wetland in USACE Region 8, which means that it occurs in wetlands 67-99 percent of the time. This species is ranked globally as apparently secure (G4), and has not been ranked statewide in Colorado (NatureServe 2011e).

A rare plant survey in the Project Area in late spring 2008 and 2009 did not detect this species. Additional plant surveys were conducted in 2007 and 2008, but did not detect this species. There are many locations in the project ROW with wet meadows and other wetland features. Fen wetland occurs just north of CR 41. These wetland sites could provide suitable habitat for the bird's eye primrose.

3.14 Wetland Resources

3.14.1 Analysis Area

Wetland resources present in the project study area are riparian habitats associated with creeks and irrigation ditches, as well as wetlands that receive some portion of their water budget from groundwater sources. These wetlands are generally very limited in areal extent, with the exception of the wetlands, fens, and wet meadows north of CR 41 (Map 3-11).

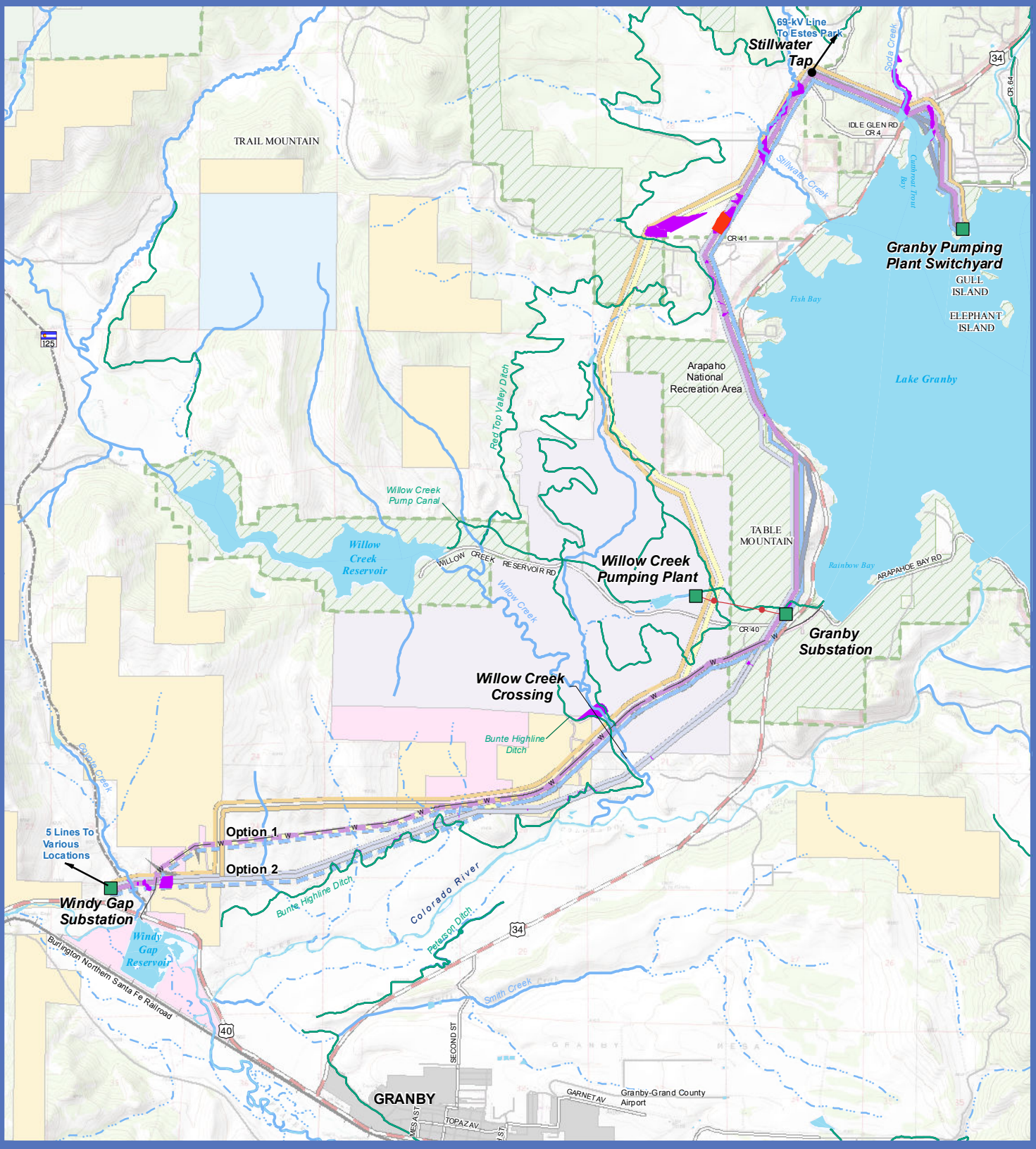
3.14.2 Existing Conditions and Context

Wetlands in the project study area are diverse. They include riparian systems associated with many streams and ditches that are crossed by the project alternatives. Wetlands associated with smaller drainages and irrigation ditches are typically found as narrow vegetated fringe along channel margins. The larger drainages of Willow Creek and Stillwater Creek have generally broader wetland margins. Named stream and ditch features in the Project Area include the following: Willow Creek, Stillwater Creek, Coyote Creek, Soda Creek, Shadow Mountain Canal, Bunte Highline Ditch, and Red Top Ditch.

There are many acres of wet meadows created by historic and current irrigation practices. All of the project alternatives cross over these features at various locations, most notably the valley north of CR 41 and south of CR 40. There are also fen wetlands and other palustrine emergent wetlands located north of CR 41. All of the project alternatives cross over fen wetlands in the valley north of CR 41. Fen wetlands are found in a mosaic; a combination of wet meadows, palustrine emergent wetlands and fens, with interstitial uplands mixed into the overall valley area. These wetlands were documented during field survey work between 2007 and 2009. Fens are a type of wetland typically located at elevations above 8,000 feet, and occurring at low points in the landscape or near slopes where groundwater intercepts the soil surface, maintaining a constant water level. Fens are defined as wetlands that are water logged and characterized by peat formation. These peaty soils are classified as histosols, or mineral soils, with a histic epipedon. Fens are relatively unique and are considered an irreplaceable type of wetland. The USFWS designates fen wetlands as Resource Category 1 (*Federal Register* 1981). This category represents high value wetlands with a mitigation policy of "no loss of existing habitat value."

There are also lacustrine wetlands associated with the lakeshore at Cutthroat Trout Bay on Lake Granby. The lacustrine wetlands are crossed by the current transmission line (Alternative A).

Vegetation associated with Project Area wetland and riparian areas is diverse and includes many different species of willows, sedges, rushes, bulrushes, spikerushes, grasses, and forb species.



Map 3-11

Legend

Base Data
- Existing Willow Creek Tap (69-kV)
- Windy Gap Water Pipeline (NCWCD)

Hydrology
- Perennial Stream
- Intermittent Stream
- Canal/Ditch
- Fen
- Wetlands Field Delineated
- Waterbodies

Transmission Line Alternatives
- Alternative A - Existing
- Alternative B1
- Alternative C1
- Alternative C2
- Alternative C2 - Options 1 and 2
- Alternative D
- Alternative D - Options 1 and 2

Land Status
- Northern Colorado Water Conservancy District (NCWCD)
- Municipal Subdistrict - Northern Colorado Water Conservancy District (MS-NCWCD)
- Forest Service Land within Arapaho National Recreation Area
- Bureau of Land Management (BLM)
- Colorado State Land Board (SLB)
- U.S. Forest Service (USFS)
- Private or Other Land Ownership
- U.S. Forest Service Boundary

Wetlands

November 7, 2011

Source: Source: Bureau of Land Management (BLM), Northern Colorado Water Conservancy District (NCWCD), U.S. Forest Service (USFS), Grand County, Wetland Field Delineation, USGS Land Cover, and Colorado State University

3.15 Terrestrial and Avian Wildlife Resources

3.15.1 Analysis Area

The analysis area includes all five alternatives, including the no action alternative (or existing) corridor. The planning area used to assess population viability and habitat impacts for FSS and MIS includes the ANRA and, on a larger scale, the ARNF. Impacts to wildlife and habitats are analyzed on a Forest-wide scale, and cumulatively for surrounding lands.

Elevation in the Project Area ranges from 7,800 feet near the Windy Gap substation to 8,400 feet near the Town of Grand Lake. The Colorado River flows south to southwest, immediately east of the Project Area, and joins with the Fraser River 1 mile south of the Project Area. Willow Creek runs through the Project Area, as well as several intermittent and ephemeral creeks and the Bunte Highline and Red Top irrigation ditches. Average annual precipitation is approximately 14 inches.

The southern segments of the alternatives pass through sagebrush dominated areas and irrigated hay meadows. The central segments of the alternatives pass though sagebrush communities interspersed with evergreen conifer forests. The northern segments of the alternatives pass through predominantly evergreen conifer forest, interspersed with areas of wet meadow wetlands. A larger wetland and fen is located at the northern end of the Project Area, west of U.S. Highway 34.

3.15.2 Alternative-Specific Analysis Area

The analysis area for terrestrial and avian wildlife resources in the Project Area includes the no action and the four action alternative ROWs. The study area was expanded to 0.25 mile from the edge of each of the ROWs to analyze potential impacts to nesting raptors in the Project Area. The analysis included data collection up to 0.50 mile for bald and golden eagles. These distances were selected based on the USFWS and CDOW recommended construction buffers and seasonal restrictions for breeding raptors in Colorado (Appendix D).

3.15.3 Management Considerations

3.15.3.1 Regulatory and Forest Plan Direction

Statutes, regulations, and executive orders that provide authority to manage wildlife, fish, and plant resources on the ARNF, BLM, and state and private lands include the following:

- Agricultural Appropriation Act
- BGEPA of 1940 (16 U.S.C. 668-668c, 54 Stat. 250), as amended
- Non-game, Endangered, or Threatened Species Conservation Act (CO ST 33-2-105)
- ESA of 1973 (16 U.S.C. 1531-1544, 87 Stat. 884), as amended
- E.O. 11990, Protection of Wetlands, May 24, 1977
- Federal Land Policy and Management Act (FLPMA) of 1976, as amended (43 U.S.C.1701 et seq.)
- Federal Water Pollution Control Act (Clean Water Act) (CWA) of 1972 (33 U.S.C. 1251 et seq.), as amended

- Fish and Wildlife Coordination Act of 1934 (16 U.S.C. 661-666c), as amended
- Forest and Rangeland Renewable Resources Planning Act of 1974 (P.L. 93-378)
- MBTA of 1918 (16 U.S.C. 703-712; Ch. 128; July 13, 1918; 40 Stat. 755), as amended
- Multiple-Use, Sustained-Yield Act of 1960 (P.L. 86-517)
- NFMA of 1976 (16 U.S.C 1600-1614), as amended
- Sikes Act of 1960 (16 U.S.C. 670a-670o, 74 Stat. 1052), as amended

3.15.4 Scoping Issues and History of Agency Consultation

Western has worked with CDOW since the project's inception in 2005 to obtain data regarding species and habitats of state concern within the Project Area. A letter requesting information on state species of concern and habitat was submitted to CDOW on August 24, 2005 and again in 2007. CDOW responded and provided a list of agency concerns, including potential impacts to mule deer (*Odocoileus hemionus*) and elk (*Cervus elaphus*) winter range; greater sage grouse (*Centrocercus urophasianus)* nesting and brooding areas; and compliance with the MBTA of 1918, as amended; and the BGEPA of 1940. These letters are included in Appendix H. Western met with CDOW, USFWS, Forest Service, and BLM on December 11, 2007, and also met 2 years prior, to provide project updates to the CDOW and USFWS and to request any additional information on state-listed species that may occur in the project.

The wildlife concerns identified by CDOW (outlined by CDOW in their 2005 and 2007 letters to Western), Forest Service, USFWS, and BLM include:

- Impacts to winter range and severe winter range for mule deer and elk at Table Mountain and surrounding habitats. Maintenance and construction of this line in winter range between the months of November through April may temporarily displace elk and reduce the available severe winter range habitat in the study area.
- Impacts to sage grouse lek sites, nest, and brood sites from construction of a transmission line in a new, previously undisturbed ROW in sagebrush habitats.
- The presence of a transmission line in proximity to a documented lek site, or an increase in structure heights of the existing transmission line could increase perch sites for raptors in the area and increase predation on sage grouse.
- Increased habitat fragmentation and human disturbance in the Project Area.
- Propagation of noxious weeds in the transmission ROW and the resulting effects to native habitats for wildlife.
- Raptor occurrence in the Project Area and the potential for collisions with the power line or electrocution.
- Compliance with the BGEPA of 1940 and the MBTA of 1918 as amended.
- Potential impacts to wetlands (fens) and riparian communities.

Public scoping meetings identified similar concerns for biological resources as were identified by the agencies.

3.15.5 Existing Conditions and Context

The physical characteristics, including a description of the primary vegetation communities that occur in the area, are discussed above under Section 3.12, Vegetation Resources. Wildlife habitat in the Project Area includes sagebrush shrublands, lodgepole pine stands, aspen forest, irrigated hay meadows, wetlands, and riparian communities. The lodgepole pine stands in the Project Area have been heavily impacted by the mountain pine beetle epidemic that is affecting forested pine communities throughout Grand County and much of Colorado. Portions of the Project Area are currently under construction for residential development or occur within existing residential communities. All project alternatives would cross portions of Table Mountain, which has been mapped by CDOW as severe winter range and winter range for deer and elk. There is a pair of golden eagles that nest on the west side of Table Mountain as well as numerous other nesting raptor species including, but not limited to, osprey, Swainson's hawk, Cooper's hawk, and red-tailed hawk.

The Project Area lies to the north of the Colorado River and Windy Gap Reservoir, west of Lake Granby and Shadow Mountain Lake, and east of Willow Creek Reservoir. There are a number of ephemeral drainages located throughout the Project Area. The surface waters crossed by the no action and action alternatives include Stillwater Creek, Willow Creek, the Bunte Highline Ditch, and the Red Top Valley Ditch. The reservoirs and lakes near the Project Area provide foraging and nesting habitat for a variety of avian species. The largest concentration of osprey in Colorado can be found at the reservoirs of eastern Grand County (NDIS 2009).

Amphibian species associated with aquatic habitats that have historically or have the potential to exist within the Project Area include the western chorus frog (*Pseudacris triseriata*), wood frog (*Lithobates sylvaticus*), boreal toad (*Anaxyrus boreas boreas)*, mountain toad (*Anaxyrus woodhousii woodhousii*), tiger salamander (*Ambystoma tigrinum*), and northern leopard frogs (*Lithobates pipiens*), among others (Hammerson 1999).

3.15.5.1 Wildlife Summary by Project Alternative

Alternative A (No Action)

There are nine raptor nests that are believed to be active within 0.25 mile of the Alternative A ROW. This includes one Cooper's hawk, three osprey, one Red-tailed hawk, and four Swainson's hawk nests. The Sulphur Ranger District monitors raptor nests annually and maintains records of locations of nesting raptors.

Six additional osprey nests are located within 1 mile of the Alternative A ROW. Some osprey nests in the area are on man-made nesting platforms. Western constructed these nesting platforms in cooperation with the Forest Service to mitigate nesting on power poles. Other raptor nests within 1 mile from Alternative A include a second Cooper's hawk, two golden eagles, another Red-tailed hawk, and two additional Swainson's hawk nests.

An inactive raptor nest was observed several hundred feet to the east of the Alternative A ROW in the forested segment that occurs just south of the Granby Substation. The nest was in the top of a lodgepole pine that had been affected by mountain pine beetle. Based on a lack of white wash, green material in the nest, prey remains, or presence of raptor in the area, it was assumed the nest was inactive in 2008.

A breeding population of yellow-rumped warblers was also mapped 21 feet from the ROW in proximity to the corvid nest site. Northern flickers, western meadowlarks, song sparrows, and mourning doves were a few of the more commonly observed species in this ROW.

Mule deer and elk sign were observed throughout the Alternative A ROW. The southwestern end of the Project Area has been mapped by CDOW as severe winter range and winter range for mule deer and elk.

Greater sage grouse occurrence, relative to the Alternative A alignment, is discussed in detail under Section 3.16, Special Status Terrestrial, Avian, and Aquatic Wildlife Species.

Alternative B1

Alternative B1 is similar to Alternative A, with the exception of the reroute onto ANRA lands on the east side of Table Mountain. The habitat within the reroute portion of the alignment is a mix of sagebrush shrubland/serviceberry communities and aspen forest.

With the exception of the reroute on ANRA land, Alternative B1 is in a previously disturbed ROW that includes some residential development on the northern edge of the Project Area.

Active raptor nests in proximity to the ROW are the same as the nests identified in proximity to the Alternative A ROW.

Greater sage grouse occurrence, relative to the Alternative B1 alignment, is discussed in detail under Section 3.16, Special Status Terrestrial, Avian, and Aquatic Wildlife Species.

Alternative C1

The ROW for Alternative C1 crosses greater sage grouse breeding and nesting habitats. The Alternative C1 ROW would be located within 0.25 mile or less of an active greater sage grouse lek. Greater sage grouse occurrence is discussed in further detail under Section 3.16, Special Status Terrestrial, Avian, and Aquatic Wildlife Species.

The Alternative C1 alignment also crosses winter range and severe winter range for mule deer and elk. On the west side of Table Mountain, Alternative C1 would cross a valley that serves as a migration corridor for big game species in the area.

Three raptor nests are located within 0.25 mile of the Alternative C1 ROW, all of which are Swainson's hawk nests. There is an historic, active golden eagle nest site located on the west side of Table Mountain within 0.50 mile of the proposed ROW for Alternative C1 (as well as Alternative C2). The golden eagle nest was active in 2009 and produced two chicks. A juvenile golden eagle was observed on several occasions foraging in the wetlands and surface waters west of Table Mountain in 2008. As a special status species, golden eagles will be discussed further under Section 3.16.

Nine additional raptor nests are within 1 mile of the ROW including a Cooper's hawk, four osprey, one Red-tailed hawk, and three Swainson's Hawks. Raptors occupying nests documented in proximity to the ROW for Alternatives A and B1 likely frequent hunting and perching grounds in proximity to the Alternative C1 ROW.

Alternative C2

Alternative C2-Option 1 is similar to Alternative C1, with the exception of changes to the alignment leaving the Windy Gap Substation moving to the northeast. Alternative C2-Option 1 follows the existing water pipeline ROW owned by MS-NCWCD. Mountain lion scat was observed on the pipeline ROW in this area.

Alternative C2-Option 2 follows the existing transmission ROW (Alternative A) until it joins the water pipeline ROW southwest of the Granby Substation. From the vicinity of the Willow Creek crossing, Alternative C2 follows the same alignment described for Alternative C1.

Wildlife habitat conditions are very similar to what was described for C1. The ROW for Alternative C2 crosses greater sage grouse breeding and nesting habitats. The Alternative C2 ROW would be located within 0.25 mile or less of an active greater sage grouse lek. Greater sage grouse occurrence is discussed in further detail under Section 3.16, Special Status Terrestrial, Avian, and Aquatic Wildlife Species.

The Alternative C2 alignment also crosses winter range and severe winter range for mule deer and elk. On the west side of Table Mountain, Alternative C1 would cross a valley that serves as a migration corridor for big game species in the area.

Four raptor nests are located within 0.25 mile of the Alternative C2 ROW, including three Swainson's hawk nests and one Red-tailed nest. There is an historic, active golden eagle nest site located on the west side of Table Mountain within 0.50 mile of the proposed ROW for Alternative C2. The golden eagle nest was active in 2009 and produced two chicks. As a special status species, golden eagles will be discussed further under Section 3.16.

Eight additional raptor nests are within 1 mile of the ROW including a Cooper's hawk, four osprey, and three Swainson's hawks. Raptors occupying nests documented in proximity to the ROW for Alternatives A and B1 likely frequent hunting and perching grounds in proximity to the Alternative C1 ROW.

Alternative D

Alternative D habitat characteristics, nest occurrences, and general wildlife occurrences are similar to those described for Alternative B1, except that Alternative D includes an option to follow the water pipeline ROW (Option 1) or the existing ROW (Option 2) at the western end of the Project Area.

Alternative D-Option 1 wildlife occurrences and habitat characteristics are the same as described for Alternative C2-Option 1.

Alternative D-Option 2 wildlife occurrences and habitat characteristics are the same as described for Alternatives A, B1, and C2-Option 2.

Greater sage grouse occurrence, relative to the Alternative D alignment, is similar to that described for Alternative B1.

Raptors occupying nests documented in the ROW for Alternatives A and B1 likely frequent hunting and perching grounds in proximity to the Alternative D ROW.

3.16 Special Status Terrestrial, Avian, and Aquatic Wildlife Species

For purposes of this EIS, special status species are defined as those species that are listed under the ESA as threatened, endangered, or candidate species; FSS, or MIS; species that are protected by the State of Colorado as threatened and endangered species; or species of local concern.

Information was collected for those species that are known to occur within or with suitable habitat in the Project Area. Data was collected through contacts and information provided by the ARNF, Sulphur Ranger District, USFWS, CDOW, CNHP elemental occurrence database, and the BLM.

Habitat assessments were conducted by a qualified biologist(s) and natural resource specialist in the summers of 2005, 2007, 2008, and 2009 for all project alternatives. Formal boreal toad surveys occurred in the summer of 2007. Boreal toad surveys were conducted by CNHP in the summer of 2007. The survey encompassed other amphibian species of concern, including the wood frog and northern leopard frog, as well as general amphibian occurrence.

3.16.1 Analysis Area

The Project Area, as defined for the purpose of analysis of special status species, is the same as described for wildlife overall (see Section 3.15).

3.16.1.1 Alternative-Specific Analysis Area

The specific analysis area and data collection effort for special status species includes 0.25 mile from the edge of each of the alternative ROWs to analyze potential impacts to nesting raptors in the Project Area. However, the analysis included data collection up to 0.50 mile for bald and golden eagles. These distances were selected based on the USFWS and CDOW's recommended construction buffers and seasonal restrictions for breeding raptors in Colorado. Formal surveys were not conducted in areas outside of the project alternative ROWs, but information was collected from Cooperating Agencies and CDOW.

The planning area used to assess population viability and habitat impacts for FSS species and MIS includes the ANRA and, on a larger scale, the ARNF. Impacts to wildlife, vegetation, and their habitats are analyzed for each alternative, on a Forest-wide scale, and cumulatively for surrounding lands.

3.16.2 Management Considerations

3.16.2.1 Federally Listed Species

As described in Section 3.13, a BA is required if listed species or critical habitat may be present in the Project Area. The BA determinations included in this document apply only to federally listed species and their designated and proposed critical habitat.

Table 3-27 identifies the complete list of Threatened and Endangered Species for Grand County (USFWS 2010). The species noted as "excluded" are not carried forward for analysis in the BA.

Table 3-27. Federally Listed Species with the Potential to Occur in Grand County.

Common Name	*Scientific Name*	*Federal Status**	*Species Excluded?*	*Reason for Exclusion*
MAMMALS				
Canada lynx	*Lynx Canadensis*	T	No	
FISH				
Bonytail chub	*Gila elegans*	E	Yes	No water depletions proposed
Colorado pikeminnow	*Ptychocheilus lucius*	E	Yes	No water depletions proposed
Greenback cutthroat trout	*Oncorhynchus clarki stomias*	T	Yes	No water depletions proposed
Humpback chub	*Gila cypha*	E	Yes	No water depletions proposed
Razorback sucker	*Xryauchen texanus*	E	Yes	No water depletions proposed

Source: USFWS 2010; *T= Threatened, E=Endangered

3.16.2.2 Forest Service Sensitive Species

As described in Section 3.13, it is Forest Service policy to analyze impacts to sensitive species in a BE (FSM 2670.31-32: Forest Service 1995).

Table 3-28 lists the FSS wildlife species carried forward for evaluation based on the Region 2 Forest Service Sensitive Species List dated May 19, 2011.

Table 3-28. Forest Service Sensitive Species Retained for Further Analysis.

Forest Service Sensitive Species	
WILDLIFE	
American marten North American river otter North American wolverine Pygmy shrew	Mammals
American bittern American peregrine falcon Bald eagle Black tern Boreal owl Brewer's sparrow Greater sage grouse Loggerhead shrike Northern goshawk Northern harrier Olive-sided flycatcher	Birds
Boreal toad Northern leopard frog Wood frog	Amphibians

3.16.2.3 Management Indicator Species

The NFMA of 1976 requires that national forest planning "provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives." To implement this mandate, in 1982 the Forest Service developed and implemented regulations requiring the identification of MIS to be used as planning and analysis tools to set goals, objectives, and minimum management requirements in Forest Plans; to focus the analysis of effects of plan alternatives; and to monitor the effects of plan implementation at the project level. MIS species were created to evaluate the effects of management practices on fisheries and wildlife resources. The Forest Service monitors select species whose population trends are believed to reflect the effects of management activities on forest ecosystems (36 CFR 219.9). Specifically, the regulations state that "these species shall be selected because their population changes are believed to indicate the effects of management activities" (36 CFR 219.19). The MIS designation is not intended to provide special protective status, serve as biological diversity benchmarks, nor represent every species of plant or animal found in the forest.

Available information regarding MIS populations and trends was considered for this project. Monitoring and evaluation is carried out to address populations across the entire Forest. Forest Plan goals are to maintain or improve MIS habitat. Numerous Forest Plan goals, objectives, standards, and guidelines provide coordinated direction for MIS management (Forest Service 1997).

The Forest Plan requires sufficient habitat to support at least a minimum of reproductive MIS individuals. As a result, the ARNF tiers their analysis of MIS species to a community-based analysis of habitats. These habitats are designated Management Indicator Communities (MIC). The MICs for the ARNF are as follows:

- existing and potential old-growth forests
- interior forests
- young to mature forest structural stages
- openings within/adjacent to forests
- aspen forests
- montane riparian areas and wetlands
- montane aquatic environments

Table 3-29 lists all MIS species considered for analysis based on the MIS list, as amended May 3, 2005. Certain MIS are also listed as FSS. These species are denoted in the following table; background information for these dual-listing species is not repeated in this section.

Table 3-29. MIS Carried Forward for Analysis.

Management Indicator Species	
Elk Mule deer	Mammals
Golden-crowned kinglet Hairy woodpecker Mountain bluebird Pygmy nuthatch Warbling vireo Wilson's warbler	Birds
Boreal toad*	Amphibian

*Species is also included as a FSS.

3.16.2.4 Migratory Birds

The MBTA states it is "unlawful to pursue, hunt, take, capture or kill; attempt to take, capture or kill; possess, offer to or sell, barter, purchase, deliver or cause to be shipped, exported, imported, transported, carried or received any migratory bird, part, nest, egg or product, manufactured or not."

The Project Area provides nesting, foraging, and stopover habitats for a variety of avian species protected under the MBTA. The project also lies 0.5-1 mile to the north of the Colorado River, a major migratory corridor for a variety of species. Sandhill cranes, bald eagles, pelicans, and other avian species migrate through the Project Area, particularly on the southern end near the Colorado River (Sumerlin 2007, pers. comm.). A variety of avian species are known to nest within or in proximity to the project alternatives.

The USFWS recommends that surveys be conducted no earlier than 72 hours prior to any ground-disturbing activity during the avian breeding season to avoid the incidental take of a migratory bird or nest. The avian breeding season is species dependant, but for most species is generally March 15-September 1. Recommended time constraints for construction near bald and golden eagles would begin as early as November or December.

3.16.2.5 State-Listed or Other Species of Concern

CDOW designates state threatened and endangered species as well as Species of State Concern. Those species that may occur within the Project Area include the greater sage grouse (Species of State Concern), boreal toad (State Endangered), the northern leopard frog (Species of State Concern), wood frog (Species of State Concern), bald eagle (State Threatened), American peregrine falcon (Species of State Concern), Canada lynx (State Endangered), and the North American wolverine (wolverine) (State Endangered). Other species of concern include the golden eagle, osprey, and the American white pelican, all of which are protected by the MBTA.

3.16.3 Scoping Issues and History of Agency Consultation

As required by Section 7 of the ESA, interagency consultation has occurred between Western, Forest Service, and USFWS regarding listed and proposed species in the Project Area. Informal consultation with USFWS was initiated on June 30, 2005 when Western submitted a letter to the USFWS requesting information on threatened and endangered species in the Project Area.

Western received a response letter on July 13, 2005. The USFWS was not able to provide species-specific information for the Project Area at that time, but did include a list of endangered, threatened, and candidate species for Grand County. Western met informally with USFWS on November 2, 2005 and again on December 11, 2007 to provide project updates to the USFWS, and to request any new information on federally listed species that may occur in the Project Area. The USFWS in Lakewood, Colorado determined in December 2008 that the primary wildlife species of federal concern in the Project Area is the Canada lynx (*Lynx canadensis*).

CDOW was also consulted to obtain data regarding species and habitats of state concern within the proposed Project Area. A letter requesting information on state species of concern and habitat was submitted to CDOW on August 24, 2005 and again in 2007. CDOW responded in 2005 and 2007 (Appendix H). A list of their concerns was provided in Section 3.15, Terrestrial and Avian Wildlife Resources. Western met with CDOW in December 2007 to provide project updates to the CDOW and USFWS and request any additional information on state-listed species that may occur in the project.

3.16.4 Existing Conditions and Context

3.16.4.1 Forest Service Sensitive Species

Nineteen FSS were analyzed for this Project. The only species observed during field investigations conducted in 2005, 2007, 2008, and 2009 were Brewer's sparrow, olive-sided flycatcher, and greater sage grouse. Each of these species was observed in sagebrush shrubland/serviceberry communities on the western end of the Project Area. Suitable habitat for the remaining species exists within the Project Area.

A brief description of each of the FSS carried forward for evaluation is included in the remainder of this section.

American bittern

In Colorado, the bittern can be found in cattail marshes and adjacent wet meadows. It is seen outside of marshes around lakes and in riparian areas, primarily during fall and spring migration (NDIS 2005). This species breeds and overwinters in freshwater wetlands with emergent vegetation and shallow water. According to NatureServe (2010a), loss and degradation of wetlands is the most serious threat to bittern viability. According to NDIS (NDIS 2009), this species is known to occur in Grand County; however, there are no known incidental or breeding occurrences of this species within or adjacent to the Project Area. No bitterns were observed during field surveys conducted in 2005, 2007, 2008, or 2009.

Habitat for the American bittern occurs within portions of all alternative ROWs in areas that would cross wetland and wet meadow habitats. (Wetland communities in the Project Area were described in detail above under Section 3.14.) The largest wetland complex in the Project Area can be found within the ROW for all of the alternatives to the north of CR 41. The wetland areas are bordered by irrigated hay meadows that also provide suitable habitat for the bittern.

American marten

In Colorado, marten occur in most areas of coniferous forest habitat in the high mountains (Fitzgerald et al. 1994). According to NatureServe (2010b), marten populations are apparently secure. Marten inhabit subalpine spruce-fir and lodgepole pine forests, alpine tundra, and

occasionally montane forests. They prefer late-successional or mixed age stands with over 30 percent, and preferably 40-60 percent canopy cover. Marten den in tree cavities, logs, rocks, rock piles, and burrows, and frequently rest on tree limbs during the day.

According to NatureServe (2010b) threats to marten include timber harvest that reduces canopy cover and removes structure from the forest floor, and trapping for pelts. Marten are susceptible to overharvest.

The Project Area does not contain contiguous blocks of forested areas that would provide suitable habitat for breeding marten populations. Marten habitat in the Project Area is limited to the individual forested segments that occur in each of the alternative ROWs. Alternatives A, B1, and D would cross forested habitats on the east side of Table Mountain, north and south of the Granby Substation, and near the campground at Cutthroat Trout Bay. Alternatives C1 and C2 would cross forested habitats on the west side of Table Mountain, specifically the Forest Service parcels located just south of CR 41. All of these forested communities have been heavily impacted by the mountain pine beetle epidemic and do not provide quality habitat for the American marten. Surveys were conducted for martens in 2005 on Table Mountain and there were no signs or tracks of martens found.

American peregrine falcon

In Colorado, peregrine eyries are scattered throughout the mountains and canyons, with highest concentrations along the Dolores and Colorado River canyons and in Dinosaur National Park (Kingery 1998).In Grand County, peregrine falcons are rare spring and fall visitors in aspen, canyon, riparian and tundra habitats (Jasper and Collins 1987). An active eyrie was discovered near Hot Sulphur Springs in Grand County in 2009, which was also active in 2010 (Forest Service n.d.).

Peregrines nest on ledges on cliff faces, and also on other structures/micro-habitats, including riverbanks, tundra mounds, bogs, large stick nests of other species, tree hollows, and man-made structures (e.g., ledges of city buildings). Nests are typically situated on ledges of vertical rocky cliffs, commonly with a sheltering overhang. Ideal locations include undisturbed areas with a wide view, near water, and close to plentiful prey (NatureServe 2010s).

Review of Forest Service and CDOW data for the Project Area showed there are neither anecdotal sightings nor historic occurrence records for peregrine falcons in the Project Area (prairie falcons are far more common cliff occupants in Grand County) (Forest Service n.d.). The cliff habitats on the west side of Table Mountain contain marginal cliff habitat, which may provide habitat for some smaller avian species, but it is highly unlikely a peregrine would nest in the area.

The Colorado River, Stillwater Creek, Willow Creek and Reservoir, and the agricultural properties within the greater Project Area provide suitable foraging habitat for this species. Peregrines feed primarily on birds (medium-size passerines up to small waterfowl), and secondarily, small mammals (e.g., bats), lizards, fishes, and insects. Prey pursuit is initiated from perches or while soaring (NatureServe 2010s). All of the project alternatives would cross wetlands and riparian communities associated with Willow and Stillwater creeks. Alternatives C1 and C2 would cross the west side of Table Mountain. These alternatives would occur within suitable foraging and potential nesting habitat for the falcon.

Bald eagle

Bald eagles prefer to roost in conifers or other sheltered sites in winter, and typically select larger trees. Communal roost sites used by two or more eagles are common, and 100 or more eagles may use some roosts during winter. Winter roost sites vary in their proximity to food resources (up to 20 miles) and may be determined, to some extent, by a preference for a warmer microclimate at these sites. Wintering areas are commonly associated with open water, though in some areas eagles use habitats with little or no open water if other food resources (e.g., carrion) are readily available. Winter roosts generally avoid areas with nearby human activity (pedestrians) and development (buildings) (NatureServe 2010d).

The closest bald eagle roosting sites to the Project Area occur northeast of Lake Granby and south along the Colorado River (Sumerlin 2005, pers. comm.). A winter concentration area also exists north of Lake Granby and at Shadow Mountain Lake. Summer forage habitat for bald eagles exists along the northern edge of Lake Granby and north to the southern end of Shadow Mountain Lake, and along the Colorado River south of the Project Area.

Wintering bald eagles may be found along ice-free sections of the Colorado River. Winter concentrations include portions of the Colorado River below the Shadow Mountain Dam and at Windy Gap Reservoir. Spring and fall bald eagle migrants also occur along the Colorado River, Lake Granby, Shadow Mountain Reservoir, Grand Lake, and other large creeks and lakes/reservoirs. Bald eagle winter forage and communal roost sites are known to exist along the Colorado River, directly south of the western end of the proposed transmission line alignment (AECOM 2011).

Black tern

The black tern's preferred breeding habitat includes marshes, along sloughs, rivers, lakeshores, and impoundments, or in wet meadows, typically in sites with mixture of emergent vegetation and open water. Nests may be placed in a variety of vegetative situations, from dense stands of emergent vegetation to open water (Bergman et al. 1970; Novak 1990; and NatureServe 2010e), but moderate or sparse vegetation appears to be preferred (Cuthbert 1954; Weller and Spatcher 1965; Dunn 1979).

Regionally, Willow Creek Reservoir to the west of the Project Area, Lake Granby and Grand Lake to the east, and the Colorado River provide habitat for the black tern. Within the Project Area, suitable habitat for this species is found at Willow Creek, Cutthroat Trout Bay, and associated wetlands; and the wet meadows and wetland communities associated with irrigation ditches, and Stillwater Creek north of CR 41. Although rare, the black tern has been documented in Grand County on at least three occasions (Sulphur Ranger District Records 2010).

Boreal owl

Considered imperiled in Colorado, boreal owls occupy a circumpolar distribution in Northern hemisphere boreal forests. In North America, boreal forests in Colorado and northern New Mexico delineate the southernmost extent of their distribution. Although boreal owls are considered globally secure, their trend is unknown due to unreliable population estimates and nomadism caused by fluctuations in prey base abundance and distribution (NatureServe 2010f). Boreal owls appear to be distributed in Colorado between 9,200 and 10,400 feet. In Grand County, boreal owls are rare summer breeders in coniferous habitats, and are believed to remain within and around their home ranges through the winter (NatureServe 2010f).

In Colorado, boreal owls utilize late-successional, multi-layered habitats of spruce-fir and lodgepole pine interspersed with meadows. These owls may also be found in aspen and mixed conifer stands. Boreal owls are secondary cavity nesters, usually occupying cavities excavated by woodpeckers. Nest cavities are commonly found in snags with a diameter of at least 10 inches, and may be used in consecutive years. In Colorado, nesting occurs from mid-April to early June.

Although suitable boreal owl habitat occurs within the Project Area, breeding bird survey (BBS) data has not documented boreal owl occurrences in the Project Area (Kingery 1998). Boreal owl surveys have not been conducted in the Project Area, and there are no historic or recent records of this species within the Project Area.

The Project Area and the Forest have been heavily impacted by the mountain pine beetle epidemic. As a result, stand structure has been significantly altered within the Project Area and forest-wide. The structural stages that boreal owls prefer have been compromised by the epidemic.

Suitable habitat in the Project Area is associated with the lodgepole, aspen, and meadows found in all project alternatives. Alternatives B1 and D would cross a dense aspen community on the east side of Table Mountain, located on the boundary of the ANRA just west of U.S. Highway 34.

Brewer's sparrow

Brewer's sparrows are often the most abundant bird species in appropriate sagebrush habitats. There has been significant decline, however, throughout its range in the last 10-20 years (Rotenberry et al. 1998). Brewer's sparrows are a common to fairly common spring and summer visitor in Grand County's grasslands and pinyon-juniper woodlands, with confirmed breeding in grassland habitats (Jasper and Collins 1987). BBS records document Brewer's sparrow occurrences in the Project Area vicinity as well as confirmed breeding (Kingery 1998).

Direct causes of widespread decline on breeding grounds are uncertain; but are possibly linked to widespread degradation of sagebrush habitats in the western United States, especially on private lands (NatureServe 2010g, Forest Service 2002).

Breeding is strongly associated with sagebrush habitat but can also occur in mountain mahogany, rabbitbrush, bunchgrasses, bitterbrush, ceanothus, manzanita, and openings in pinyon-juniper habitats (NatureServe 2010g). In Colorado, courtship begins late in May or early June, with eggs laid in June and hatched young from late June through late July (Kingery 1998).

One Brewer's sparrow was observed on the western end of Alternative A in 2008. Suitable habitat exists for the sparrow within all the alternative's ROWs, where the transmission line would leave Windy Gap Substation and head east towards Willow Creek.

Greater sage grouse

The greater sage grouse is a species of concern for the Forest Service, BLM, and CDOW. Greater sage-grouse are found throughout northwestern Colorado, with the majority of the birds occurring in Grand, Moffat, and Jackson counties. Additional counties with sage-grouse include Eagle, Larimer, Garfield, Rio Blanco, Routt and Summit. They typically occur between 7,000-9,500 feet elevation in sagebrush habitats (Kingery 1998). Range-wide, greater sage-grouse occur from southwestern North Dakota and northwestern South Dakota west to

Montana, Washington, Oregon and Idaho, north into Canada, and south as far as California, Nevada, Utah, and Colorado (GSGCP 2008). In Grand County, sage-grouse can be found in sagebrush habitat from Kremmling to Granby, as well as within the Muddy Creek, Troublesome, Williams Fork, and Blue River drainages (GSGCP 2008). The USFWS determined that listing the greater sage-grouse is warranted, but precluded as of March 2010.

Greater Sage-grouse Conservation Plan-Middle Park (GSGCP 2008) reports that habitat for this species is restricted to sagebrush-steppe areas adjacent to riparian areas. Habitat preferences vary seasonally. Grouse would use sage-dominated habitats in the spring and more diverse mountain shrub habitat during the summer. Greater sage grouse would move to sagebrush habitats at lower elevations during the winter. This species feeds on leaves of sagebrush, and leaves and flowers of forbs within sagebrush habitats. Male grouse display on leks in the spring; usually flat, open areas within sagebrush habitats. Females build ground nests under sagebrush near the leks and incubate their clutches for 25-27 days. Moist areas with forb and insect availability are used for brood-rearing and often occur near riparian areas. Threats to sage grouse include disturbance to lek and nest sites, large-scale sagebrush habitat loss, and predation from a variety of egg, chick, and adult predators.

The Project Area contains breeding (lek), foraging, and nesting habitats for the greater sage grouse. Habitat assessment surveys conducted within the Project Area in July 2005 and again in 2008 found signs of heavy sage grouse use within the Alternative C1 ROW and along the NCWCD water pipeline. Up to 18 sage grouse have been observed near the ROW for Alternatives C1, C2-Option 1, and D-Option 1. There was no sign of sage grouse within the ROW for Alternative A. Suitable habitat exists for the sage grouse within the ROW of Alternative A; however, the existing transmission line and disturbance from ongoing construction in the area may deter sage grouse from frequenting the area.

CDOW currently monitors two sage-grouse leks in proximity to the project alternatives: the Horn West and the (historic) Horn lek. The Horn West lek is located on private property on the western end of the project area and is approximately 0.8 mile north of Alternative A, B1 and D-Option 2. The lek is 0.29 mile north of Alternative C1 and 0.5 mile from C2-Option 1 and 0.79 mile north of C2-Option 2. This lek was located and found to be active in 2005. The high count for the males from 2005-2010 is five males.

A historic (last known to be active in 1993) sage-grouse lek, known as the Horn lek occurs on BLM property to the east of the Horn West lek. The Horn lek is 0.24 mile north of Alternative A, B1, and C2-Option 2 and D-Option 2. The lek is 0.17 mile from Alternative C1 and C2-Option 1 and D-Option 1. Individuals are also known to disperse north from the Linky lek, which lies to the south of the Colorado River, into the project area (Holland 2005, pers. comm.; Oldham 2005, pers. comm.).

Habitat assessment surveys conducted by AECOM within the Project Area in July 2005, 2008, and 2009 found signs of high sage grouse use within Alternatives C1, C2 (north), and D leaving the Windy Gap Substation and further east, up to the hillside north of Willow Creek. There was no sign of sage grouse within the ROW for Alternative A. Suitable habitat exists for the sage grouse within the ROW of Alternative A; however, the existing transmission line and disturbance from ongoing construction in the area may deter sage grouse from frequenting the area. Existing transmission lines provide perch sites for raptors in the area and may increase predation on sage grouse.

Alternative C1 and C2-Option 1 occur in relatively intact sagebrush communities. Alternatives A, B1, and D would occur within or in proximity to existing transmission or water pipeline ROWs.

Loggerhead shrike

Habitat for the Loggerhead Shrike includes open riparian areas, agricultural areas, grasslands, and shrublands, especially semi-desert shrublands, and sometimes open pinyon-juniper woodlands. Breeding birds are usually near isolated trees or large shrubs. They frequent greasewood draws in both summer and winter in Mesa County and probably elsewhere in western Colorado (NDIS 2010).

This species has shown significant population declines over much of North America (NatureServe 2010m), and for that reason is listed on the National Audubon Society Blue List and is a Colorado Species of Special Concern. This species apparently has been extirpated from some areas of eastern Colorado as a breeding species, but it does not appear to have declined in western Colorado (NDIS 2010).

According to the 2010 Occurrence Records of Grand County birds, Loggerhead shrikes are uncommon, but have been observed in the fall through early spring in Grand County. This species can occur in all habitats of the project area including aspen and coniferous forests, grasslands, wetlands, agricultural and sage brush communities.

Northern goshawk

In Colorado, goshawks occur at elevations of 7,500-11,000 feet (NatureServe 2010o; Kennedy 2003), and 64 percent of BBS breeding observations occurred in coniferous forests. In Grand County, goshawks occur uncommonly year-round within aspen and coniferous forests, and also in riparian, wetland, and meadow habitats.

Northern goshawks inhabit mature forests of various cover types, including aspen, lodgepole, ponderosa pine, and spruce-fir. Individuals feed primarily on birds of small to medium size, as well as grouse and small mammals such as rodents and hares. Goshawks may use marshes, meadows, and riparian zones for foraging (NatureServe 2010o; Kennedy 2003).

Regardless of the cover type, goshawks require large blocks of forest for nesting and foraging. According to NatureServe (2010o), threats to northern goshawk include timber harvest, fire suppression, grazing, and insect and tree disease outbreaks that can result in the deterioration or loss of nesting habitat. Known or suspected predators include martens, fishers, black bears, and wolverines.

According to Sulphur Ranger District Records, a northern goshawk nest is located in the project vicinity, approximately 1 mile north of the northern extent of all the project alternatives.

Northern goshawks require large tracts of forest for foraging and nesting, and the Project Area does not contain this type of habitat, in part, due to the mountain pine beetle epidemic. The occurrence of forested communities is higher on Alternatives B1 and D. These alternatives follow the existing transmission line for the majority of the ROW and have been cleared of forest vegetation to maintain safety standards for transmission lines. The mountain pine beetle epidemic has had a significant impact on forested habitats that goshawks prefer for nesting. The residential and recreational use within the Project Area is also expected to reduce the likelihood of

goshawks nesting in the Project Area. It is unlikely that these species have breeding habitat in the Project Area.

Northern harrier

Northern harriers are considered vulnerable in Colorado where they occur in lower elevation grasslands, agricultural lands, and marshes, but may range up to the tundra in the fall. The most common breeding habitats are emergent wetlands, croplands, and tall desert shrublands; their current distribution in Colorado favors the shortgrass prairie and lower elevations of the western slope (Kingery 1998). In Grand County, Jasper (1983) reported northern harriers as fairly common to uncommon in the spring through fall in coniferous forests, wetlands, grassland, and tundra habitats, with no breeding records. BBS data (Kingery 1998) indicate northern harrier occurrences as possible to probable, with breeding in far northwestern Grand County.

Generally found from 5,000-9,000 feet in Colorado, with additional fall use in high elevations (Kingery 1998), northern harriers are strongly associated with natural wetlands, moist grasslands, and other irrigated agricultural habitat, and tundra in the fall (NatureServe 2010p). In Colorado, breeding chronology is affected by elevation, with courtship from mid-April to late June, eggs laid from April through June, and chicks fledged from May-August (Kingery 1998). Nests are built on the ground in areas of dense vegetation and are composed of grasses, forbs, and twigs. The female incubates and feeds the young and rarely leaves the nest. Males deliver small mammal and bird prey items captured in open grassland, shrubland, and agricultural habitats (NatureServe 2010p). In Colorado, the greatest threat to northern harriers is the continued loss of wetland habitat from urban, residential, industrial, and agricultural development (Kingery 1998).

Suitable nesting and foraging habitat in the Project Area is associated with the wetland and riparian communities found throughout the alternative alignments. Suitable foraging and nesting habitats are present on the west side of Table Mountain where Alternatives C1 and C2 are located. The wetland and riparian communities associated with Willow and Stillwater creeks also provide foraging and potential nesting habitat for this species. All project alternatives would cross portions of these creeks and associated wetlands communities.

River otter

River otters inhabit riparian habitats that traverse a variety of other ecosystems ranging from semidesert shrublands to montane and subalpine forests. The species requires permanent water of relatively high quality and with an abundant food base of fish or crustaceans (NDIS 2010). Their diet includes aquatic animals including crayfish, frogs, fish, young muskrats and beavers (CDOW 2010).

Because of their high mobility and low densities, river otters require relatively long reaches of streams and rivers. They will occupy lakes and reservoirs, as long as shoreline cover and food resources are adequate (Forest Service 2006a), and river otter presence has been reported in several large lakes and reservoirs in Colorado (Forest Service 2006a). The physical habitat attribute most important to river otters besides water is riparian vegetation, which provides security cover when they are feeding, denning, or moving on land (Forest Service 2006a). The importance of cover along waterways for river otter habitat is clear. If riparian vegetation is lacking, rock piles or similar physical structures may provide such cover. River otters generally avoid areas where cover is lacking, such as reservoir shorelines with little vegetation or structural cover, even if food is abundant (Forest Service 2006a).

Most of the surface waters in the project area lack the riparian vegetation that this species prefers. However, according to the Forest Service, North American river otters likely inhabit Granby Reservoir (Forest Service 2006a). All project alternatives parallel the reservoir. Alternatives A and B1 parallel the reservoir for greater distances.

Olive-sided flycatcher

The olive-sided flycatcher is considered vulnerable in Colorado (NatureServe 2010r). The causes for the flycatcher's decline are not well understood, but may be due to changes in their breeding range and migration and wintering areas. In Grand County, olive-sided flycatchers are considered fairly common summer visitors, using aspen and coniferous forests, meadows and riparian areas. Breeding records exist within coniferous forest (Jasper 1983).

BBS records document possible to probable olive-sided flycatcher breeding in the Project Area vicinity (Kingery 1998). Olive-sided flycatchers are documented from nearly all Sulphur Ranger District point count transects, and are commonly recorded in other coniferous habitats district-wide (Forest Service n.d.). Surveys conducted by the Forest Service on Table Mountain recorded one occurrence in 2004 and four occurrences in 2005. One individual was observed within the potential ROW of Alternative D in 2008. The flycatcher was observed perched on a serviceberry shrub in a mixed sagebrush/serviceberry community.

The presence of large snags for perching and foraging appears to be the most important habitat component for olive-sided flycatchers. Snag abundance in the Project Area and adjacent landscape is extremely high as a result of a mountain pine beetle infestation. Pending any future plans for salvage of dead and dying trees, abundance, and distribution of snag trees are dramatically increasing within the Forest and portions of the Project Area. Suitable habitat is present throughout the Project Area in associated habitats within all project alternatives.

Pygmy shrew

The pygmy shrew is relatively specialized within its range, occupying high-elevation, mesic coniferous forest with possible preference for late-seral stands and possibly the edges between wet, lowland forest and dry, upland forest (Forest Service 2006). The species has been found in subalpine forests, clear-cut and selectively logged forests, forest-meadow edges, boggy meadows, willow thickets, aspen-fir forests, and subalpine parklands. Pygmy shrews build runways under stumps, fallen logs, and litter (NatureServe 2010t, Fitzgerald et. al. 1994). Pygmy shrews have short lives (12 months) and reproduce only once in their lives at about 10 months. It is possible that this species occupies suitable habitat throughout the mountains of northern and central Colorado; however, populations may be discontinuous relicts from glacial times (Fitzgerald et al. 1994).

In Colorado, pygmy shrews appear to occur in higher elevations (9,600 feet and above), which are above the project area elevation. However, the project area does contain other suitable pygmy shrew habitat characteristics including moist forest habitats (mixed conifer and aspen), forest-moist meadow edges, and wet meadow habitats. Pygmy shrews have not been documented on the Sulphur District, but survey records are scarce. There are no records of the pygmy shrew within the project area; however, formal surveys have not been conducted.

Given the wide range of habitats used by pygmy shrews (wetlands, moist lodgepole pine, spruce-fir, and aspen habitats), it is possible, but unlikely, that the pygmy shrew could occur in the Project Area. Suitable habitat is present within all of the alternative ROWs. However, the

Project Area is below the elevation where pygmy shrews have been historically found in Colorado (9,600 feet), and the spread of mountain pine beetle in the Project Area has likely reduced habitat suitability for this species.

There are no records of the pygmy shrew within the Project Area; however, formal surveys have not been conducted.

North American wolverine

Considered critically imperiled in Colorado (NatureServe 2010t), the North American wolverine (wolverine) occurs over a large range in northern Canada and Alaska, where populations are in good condition. Wolverines have been extirpated from most of its historic range in the contiguous 48 states. Recently there are signs of semi-recovery in selected western states.

Wolverines are solitary, wide-ranging, and exist in low densities in large roadless or isolated areas. Wolverines have historically had one of the lowest densities of any carnivore (Fitzgerald et al. 1994). Suitable habitat includes alpine and arctic tundra and boreal and mountain forests (primarily coniferous). Wolverines use habitats with snow on the ground in the winter. Riparian areas may also be important winter habitat. In Colorado, historical and current reports show nearly all wolverines are from higher elevations, in areas with heavy timber. However, they may also hunt in open areas (CDOW 2009).

When inactive, wolverines occupy dens in caves, rock crevices, under fallen trees, or in thickets. Young are born in March or April in natal dens among rocks or tree roots, in hollow logs, under fallen trees, or in dense vegetation, including sites under snow. Reproductive success is low, due in part to loss of kits, lack of mating opportunities, and age at first litter. Wolverines are omnivores, feeding on small mammals, birds, fish, carrion, and plant material. In winter, the diet is mostly mammalian prey and carrion, with more diversity at other times of the year (Fitzgerald et al. 1994, Ruggiero et al. 1994). Wolverines are nocturnal and remain active year-round.

It is unlikely that wolverine home range occurs within or adjacent to any of the project alternatives, given the wolverine's intolerance for human activity, lower density forested stands, and the lack of contiguous forested areas within all of the project alternatives.

Boreal toad

Although once considered fairly common in most mountainous areas of the Southern Rocky Mountains, it is much less common today and absent from many historically occupied locations. Boreal toads occur in a handful of locations on the ARNF and also on surrounding National Forests, including Routt, Pike-San Isabel, Grand Mesa, Uncompahgre and Gunnison, Rio Grande, and White River (Loeffler 2001).Boreal toads historically occurred in many locations on the Sulphur Ranger District. CDOW and CNHP surveys throughout the 1990s and ongoing have been unable to detect historic occurrences in many areas of the District, including Berthoud Pass, Rollins Pass, Shadow Mountain Lake, Strawberry Bench, and the Never Summer Mountains (Loeffler 2001; Lambert et al. 2000). Neither historic nor current survey data indicate the presence of boreal toads within the Project Area. The closest known breeding occurrence of boreal toads to the Project Area is located at Pole Creek Golf Course above the Town of Fraser and in the Big Meadows areas of Rocky Mountain National Park (Sumerlin 2005, pers. comm.)

Southern Rocky Mountain boreal toads occupy forest habitats between 7,500 and 12,050 feet. Boreal toads require breeding ponds, summer range, and overwinter refugia, within or adjacent to

lodgepole pine or spruce-fir forests. Breeding habitat includes large lakes, glacial ponds, beaver ponds, man-made ponds, wetlands, and roadside ditches and puddles. Egg placement occurs in shallow, quiet water where thermal effects of the sun on egg masses can be optimized. Young toads are restricted to moist habitats while adult toads can move several miles through upland habitats. Hibernacula include rodent burrows, beaver dams, and lodges. Summer range includes upland forests and rocky areas with spring seeps (Loeffler 2001).

Western contracted the CNHP to conduct an inventory focused on the boreal toad within and adjacent to the proposed Granby – Windy Gap Transmission Line Rebuild project area during the summer breeding season of 2007. The objectives of the inventory were to quantify the amount and quality of habitat, find suitable breeding sites, and evaluate historic or current activity of boreal toads and other amphibians along the alternative ROWs. Survey results indicated that there is currently no known occupied habitat for the State Endangered boreal toad in the project area. Refer to the Biological Report for this project (AECOM 2011) for a more detailed discussion of this species.

Northern leopard frog

Considered vulnerable in Colorado (NatureServe 2010q), northern leopard frog range includes the southern provinces of Canada, south through the United States to Texas (Hammerson 1999). Although still widespread and common in many areas, many populations have drastically declined, especially in the Rocky Mountains of Colorado, Wyoming, and Montana. This species remains abundant in some parts of Forest Service Region 2, such as the Black Hills (Smith and Keinath 2007). Leopard frog records from Colorado occur from 3,500-11,000 feet, but exclude southeastern Colorado (Hammerson 1999).

Northern leopard frogs can be found in springs, slow-moving streams, marshes, bogs, ponds, canals, floodplains, reservoirs, and other lakes with rooted aquatic vegetation. They can also be found in wet meadow habitats in the summer. Leopard frogs disperse from breeding sites using creeks and riparian areas. They overwinter underwater. Shallow, still, permanent water with good exposure to sunlight is needed for egg deposition and development. Metamorphosed frogs eat a variety of small invertebrates. Tadpoles eat algae, plant tissue, organic debris, and some small invertebrates. Threats to leopard frogs include habitat loss, overharvest, disease, water quality degradation, and competition with and predation by introduced bullfrogs and nonnative predaceous fish. Like many amphibians, leopard frog declines appear related to environmental changes that alter the frog's susceptibility to disease (e.g., red leg disease, ranavirus, and chytrodiomycosis) (NatureServe 2010q; Hammerson 1999).

According to Smith and Keinath (2007), northern leopard frogs in Colorado are now scarce: 9 high elevation population extirpations, and extirpations or severe population reductions at most low elevation sites were documented. There are currently no known populations of leopard frogs on the ARNF. The potential ROWs of project alternatives contain areas of suitable leopard frog habitat associated with wetlands and surface waters. Only one amphibian was observed during field surveys conducted in 2005, 2008, and 2009, and this was a chorus frog. Historic records of leopard frog occurrence in Grand County are scarce and do not include any occurrences within the Project Area, although Hammerson (1999) includes an historic site within the Fraser Valley. There have been no prior records of northern leopard frogs in the Willow Creek or Stillwater Creek drainage basins (CDOW 2007, CNHP 2007).

Wood frog

In Colorado, this species occurs in the mountains surrounding North Park, along the upper tributaries of the Colorado River in Grand County, and in the upper Laramie River drainage of Larimer County (Hammerson 1999). The elevation range in Colorado for this species is approximately 7,900-9,800 feet. Wood frog populations typically undergo large fluctuations over periods of several years and, as a result, decades of monitoring are necessary to assess populations.

Wood frogs inhabit subalpine marshes, bogs, pothole ponds, beaver ponds, lakes, stream borders, wet meadows, willow thickets, and forest bordering these mesic habitats. During the summer, wood frogs can often be seen along the edges of wetlands and marshy ponds (Hammerson 1999). In winter months, wood frogs hibernate in holes or under logs or rocks in forested areas. Wood frogs emerge from hibernation in May. Breeding habitats include small, shallow, natural ponds, which lack a permanent inlet and outlet; inactive beaver ponds; and sometimes in human created ponds. Most breeding sites are ephemeral pools, which dry out in the summer. The primary vegetation types associated with breeding sites are lodgepole pine and aspen (Hammerson 1999).

Activities that have reduced population numbers and lead to extirpations in Grand County include; dredging of breeding ponds, clearing of shoreline vegetation, expansion of residential areas, and highway construction (Hammerson 1999). There are no recent occurrences of the wood frog within the Project Area. The Colorado River, to the south of the Project Area, historically provided habitat for wood frogs.

There have been no prior records of wood frogs in the Willow Creek or Stillwater Creek drainage basins (CDOW 2007, CNHP 2007). Wetlands and riparian communities associated with Willow Creek, Stillwater Creek, and other surface waters within the Project Area, and along potential alternative ROWs, do provide habitat characteristics suitable for the wood frog. No wood frogs were observed, however, during boreal toad and general amphibian surveys conducted in 2007 within the Project Area by CNHP.

3.16.4.2 Management Indicator Species

The MIS analyzed for the project include boreal toad, elk, mule deer, golden-crowned kinglet, hairy woodpecker, mountain bluebird, pygmy nuthatch, warbling vireo, and Wilson's warbler. The boreal toad analysis is presented above in the FSS section. MIS are analyzed in greater detail in the project's Biological Report (AECOM 2011).

The MIC located in the project includes:

- Young to mature forest structural stages (elk, mule deer, and hairy woodpeckers)
- Openings within/adjacent to forests (elk, mule deer, and the mountain bluebird)
- Interior forest (golden-crowned kinglet)
- Old growth (Pygmy nuthatch)
- Aspen forests (Warbling vireos)
- Montane riparian and wetlands (Wilson's warblers)

The MIC communities that may occur within the potential ROW of Alternatives A, B1, C1, C2, and D are the young to mature forest structural stages, openings within/adjacent to forests, aspen forests, and montane riparian and wetlands.

Habitat for elk and mule deer are found throughout the Project Area and along all alternatives. Alternatives C1 and C2 would cross a larger extent of severe winter range and winter range on the western end of the Project Area, and along the segments that cross the west side of Table Mountain.

Interior forest habitat for the ruby-crowned kinglet is limited in the Project Area because of the mountain pine beetle epidemic. This species was not observed in the Project Area, but may occur in the forested sections of the alternative ROWs.

Aspen stands are primarily associated with Alternatives B1 and D. The segment of these ROWs that occurs on the boundary of the ANRA, on the east side of Table Mountain, may provide suitable habitat for warbling vireos. Forest Service has conducted avian surveys on Table Mountain since 2002. In 2004, the Forest Service recorded 12 warbling vireos on the east side of Table Mountain.

Wilson's warbler may be found within the wetland and riparian communities along each of the project alternatives, particularly along Willow and Stillwater creeks.

Old-growth habitat, which pygmy nuthatch prefer, is limited in the Project Area. The mountain pine beetle epidemic has substantially altered forest structure and composition on the ANRA and ARNF. Pygmy nuthatch may be found in the mixed-conifer and aspen stands in the Project Area.

Hairy woodpeckers are associated with young to mature forest structural stages. Forest Service surveys from 2004 recorded one hairy woodpecker occurrence west of Alternatives C1 and C2, north of the water treatment plant. Surveys conducted by AECOM in 2008 recorded one hairy woodpecker in proximity to the ROW of Alternative A in a lodgepole pine stand that had been hit by mountain pine beetle. The mountain pine beetle epidemic is expected to increase hairy woodpecker habitat and abundance on the ANRA.

The last recorded Forest Service documented occurrence of pygmy nuthatch on Table Mountain is from 2002. Old-growth habitat does not occur in the Project Area because of the mountain pine beetle epidemic and residential developments. Pygmy nuthatch that may occur in the Project Area would likely occur in the mixed conifer, lodgepole pine, and aspen communities. The aspen communities would be associated with Alternatives B1 and D.

Mountain bluebirds were observed in the Project Area during surveys (conducted by AECOM in 2008 and 2009) on the edges of lodgepole pine forests along Alternatives A, B1, C1, C2, and D. The mountain pine beetle epidemic has created forest openings and increased snag densities throughout the Project Area and in each of the alternative ROWs.

Elk, Cervus elaphus

Elk is an MIS for young to mature forest structural stages and openings within and adjacent to forests (Forest Service 1997b).

Elk are found throughout the ARNF, finding both forage and cover in and near forested ecosystems. They are often associated with semi-open forests and forest edges adjacent to parks, meadows, and alpine tundra. Elk are both grazers and browsers; and in the northern and central Rocky Mountains, grasses and shrubs compose most of the winter diet. Forbs become increasingly important in late spring and summer, and grasses dominate again in the fall. Elk tend to inhabit higher elevations during the spring and summer and migrate to lower elevations for winter (Forest Service 1997b).

Threats to elk include loss of winter and summer range habitat quality and quantity and severed migration corridors. Invasive plants, such as cheatgrass, are threats to habitat quality. Hunting and collisions with vehicles would reduce numbers locally. Disturbance on summer ranges, especially calving and young-rearing areas, may lead to indirect effects on populations. Chronic wasting disease (CWD) is a new threat to Colorado elk populations, and the first CWD positive elk was detected in Grand County in September 2002 (CDOW, pers. comm.).

The Project Area is located within elk severe winter range, winter range, and winter concentration areas; elk migration corridors adjacent to the Project Area; and also includes elk summer range and production areas (CDOW 2003).

Mule deer, Odocoileius hemionus

Mule deer is an MIS for young to mature forest structural stages, openings within and adjacent to forest, and prairie woodlands (Forest Service 1997b).

Mule deer occupy all ecosystems in Colorado, from grassland to alpine tundra. Spring and summer ranges are most typically mosaics of meadows, aspen woodlands, alpine tundra subalpine forest edges, or montane forest edges. In the Rocky Mountains, winter diets for mule deer consist mainly of browse from a variety of trees and shrubs with some forbs. In the spring, browse contributes half of the diet, and forbs and grasses make up the remainder. During the summer months, grass consumption declines in favor of forbs. Browse consumption increases and forb use declines throughout the fall and into winter. Over much of Colorado, the species is migratory, summering at higher elevations and moving down slope to winter range (Forest Service 1997b).

Threats to deer include loss of winter range habitat quality and quantity and blocked migration corridors. Invasive plants, such as cheatgrass, are threats to habitat quality. Hunting and collisions with vehicles would reduce numbers locally. Disturbance on summer ranges, especially calving and young-rearing areas, may lead to adverse effects on populations. Chronic wasting disease is a new threat to Colorado deer populations; CWD has been recently been confirmed in Grand County (CDOW, pers. comm.). In the project area between 2006-2008, chronic wasting disease was detected in approximately 1 to 5 percent of mule deer.

The Project Area falls within mule deer winter, crucial winter range, and summer ranges, and a north–south mule deer migration corridor runs from Willow Creek Reservoir, west of Table Mountain and south to the Colorado River.

Golden-crowned kinglet, Regulus satrapa

Golden-crowned kinglet is an MIS for interior forests (Forest Service 1997b).

Golden-crowned kinglets utilize Douglas fir, spruce fir, lodgepole, and aspen habitats for feeding and nesting. They breed primarily in dense coniferous forests, especially where spruce is present, and winter in coniferous forests (occasionally in deciduous woodland scrub and brush). This kinglet eats insects and their eggs, and fruit and seeds. Golden-crowned kinglets forage in tall dense conifers, concentrating at medium heights. Food is gleaned from foliage, small twigs, limbs and bark of trees and shrubs, or they may also hover to clean food from vegetation. Golden-crowned kinglets are fairly uncommon summer residents on the ARNF. This interior forest species tolerates little change on nesting grounds (Kingery 1998; Forest Service 1997b).

Severe winter storms can significantly contribute to local mortality rates. Habitat modification due to lumber activities, spruce die-off, burned areas, open canopy, and pure stands of lodgepole pine or hardwoods may reduce local populations. Brown-headed cowbird parasitism is uncommon but has been known to occur (NatureServe 2010i). Threats to passerines also include suburban and rural sprawl, which fragments habitat and increases predation by domestic cats, raccoons, and other species that thrive along with human settlement.

Forest-wide, there exists about 193,700 acres of interior forest habitat, or 15 percent of the total NFS land (Forest Service 1997b). However, as a result of a mountain pine beetle epidemic in lodgepole pine habitats, this large block of interior forest habitat has been reduced by about half to now only include the spruce and fir portion of the block. The dead mature lodgepole pine component no longer has a closed canopy to provide the attributes needed to provide for interior forest conditions.

Hairy woodpecker, Picoides villosus

Hairy woodpecker is an MIS for the snag component of young to mature forest structural stages (Forest Service 1997b).

Hairy woodpeckers are found in wooded areas throughout North America, from the northern tree line to Panama. Mountain forests, mixed woodlands, and river groves are all suitable habitat for hairy woodpeckers. Six to 9 acres per pair is required for successful breeding. It excavates cavities in snags or in live trees with decaying heartwood, and consumes a diet that is about 80 percent animal food (wood boring beetles removed from dead and diseased trees are an important source of food). Hairy woodpeckers also eat other insects, fruits, corn, nuts, and cambium (Forest Service 1997b).

Local threats to the species may include loss of cavity trees/snags from forest thinning, and competition for nesting cavities by house sparrows or starlings (NatureServe 2010k). Threats to the woodpecker also include suburban and rural sprawl, which fragments habitat and increases predation by domestic cats, raccoons, and other species that thrive along with human settlement.

Forest-wide amounts of snags are generally high, and the Project Area is no exception. The current mountain pine beetle epidemic has resulted in significant increases in snag density in the Project Area. Therefore, the existing condition of snags is not a concern or issue for woodpeckers or other snag-dependent wildlife in the Project Area. Young to mature forests make up about 86 percent (815,000 acres) of all forest vegetation on ARNF (Forest Service 1997b). Since tree mortality, including mountain pine beetle-induced mortality, occurs in most tree sizes, the area provides a continuous source of existing and future snags for woodpeckers.

There has been one recorded occurrence of the hairy woodpecker just west of the Alternatives C1 and C2 in 2002. A hairy woodpecker was observed in 2008 in a pine beetle infested lodgepole pine stand to the south of Granby Substation.

Mountain bluebird, Sialia currucoides

Mountain bluebird is an MIS for openings within and adjacent to forests (Forest Service 1997b).

Mountain bluebirds are common from Alaska and British Columbia, south throughout the west to southern California and Oklahoma. Mountain bluebirds nest in nearly all forest types of the Rocky Mountain region, usually from 7,000-11,000 feet in open forests or near forest edges. During migration and in winter, mountain bluebirds also frequent grasslands, open brushy country, and agricultural lands. Mountain bluebirds usually nest in old woodpecker holes, natural cavities, or nest boxes in open areas near forest edges. Bluebirds hunt from high perches or fly to the ground to catch prey. Nearly 92 percent of the bluebird's diet is animal material; the small amount of herbivorous food includes fruits, hackberry seeds, and cedar berries (Forest Service 1997b).

Local threats to the species may include loss of cavity trees and snags from forest thinning and competition for nesting cavities by house sparrows or starlings. Threats to songbirds also include suburban and rural sprawl, which fragments habitat and increases predation by domestic cats, raccoons, and other species that thrive along with human settlement.

Pygmy nuthatch, Sitta pygmaea

Pygmy nuthatch is an MIS for existing and potential old-growth forests (Forest Service 1997b).

The pygmy nuthatch typifies Colorado's ponderosa pine forests. They rely on healthy, mature ponderosa pine trees and occur less frequently in logged tracts. Because they excavate their own cavities, they need large trees with old or decayed wood (Kingery 1998), hence their association with old growth and near old-growth habitats. Pygmy nuthatches tend to forage in the crowns of ponderosa pine, and their diet consists of insects, spiders, and conifer seeds (Kingery 1998).

Although pygmy nuthatches are most often associated with mature ponderosa pine habitats, they also inhabit late-successional lodgepole pine and aspen habitats, where cavities are available for nesting. Home range size is approximately 3 acres per breeding pair. They altitudinally migrate during the winter months and are gregarious outside of the breeding season. Food is mainly insects that are gleaned from bark, but they also eat conifer seeds. During poor pine cone years, pygmy nuthatches may switch from pine to spruce and fir seeds (Forest Service 1997b).

Local threats to the species may include loss of cavity trees and snags from forest thinning in the ponderosa woodland, and competition for nesting cavities by house sparrows or starlings. Threats to passerines also include suburban and rural sprawl, which fragments habitat and increases predation by domestic cats, raccoons, and other species that thrive along with human settlement.

Although closely associated with ponderosa pine habitats, pygmy nuthatches are an indicator for old-growth habitats on the Planning Area. On the Sulphur Ranger District, lodgepole pine and spruce-fir cover types used to represent this MIC; however, with beetle kill in lodgepole pine, old

spruce-fir, old growth now represents old-growth habitat conditions. There are no old-growth forests present within any of the project alternatives.

Warbling vireo, Vireo gilvus

The Warbling vireo is an MIS for aspen communities (Forest Service 1997b).

Warbling vireos forage and breed almost exclusively in deciduous habitats. Warbling vireos in Colorado occupy two main habitat types: riparian stream bottoms and aspen forests. Breeding habitat in Colorado is primarily aspen woodlands. Warbling vireos build their nests in aspens or shrubs within 12 feet of the ground. Warbling vireos glean most of their food from the mid to upper canopy of deciduous trees, and their diet consists of caterpillars, beetles, grasshoppers, and ants (Forest Service 1997b). In Colorado, warbling vireos are common on the plains in migration and in the mountains in summer.

Brown-headed cowbird parasitism of nests can be up to 80 percent, creating sink populations in some places (NatureServe 2010v). Threats to passerines also include suburban and rural sprawl, which fragments habitat and increases predation by domestic cats, raccoons, and other species that thrive along with human settlement.

Considered secure in Colorado (NatureServe 2010v), the warbling vireo is a fairly common summer resident in the foothills and lower mountains. In the western valleys and eastern plains, it is considered uncommon to fairly common. As a spring and fall migrant, it is thought to be uncommon in the western valleys, foothills, and eastern plains (Andrews and Righter 1992). Confirmed nesting occurs throughout much of Grand County and in other counties in the Planning Area.

Transect counts in and near ARNF since 1998 indicate that population trends are variable, increasing in 2000 through 2001 and then decreasing through 2004, with highest bird densities in aspen, high elevation riparian, and ponderosa pine habitats.

Surveys conducted in July 2005 by the Forest Service (McCormick 2006) show occurrences of warbling vireos on Table Mountain, east of Alternatives C1 and C2, and located within or adjacent to Alternatives A, B1, and D. Isolated patches of aspen exist along portions of U.S. Highway 34, adjacent to Alternatives A, B1, and D.

Wilson's warbler, Wilsonia pusilla

Wilson's warbler is an MIS for montane riparian and wetlands (Forest Service 1997b).

Wilson's warbler breeds from northern Alaska, northern Yukon, northern Ontario, southeastern Labrador, and Newfoundland; south to southern California, central Nevada, northern Utah, northern New Mexico, central Ontario, northern New England, and Nova Scotia. Wilson's warblers winter from southern California and southern Texas to Panama. They prefer wet clearings in early stages of regeneration. Wilson's warblers also inhabit peat or laurel bogs with scattered young or dwarf spruces, tamaracks, and riparian willow and alder thickets. Wilson's warblers usually build nests at the base of small trees or shrubs, often well concealed in a grass hummock. They eat insects gleaned from the ground and twigs or caught by flycatching, and spiders and fruit pulp (Forest Service 1997b).

Habitat change, particularly destruction of riparian habitats, is thought to play a part in regional decreases in the west. Brown-headed cowbird parasitism of nests may also be a threat, but more study is needed (NatureServe 2011i). Threats to passerines also include suburban and rural sprawl, which fragments habitat and increases predation by domestic cats, raccoons, and other species that thrive along with human settlement.

Stillwater and Willow creeks support riparian vegetation, which may provide suitable habitat for the warbler within the various alternative ROWs.

Brook trout, Salvelinus fontinalis

Brook trout is an MIS for montane aquatic environments (Forest Service 1997b).

High elevation rivers and streams in Colorado provide clear, cool, well-oxygenated habitat. Water temperature is a key requirement; preferred temperatures are 14-16°C and spawning usually takes place over gravel in shallow water less than 15°C. Water exceeding 20°C for extended periods is usually avoided (NatureServe 2011b).

Habitat change, including warmer water temperatures and increased sedimentation, are greatest threats to this species. In Colorado, river and creek structures or high waterfalls limit the upstream dispersal of brook trout. In these headwater streams, native trout species have a better chance at success.

This species is an exotic in Colorado (it is native to the eastern United States). The brook trout was introduced in the late 1800s. This prolific feeder would often out-compete native trout species (CDOW 2009). Suitable habitat exists for this species in Stillwater and Willow creeks.

Brown trout, Salmo trutta

Brown trout is an MIS for montane aquatic environments (Forest Service 1997b).

Medium to high gradient streams in Colorado with cold temperatures but tends to occupy deeper, lower velocity, and warmer waters than other species of trout. Spawning usually takes place in shallow gravelly headwaters, rocky lake margins, or sand/hard clay within a variety of waters ranging from large streams to small spring-fed tributaries. Habitat for juveniles includes quiet waters along shorelines or in areas sheltered from the main flow (NatureServe 2011c).

Habitat change, including warmer water temperatures and increased sedimentation, are likely the biggest threats. Overfishing is also a threat to this species.

An exotic species in Colorado (native to Europe and western Asia), the brown trout was introduced in the 1890s. A popular game fish occupying different habitat, the brown trout is less of a threat to the native cutthroats. Suitable habitat exists for this species in Stillwater and Willow creeks and Lake Granby.

Boreal toad, Anaxyrus boreas boreas

Refer to the boreal toad description and impact analysis under the FSS Species discussion.

3.16.4.3 Other Species of Project Concern

Golden Eagle

The golden eagle is found in North America: mainly western and northern Alaska; east through the Northwest Territories to Labrador; south to northern Mexico, Texas, western Oklahoma, and western Kansas; and east to New York and New England (rare). The eagle is also known to breed in the Palearctic. This species winters in south-central Alaska, southern Canada south through breeding range, casually southward. In the United States, golden eagles are most numerous in winter in the Rocky Mountain states, Great Basin, and western edge of the Great Plains (Root 1988). Northernmost populations in Eurasia winter south to northern Africa (Sibley and Monroe 1990). Golden eagles are protected under the MBTA of 1918, as amended, and the BGEPA of 1940.

In Colorado, the golden eagle is a winter resident in western valleys, foothills, lower mountains, mountain parks, and eastern plains. The greatest winter concentrations occur in northwestern Colorado. The golden eagle is an uncommon summer resident in western valleys, foothills, mountains, mountain parks, and eastern plains (NDIS 2006).

Golden eagles occur in grasslands, shrublands, pinyon-juniper woodlands, and ponderosa pine forests. They may occur in other habitats during the winter and migration. Golden eagles nest on cliffs and sometimes in trees in rugged terrain. Breeding birds range widely over surrounding habitats. Hunting territory can extend up to 160 square miles. Golden eagles begin breeding by 4 years of age and can live up to 20 years. Unlike bald eagles, golden eagles do not congregate in the winter. Besides small mammals, golden eagles would prey upon birds, reptiles, amphibians, and insects. Studies have shown a positive correlation between breeding success and jackrabbit numbers in Idaho, Colorado, and Utah (NatureServe 2010j).

There are two golden eagle nests located on the west and north side of Table Mountain, less than 0.50 mile above the ROW of all alternatives. In 2009, two chicks were produced at one of the nest sites. A juvenile golden eagle was observed perching on the ROW for Alternative C on the west side of Table Mountain during habitat assessment surveys conducted in July of 2005 and again in 2007.

Osprey

Osprey occur near surface waters including lakes, rivers, reservoirs, and seacoasts. They can often be found traveling between habitats providing surface water. They nest in large stick nests and man-made structures above or near water.

According to Sulphur District 2010 records, eight Osprey nests are located in proximity to the project. There are three osprey nests located to the east of Alternative A and the project area, on the east side of Rainbow Bay. Two nests have been identified near Willow Creek Reservoir to the west of all project alternatives, and another two nests are located to the south of Granby Tap Substation. Of the eight nests in the project area, four osprey nests are located in proximity (within 0.5 mile) to Alternatives A and B1. These nests are located approximately 26, 177, 324, and 2,000 feet away from these two alternatives. Two osprey nests are located in proximity to Alternatives C1 and C2. These nests are located 1,817 and 2,030 feet from the alternatives. Alternative D is similar to Alternatives A and B1, located in proximity to the same four nests, with a slight increase in nest distance. The Osprey nests are located approximately 26, 387, 482, and 2,200 feet away from Alternative D. Osprey have also been observed over Windy Gap and the

Fraser river inlet area. The other 4 nests in the project area are greater than 0.5 mile from any alternative.

American White Pelican

American White Pelican occurs throughout western and central North America. Several dozen colonies supporting more than 60,000 nesting pairs occur over a large nesting and winter range in Canada, United States, and Mexico (NatureServe 2010c). King and Anderson (2005) determined that at least 27 American White Pelican colonies and 48,240 nests occur east of the Continental Divide and at least 15 colonies and 18, 790 nests exist west of the Divide, for a total of about 134,000 breeding pelicans in North America.

Nesting colonies occurs have also been documented in south-central British Columbia, Alberta, Saskatchewan, Manitoba, southwestern Ontario, northern California, Nevada, Utah, Colorado, South Dakota, and Minnesota (Knopf and Evans 2004). Wintering range of the American White Pelican includes Florida, Gulf of Mexico coast south to northern Yucatan Peninsula, and central California south to southern Baja California and through western mainland Mexico to Nicaragua (AOU 1983, Knopf and Evans 2004). The area of southern Texas has been documented to have the largest wintering population of American White Pelicans (Root 1988); other important wintering areas include the Gulf coast and Everglades region of Florida (NatureServe 2010c).

Habitats of the American White Pelican include rivers, lakes, reservoirs, estuaries, bays, and open marshes, and inshore marine habitats. Pelicans are often observed roosting on islands and peninsulas. Nests usually are on islands or peninsulas (natural or dredge spoils) in brackish or freshwater lakes, or on ephemeral islands in shallower wetlands as in the northern Great Plains or on the Texas coast (Knopf and Evans 2004).

American White Pelicans are abundant summer resident on eastern plains and rare in western valleys and mountain parks. Many reservoirs have large populations of non-breeders, especially on eastern plains. The species is also an abundant spring and fall migrant on the eastern plains. They are rare in western valleys and mountain parks and rare in mountains outside parks, mostly only noted flying overhead. There are several observations of individuals spending the winter at eastern plains reservoirs (NDIS 2010).