# Chapter 4.0
# Cumulative Impacts

## 4.1 Introduction

A cumulative impact, as defined in 40 CFR 1508.7, is "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" by federal, state, or local agencies or by individuals. To make informed decisions, agencies should consider cumulative impacts resulting from actions that have already occurred, projects under construction, actions that are proposed, and actions that are anticipated to be implemented in the reasonably foreseeable future. Reasonably foreseeable future actions consist of activities that are generally in the planning stage and can be evaluated with respect to their impacts.

The discussion of cumulative impacts assumes that the mitigation and conservation measures, EACPs, and BMPs discussed in Chapters 2.0 and 3.0 would be applied to the CCSM Phase I Project alternatives, and that each of the alternatives would comply with all applicable federal, state, and local regulations and permit requirements. Because the primary purpose of this EIS is to analyze the effects on eagles of issuing ETPs for construction and operation of the CCSM Phase I Project, we have focused our analysis of cumulative impacts on eagles and those resources that directly impact eagles (that is, habitat and prey). However, we have also assessed the cumulative impacts on other resources evaluated in detail in Chapter 3.0.

The BLM analyzed cumulative impacts of the CCSM Project in the BLM FEIS, EA1, and EA2, and we are incorporating that information by reference. However, new information or new analysis provided herein supplements the BLM's analyses.

## 4.2 Approach

The study area for each resource evaluated in Chapter 3.0 and considered for cumulative impacts in this chapter is dependent on the potential for impact, with some resources having larger study areas than other resources. For example, the physical boundaries of the study area for wetlands and vegetation consists of the Phase I development and infrastructure areas, but the study area for cultural resources comprises the four BCRs containing eagle populations that could potentially be affected by the CCSM Phase I Project. Additionally, because of the cultural importance of eagles to Native American tribes, an even broader study area exists to account for tribal interests outside of the four BCRs. See Section 3.9.2.1 for further information on tribal interest in this area and project.

Our approach to evaluating cumulative impacts on eagles considers the effects of programmatic take on eagle populations at three scales: (1) eagle management unit (EMU); (2) local area population (LAP), and (3) project area. This approach is consistent with our ECP guidance (USFWS 2013b). These three scales are defined as follows:

- EMU: For the CCSM Phase I Project, the EMUs for bald eagles are the Northern Rocky Mountains EMU and the Rocky Mountains and Plains EMU (USFWS 2013b); Figure 2-1 shows the bald eagle EMUs. The EMUs for golden eagles are the four BCRs described in Section 2.1.2.1 and shown in Figure 4-1. These four BCRs are the Northern Rockies (BCR 10), Southern Rockies/Colorado Plateau (BCR 16), Badlands and Prairies (BCR 17), and Shortgrass Prairie (BCR 18).
- LAP: The LAP for bald eagles is a 43-mile radius around the CCSM Phase I Project, and the LAP for golden eagles is a 140-mile radius around the CCSM Phase I Project. The size of the LAP is based on the median distance to which eagles are thought to disperse from the nest where they are hatched to where they settle to breed.
- Project area: The project area is defined as the CCSM Phase I Project and the infrastructure boundaries, as shown in Figures 2-4 and 2-5.

The goal of this cumulative impacts analysis is to qualitatively assess cumulative eagle take within the EMUs by discussing broad landscape-level changes, to quantitatively assess take of bald and golden eagles within the LAP by discussing specific activities and projects, and to assess cumulative impacts on other resources evaluated in detail in Chapter 3.0. The larger the area of analysis, the more variables and uncertainty will exist. Consequently, a quantitative analysis would not be reasonable at the EMU scale. As noted in Chapter 3.0, we are focusing primarily on evaluating potential impacts on eagles, and secondarily on other key resources that directly and indirectly affect eagles.

Although the EMU, LAP, and project areas described above have been defined for the purposes of this analysis, an inherent challenge of assessing cumulative impacts of eagle take is the lack of specific data on where eagles nest and how they migrate. As part of ongoing USFWS field studies on golden eagles to better understand movements, migration pathways, habitat use, survival, and mortality causes, we have fitted about 100 golden eagles in the four BCRs with satellite telemetry units. Section 3.8.2.3.2 describes seasonal use of the Phase I development and infrastructure areas by golden eagles.

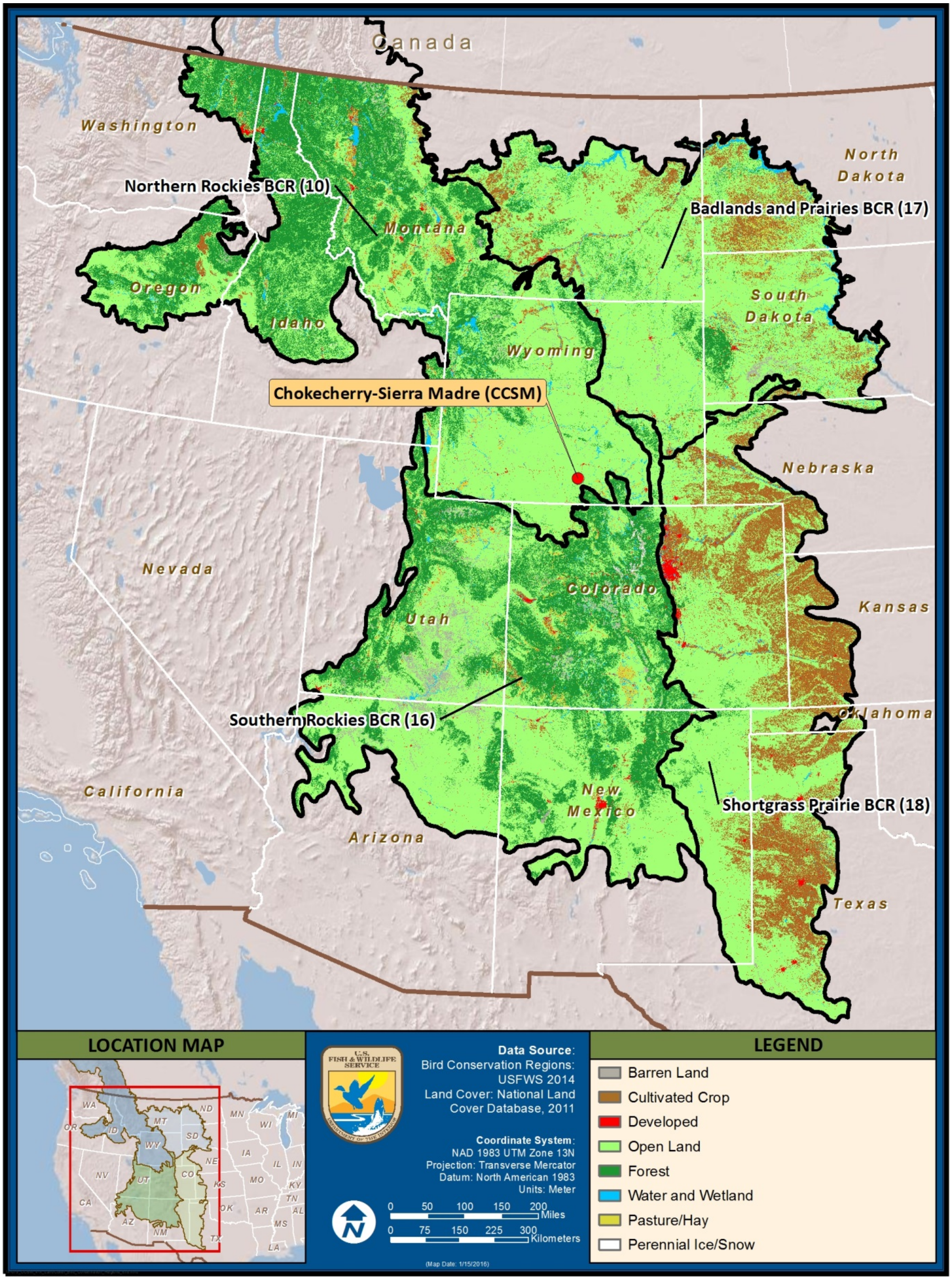


Figure 4-1. Land Cover Categories in the Four Bird Conservation Regions (BCRs) Contiguous to the CCSM Phase I Project in Wyoming

To assess cumulative impacts on eagles, we followed the methods outlined in our ECP guidance, Appendix F (USFWS 2013b), and we used our cumulative effects tool developed to complete an LAP analysis. We also used eagle mortality records available to us in a USFWS eagle mortality database and an additional set of eagle mortality records available from WGFD. It is important to note that our eagle mortality records are based on opportunistic or incidental reporting of eagle fatalities, and they were not obtained from regular or systematic survey efforts to detect eagle mortality using a statistically valid protocol or sampling methodology. Except for some of the wind energy industry mortality records, no searcher efficiency or carcass persistence trials are associated with any of these records, so we cannot apply a bias correction factor as we could for studies conducted using statistically valid sample designs. Also, some industries that impact eagles conduct self-reporting of eagle fatalities at a higher rate than other industries, and some types of eagle fatalities lend themselves better to discovery and reporting. Hence, there are types of bias associated with these records. Still, we elected to use the eagle mortality records in the USFWS database and WGFD database because this is the best scientific information available to us regarding eagle mortality within the LAPs for both bald and golden eagles.

We used eagle mortality records from our database for only the most recent 10 full years (2005 through 2014). We used this dataset because work on the EA for the new 2009 BGEPA regulations for non-purposeful take of eagles included estimates of eagle populations and mortality levels that are now about 8 years old. Also, the 2009 BGEPA regulations themselves were issued about 6 years ago, and there has likely been an increase in reporting of eagle fatalities to USFWS since these went into effect, which provides us with a more accurate estimate of eagle mortality compared to the preceding 20 or 30 years. Last, most wind energy facilities operating in Wyoming became functional within the last 10 years, and some of these facilities have voluntarily reported eagle fatalities to us.

## 4.3 Past, Present, and Reasonably Foreseeable Future Actions

This section begins with a description of the environments at the EMU scale at the four-BCR scale, and then discusses past, present, and reasonably foreseeable future actions within the individual BCRs. The section continues with a more detailed description of the environment within the LAP for eagles and of key activities that affect eagles within the LAP. Potential cumulative effects are more reasonably predictive at an LAP scale based on a smaller area, more available data, and fewer unknowns. However, a qualitative review of potential cumulative impacts within EMUs is needed to account for potential mitigation occurring outside the LAPs.

### 4.3.1 Eagle Management Unit Scale (Four-BCR Scale)

The North American Bird Conservation Initiative has established BCRs as ecologically distinct regions in North America with similar bird communities, habitats, and resource management issues (U.S. NABCI Committee 2015). To meet the North American Bird Conservation Initiative’s goal of conserving important migratory bird habitat, migratory bird joint ventures were formed throughout North America. Migratory bird joint ventures are collaborative, regional partnerships of agencies, non-profit organizations, corporations, tribes, and individuals. Although BCRs are located within designated Joint Venture units, these units do not play any direct role in management of eagle populations.

Land cover in the four BCRs is shown in Figure 4-1; land cover and respective land uses in each BCR based on information provided by the migratory bird joint ventures are discussed further below.

#### *4.3.1.1 Bird Conservation Region 10 (Northern Rockies)*

Approximately half of BCR 10 lies within the Northwestern Forested Mountains ecoregion, and the remainder lies within the North American Deserts ecoregion. The Northwestern Forested Mountains ecoregion "contains many of the highest mountains of North America" and includes bird habitats "ranging from alpine tundra to dense conifer forests to dry sagebrush and grasslands" (Intermountain West Joint Venture [IWJV] 2013). The North American Deserts ecoregion encompasses the southeastern half of the ecological setting within BCR 10, and is also within BCR 16. The ecoregion "is distinguished from the adjacent forested mountain ecoregions by its aridity and associated landscapes dominated by shrubs and grasses" (IWJV 2013). Although the mountainous portions of BCR 10 are dominated by a variety of coniferous forest habitats, the BCR includes the intermontane Wyoming basin, which is characterized by sagebrush shrubland and shrub-steppe habitat (Wiken et al. 2011; Chapman, Bryce, et al. 2004; U.S. NABCI Committee 2015). The CCSM Phase I Project would be located in the southern portion of BCR 10. Golden eagles present in the northern areas of BCR 10 may also migrate south to the Phase I development and infrastructure areas during winter months.

Human activities in the North American Deserts ecoregion have had substantial impacts on the natural resources of the region. These human activities include resource extraction (forestry, mining, and oil and gas production), agriculture (ranching and cropland), urbanization, and energy production. Other threats to bird populations include climate change, invasive species, and changes in water quality and quantity (IWJV 2013).

Commercial forest operations have been established in many areas of the North American Deserts ecoregion, particularly in the northern portions of the region (IWJV 2013). Other common activities include mining, oil and gas production, and tourism (IWJV 2013). Mining is also an important economic factor in the North American Deserts ecoregion within BCR 10 (IWJV 2013). Oil and gas production affects habitat throughout much of Wyoming (Chapman, Bryce, et al. 2004). Tourism and recreation are also becoming increasingly important contributors to local and regional economies (IWJV 2013).

Cattle grazing is common throughout the North American Deserts ecoregion, as well as in many of the surrounding mountainous regions (IWJV 2013). Many lower mountain valleys have been converted to range and agricultural uses. Although only a small fraction of the region's land base is cultivated, irrigated agriculture is the largest user of water resources (IWJV 2013). These water resources originate largely outside the ecoregion as winter snow pack (IWJV 2013). Water rights allocated to agriculture are increasingly being converted to domestic water use, limiting conservation opportunities and potentially altering wildlife resource availability by reducing the extent of cropped acreage (IWJV 2013). Though there are adverse impacts on bird populations and habitat from agriculture, agricultural land uses can provide some level of protection from urbanization and can, in some cases, present opportunities for future habitat restoration. In addition, they can provide important feeding and staging areas for some species (IWJV 2013). Urbanization poses a threat to wildlife habitat; however, within BCR 10, human population density remains relatively low outside large population centers (IWJV 2013).

Development of alternative energy resources is expanding throughout BCR 10. . As with conventional energy extraction practices, the development of infrastructure associated with development of alternative and renewable energy facilities increases threats of habitat fragmentation (IWJV 2013).Climate change poses [a broad] threat to water and wetland resources of the region (IWJV 2013). Changes in temperatures and precipitation (timing and quantity) can affect vegetation and the availability of water. Alterations to the distribution and volume of snow pack in conjunction with increased evaporation rates have the potential to impact wetlands, even within areas that are otherwise well protected (IWJV 2013). Climate change can also affect food supply, disease rates, and the concentrations of contaminants in water (IWJV 2013).

Degradation of water quality and changes in water quantity are pervasive threats to many bird populations and habitat conservation in BCR 10. “Hydrologic modifications, salinization, sedimentation, pesticide contamination, and declining water quantity and quality” are particular concerns in the BCR (IWJV 2013). Timing and availability of water in the Intermountain West is also important (IWJV 2013). Water quantity issues are further exacerbated by periodic drought cycles and can lead to a substantial impact on the availability of water during important stages of birdlife cycles (IWJV 2013).

Invasive species (both plant and animal species) adversely affect bird habitat and populations. Invasive species are pervasive in many grassland, wetland, and riparian areas and threaten habitats associated with these systems, causing loss of habitat by replacement of native species or foraging pressure by non-native herbivores. Invasive predators exert additional pressure on bird species (IWJV 2013).

Historic causes of eagle population declines include loss of habitat, shooting and trapping, and toxic effects of pesticides and heavy metal (mercury and lead) contamination (USFWS 1983). Specific causes of eagle population decline in Wyoming include disease, loss of large old trees, residential development, energy production, and recreation near rivers and lakes (WGFD 2010b).

Though the region faces threats and challenges to bird populations and habitat, much of the land in the region is protected to various degrees through federal and state ownership (for example, national and state parks; national and state forests; and other federally owned land, such as land owned by the BLM, USFWS, U.S. Bureau of Reclamation, and U.S. Department of Defense), and through U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS) conservation programs (USGS 2005a; Wyoming Office of State Lands and Investments 2016; NRCS 2016).

#### *4.3.1.2 Bird Conservation Region 16 (Southern Rockies/Colorado Plateau)*

BCR 16 is topographically complex and "includes the Wasatch and Uinta Mountains to the west and the Southern Rocky Mountains to the east, separated by the rugged tableland of the Colorado Plateau" (U.S. NABCI Committee 2015). A range of habitats is contained in this BCR, including coniferous forest interspersed with aspen at higher elevations, piñon-juniper woodlands on lower plateaus, and shortgrass prairies in the high arid plains (U.S. NABCI Committee 2015). Golden eagles from this BCR may migrate north to the Phase I development and infrastructure areas during summer months.

Within BCR 16, there are three ecoregions: Northwestern Forested Mountains, North American Deserts, and Temperate Sierras. Characteristics of the Northwestern Forested Mountains and North American Deserts are discussed above, in Section 4.3.1.1. The Temperate Sierras ecoregion occurs in the mountains of New Mexico and Arizona, and consists of extensive volcanic and fault-block mountain chains and plateaus separated by wide valleys and plains (IWJV 2013). Surface water is limited, and flow in many streams and arroyos is intermittent at middle and lower elevations. Soils are variable, encompassing shallow soils of alpine sites and nutrient-poor forest soils of the mountain slopes, as well as soils suitable for agriculture and those rich in calcium that support natural dry grasslands (IWJV 2013).

Commercial forestry operations have been established in some areas of the Temperate Sierras ecoregion, but have been less intensive than those conducted in more northerly forests. Past fire suppression policies of the U.S. Forest Service have altered forest density and structure over much of the region. Shifts in forest densities have reduced productivity of understory grasses and increased the risk of catastrophic fires. Other land uses in the Temperate Sierras ecoregion include mining, oil and gas production, recreation, and tourism. Large areas of this ecoregion are in public forests and rangelands (Wiken et al. 2011). Long-term and poorly managed grazing on public and private lands have degraded rangeland productivity and severely impacted riparian resources in the region. Climate change poses a widespread] threat to water and wetland resources of the region (IWJV 2013).

While large urban areas (Denver, Colorado Springs, and Salt Lake City) are located just outside BCR 16, urbanization of the region is increasing across central and western Colorado and northern New Mexico (U.S. Census Bureau 2015), leading to habitat loss and fragmentation. Challenges and threats to bird populations and habitat identified by Colorado Parks and Wildlife include habitat conversion; habitat degradation from fragmentation, forestry, altered fire regimes, and wetland filling); pollution, collisions with powerlines; and, and invasive species. Specific threats to bald and golden eagles have been identified as poisoning, collision with powerlines, habitat conversion, pollution, disturbance by flight paths, and habitat degradation (Colorado Parks and Wildlife 2006).

Though the region faces threats and challenges to bird populations and habitat, much of the land in BCR 16is protected to various degrees through federal and state ownership including national and state parks; national and state forests; and other federally owned land, such as land owned by the BLM, USFWS, U.S. Bureau of Reclamation, and U.S. Department of

Defense; and, through NRCS conservation programs (USGS 2005a, 2005b; Wyoming Office of State Lands and Investments 2016; Colorado State Land Board 2016; NRCS 2016).

#### *4.3.1.3 Bird Conservation Region 17 (Badlands and Prairies)*

BCR 17, Badlands and Prairies, is a semi-arid rolling plain dominated by a mixed-grass prairie that lies west and south of the glaciated Prairie Pothole region, east of the Rocky Mountains, and north of the true shortgrass prairie (U.S. NABCI Committee 2015). Golden eagles from this BCR may migrate to the Phase I development and infrastructure areas, especially during winter months.

The economy in BCR 17 is dominated by natural resource-based industries such as ranching, farming, recreation, hunting, and fishing. The rugged living conditions of these arid grasslands create the social and cultural structures of the northern Great Plains communities, most notably ranching, which helps to maintain the grassland-dominated landscape (Pool and Austin 2006). Much of the area is drained by the Missouri River through its various tributaries. “Development of irrigation systems and more drought-tolerant crops has resulted in some westward expansion of cropland agriculture, although it remains limited by soils, topography, and precipitation” (Pool and Austin 2006).

Climate, grazing, and fire have been the dominant forces shaping the ecological communities of the Northern Great Plains (Pool and Austin 2006). More recently, agriculture and other human development associated with European settlement have increasingly influenced the region’s soils, landscape, flora, and fauna. The original forces of climate, grazing, and fire, remain critical factors influencing the landscape and communities of the Northern Great Plains because they are intimately linked to the ecology of native communities (Pool and Austin 2006).

Several trends in the U.S. population are indicative of changes that are occurring in the Northern Great Plains. The fraction of Americans living in cities increased from 40 percent in 1900 to more than 75 percent in 2005 (Pool and Austin 2006). Most rural areas in BCR 17 are losing population to regional cities and other states (Pool and Austin 2006). Ranching and farming are the major economic activities in the region, but urban areas provide housing and employment for a significant percentage of the region’s population (Pool and Austin 2006).

Livestock production, consisting mostly of cattle, is prevalent on private, tribal, and public lands (Pool and Austin 2006). A substantial amount of land in the region “is used for production of cash and forage crops” (Pool and Austin 2006). Another cultural trend in the region is that the numbers of farms continue to decline and that the average farm size continues to expand. For example, according to the Montana Agricultural Statistics Service, there were 37,200 farms with an average size of 1,747 acres in Montana in 1950; while in 1997, the number of farms declined to 23,000 and the average size increased to 2,591 acres (Pool and Austin 2006). This trend combined with a rapidly aging rural population favors the transfer of a large number of acres to new owners (Pool and Austin 2006).

Energy exploration and development have had major impacts on lands within the region. The region is a major supplier of coal for consumption in the United States. Recently, more interest in oil and gas development has occurred (Pool and Austin 2006). Coal mining (especially in northeastern Wyoming) and oil and gas production (especially in western North Dakota) affect much of this region by fragmenting habitat and proliferating invasive plant species (Pool and Austin 2006).

Many of the grasslands in this region have remained intact. However, threats to grasslands include invasive species and habitat fragmentation, pollution, development of infrastructure, and suppression of fire, resulting in encroachment of woody species and loss of native diversity (Dyke et al. 2015).

Though the region faces threats and challenges to bird populations and habitat, much of the land in the region is protected to various degrees through federal and state ownership (USGS 2005a; NRCS 2016).

#### *4.3.1.4 Bird Conservation Region 18 (Shortgrass Prairie)*

BCR 18, the Shortgrass Prairie region, lies in the rainshadow of the Rocky Mountains, where arid conditions greatly limit the stature and diversity of vegetation (U.S. NABCI Committee 2015). Numerous broad, braided rivers drain to the east out of the Rockies and cross through the shortgrass prairie (U.S. NABCI Committee 2015). Golden eagles from BCR 18 may migrate north to the Phase I development and infrastructure areas during summer.

This region is dominated by agricultural land uses such as crop cultivation and livestock grazing with over half of the area in cropland (Playa Lakes Joint Venture [PLJV] 2015). Grasslands are the dominant bird habitat in the landscape. Short grass prairie primarily consists of low-growing, warm-season grasses such as blue grama and buffalo grass. Sandsage prairie is found where sandy soils occur, and consists primarily of sandsage, sand bluestem and prairie sand-reed grasses (PLJV 2015). Mixed-grass species such as needle-and-thread and side-oats grama, and some tall grasses such as big bluestem, little bluestem and switchgrass become more dominant farther east (PLJV 2015).

Although grasslands and shrublands are the primary native habitats in the region, there are a variety of other water-associated habitats including playas (that is, shallow, temporary wetlands that lie in the lowest point of a closed watershed), rivers and streams, wet meadows, and saline lakes (PLJV 2015). Major rivers in the region include the Arkansas, Canadian, North and South Platte, Red, and Republican. These rivers provide habitat for a variety of migratory birds, including species of conservation concern such as the whooping crane, least tern, and piping plover. In the southern portion of the region, many river and stream (riparian) areas go through wet-dry cycles, receiving brief surges of water only after heavy rains (PLJV 2015). Major threats to riparian areas are loss or change of water periods; fragmentation due to developments such as diversions, dams, and roads; invasion of exotic species such as salt cedar and grasses; and lack of cottonwood regeneration (PLJV 2015).

Though the region faces threats and challenges to bird populations and habitat, much of the land in the region is protected to various degrees through federal and state ownership (USGS 2005a; NRCS 2016).

### *4.3.1.5 Past, Present, and Reasonably Foreseeable Future Actions in the Bird Conservation Regions*

Key bird habitats in the four BCRs include forests, wetlands, grasslands, and sagebrush. Activities that have cumulative impacts on these habitats are discussed below.

#### *4.3.1.5.1 Conversion of Habitat to Agriculture*

Both grasslands and sagebrush have experienced large-scale conversion to cropland in the past 100 years. Grasslands occur throughout the four BCRs and are considered "among the least protected and most threatened habitats in North America, with less than 2% in some form of conservation status" (Pool and Austin 2006).

Vegetative composition throughout the four BCRs has undergone tremendous changes. In the past 100 years, native herbivores (such as bison, elk, and deer) have been largely replaced by domestic livestock (cattle, sheep, and horses) in the region (Pool and Austin 2006). Domestic livestock have limited ability to move more than a mile from water, are attracted to shade, and require intensive management to optimize production. Livestock also are often confined by fences to relatively small acreages. As a consequence, the composition of many of the major habitats in the region has been substantially altered, especially in areas of naturally occurring water that attract livestock, such as riparian zones (Pool and Austin 2006). The changes in herbivore species have resulted in less diversity of vegetation and habitat, which negatively affects numerous species (Pool and Austin 2006).

#### *4.3.1.5.2 Fire Suppression*

The implementation of fire suppression measures was concurrent with the introduction of livestock and establishment of permanent settlements throughout the four BCRs (Pool and Austin 2006). Although large fires occasionally occur in portions of the region, the frequency and overall area burned during the last 100 years have departed substantially from the historic range of variation. In portions of the region where habitat has been substantially fragmented by cropland, fire has been essentially eliminated from the landscape (Pool and Austin 2006). Fire suppression contributes to the expansion of coniferous woodland into former grassland habitat, and it may also be allowing for the expansion of deciduous vegetation along ephemeral drainages (Pool and Austin 2006). Within coniferous woodlands, density and volume of trees per area has greatly increased, making these areas more susceptible to stand replacing fires. Increased forest cover also intercepts water, and trees have higher evapotranspiration rates than native grasslands. Together, both of these changes likely decrease water run-off to feed stream flows. In grasslands, lack of fire may be affecting plant community dynamics, altering cycling of carbon and other nutrients and species composition (Pool and Austin 2006).

#### *4.3.1.5.3 Water Diversion*

In the arid portions of the four BCRs, issues of water supply and demand from continued expansion of human development (that is, urbanization, agriculture, mining, and energy extraction) places significant strains on water supplies (IWJV 2013). Many areas are already over-allocated, contributing to continued loss of some wetland types (IWJV 2013). An example of past over-allocation is the Colorado River, which supplies water to Colorado, Wyoming, Utah, New Mexico, Nevada, Arizona, California, and Mexico. The Colorado River and its tributaries are controlled by 29 major dams and hundreds of miles of canals. About 90 percent of the flow of the Colorado River is diverted to provide irrigation water to 4 million acres of cropland and municipal water supply for almost 40 million people both inside and outside the watershed (Gupta 2007).

Long-term wetland loss from water diversions throughout the four BCRs means that remaining wetland habitats are critically important because they must provide most of the resources required to sustain bird and other wildlife populations. Because water is so important to both people and birds, remaining wetland resources are at considerable risk of loss and degradation (IWJV 2013).

Rapid human population growth is one of the most significant present and foreseeable threats to wetland water supplies in the western portions of the four BCRs (IWJV 2013). Population growth has placed increased demands and competition on water for urban, municipal, industrial, and agricultural irrigation uses. Urbanization can alter wetland hydrology directly but it also results in indirect impacts such as the depletion of water tables and diminishing of aquifer recharge rates required to sustain functional wetland environments (IWJV 2013). Further competition among water users for increasingly limited water resources prolongs the effects of periodic droughts on wetland systems and makes those droughts worse (IWJV 2013). Additionally, expansion of development can increase habitat fragmentation rates, alter hydrologic patterns, diminish water table recharge rates, and reduce habitat suitability for many plant and animal communities, especially wetland-dependent birds (IWJV 2013).

##### *4.3.1.5.4 Mineral and Energy Development*

Mineral and energy development have been occurring in the four BCRs for many decades, but in just the last 5 years, a new intensity of development has appeared, largely as a result of increased interest in some forms of energy. Oil and gas exploration and drilling activities in the four BCRs have dramatically increased in recent years and are projected to continue to increase in the reasonably foreseeable future (Pool and Austin 2006). In the past, the oil and natural gas industry considered resources locked in tight, impermeable formations, such as shale, uneconomical to produce. Advances in directional well drilling and reservoir stimulation have changed this perspective dramatically, and continued aggressive growth of oil and gas activities from tight formations is predicted to continue through at least 2020 (U.S. Energy Information Administration [EIA] 2015). From 2008 to 2013, crude oil production in the United States increased 32 percent (from 5.0 million to 7.4 million barrels per day), while annual dry natural gas production grew 17 percent (from 20.2 to 24.3 trillion cubic feet) (EIA 2015). Additionally, oil production in the Powder River basin increased 48 percent between 2009 and 2014 (EIA 2015). Predictions of oil and gas production show that growth in the Rocky Mountains and Dakotas is expected to continue. Major oil- and gas-producing formations in the four BCRs include the Niobrara, Lewis, Hilliard-Baxter-Mancos, Cody, and Green River formations (EIA 2015). Coal mining has occurred for many years in the four BCRs, particularly in northeastern Wyoming, southeastern Montana, central Utah, western Colorado, and the four corners area (where Colorado, Utah, New Mexico, and Arizona share a border). Nine of the 10 largest coal mines in the United States are surface mines in the Powder River basin, which is a 25,800-square-mile basin extending from northeastern Wyoming into southeastern Montana. The Powder River basin is the largest coal mining region in the United States, accounting for approximately 40 percent of all coal currently mined in the nation (EIA 2015). The amount of coal produced from the Powder River basin has been increasing over the last 20 years, even as nationwide coal production has decreased slightly (coal mining decreased a total of 3.1 percent between 2012 and 2013) (EIA 2015). Coal-bed methane production is projected to expand in some of the coal-producing areas within the four BCRs, especially in northeastern Wyoming (EIA 2015).

Risks to wildlife from oil, gas, and mining activities include habitat loss and fragmentation; increased spread of invasive species; disturbance of wildlife during road construction, drilling, and operation; water depletions; contamination of water and soils; spread of disease; and direct mortality in oil and gas pits if they are not covered with netting (Pool and Austin 2006).

Renewable energy activities in the four BCRs include hydroelectric, biomass, wind, geothermal, and solar developments. Due to western drought conditions, conventional hydropower generation is forecasted to decrease by 10.4 percent in the foreseeable future (EIA 2015). Conversely, non-hydropower renewable power generation is forecasted to increase by 3.2 percent over the next 5 years, due primarily to the projected growth of utility-scale solar power generation and wind power generation (EIA 2015). Renewable energy developments can carry many of the same risks and impacts associated with fossil fuel development, including habitat loss and fragmentation. Additionally, new transmission line and transportation infrastructure associated with renewable energy development can be extensive. Transmission lines and towers can impact wildlife by direct mortality (collisions), and both transmission line and transportation infrastructure contribute to habitat fragmentation (Franson et al. 1995; Kochert et al. 2002; Wayland et al. 2003; Tetra Tech 2011, as cited in Allison 2012).

#### *4.3.1.5.5 Climate Change*

Global climate change refers to long-term fluctuations in temperature, precipitation, wind, and other elements of the Earth’s climate system. Natural processes such as variations in solar irradiance, cyclical changes in the Earth’s orbital parameters, ocean circulation changes, and volcanic activity can produce variations in climate and weather patterns. However, recent discussions of the Earth’s climate system have highlighted the influence of the changes in concentrations of various gases in the atmosphere—specifically those gases referred to as greenhouse gases that affect the Earth’s absorption of solar radiation. Greenhouse gases such as carbon dioxide, methane, and nitrous oxide trap heat in the atmosphere, thereby affecting the Earth’s climate and contributing to the gradual warming of the earth (Ren 2010). The United Nations’ Intergovernmental Panel on Climate Change’s (IPCC’s) *Climate Change 2014: Synthesis Report* indicates that about 40 percent of anthropogenic greenhouse gas emissions released between 1750 and 2011 have remained in the atmosphere; the rest has been removed from the atmosphere and is stored on land (in plants and soils) and in the ocean (IPCC 2014).

Economic and population growth continued to be the most important drivers of increases in greenhouse gas emissions from fossil fuel combustion (IPCC 2014). Specific human activities that contribute to greenhouse gas emissions include burning of fossil fuels (for example, coal, natural gas, and oil), land use changes (for example, conversion of forests to agricultural land), generation of waste, and farming practices.

Information is published on an almost daily basis regarding the projected future affected environment due to climate change in any given area. Accordingly, climate change is considered and characterized as a predicted future state of the affected environment in Chapter 3.0 of this EIS.

Within the four BCRs, evidence of present climate-change impacts includes changing precipitation patterns; more frequent hot and fewer cold temperature extremes; and shifting geographic ranges, seasonal activities, migration patterns, and abundances of terrestrial and aquatic species (IPCC 2014). Projected future effects due to climate change include declines in soil moisture; increases in catastrophic events, including landslides and fires; and altered surface water flows, water quality, and water quantity (Zahniser et al. 2009).

Climate change may also have an effect on wind. Wind is caused by the interaction of the uneven heating of the atmosphere with the uneven surface of the Earth. There has been little research around the increasing global average surface temperatures due to climate change and its impacts on the amount of wind energy available for electricity production (Ren 2010; Rahim et al. 2012). Impacts will depend on how wind and cloud cover patterns change, which is difficult to project using current climate models. One study found substantial differences between several global climate models, but concluded that a warmer climate may reduce the spring and summer wind resources of the northwest United States (Eichelberger et al. 2008).

Across North America, average wind speeds have decreased slightly over the past 40 years (Ren 2010). If recent global warming trends continue, models indicated that the wind power available over China at the average height of a wind turbine is expected to decrease by about 14 percent within this century (Ren 2010).

### 4.3.2 Local Area Scale for Eagles

The local area scale for bald eagles is a 43-mile radius around the CCSM Phase I Project, and is located wholly within the local area scale for golden eagles, which is a 140-mile radius around the CCSM Phase I Project (see Section 2.1.2.3). The local area scale for golden eagles includes all or part of the following counties:

- In Wyoming: Carbon, Sweetwater, Albany, Laramie, Goshen, Platte, Niobrara, Converse, Natrona, Fremont, Sublette, Hot Springs, Washakie, Johnson, and Campbell Counties
- In Colorado: Moffat, Routt, Jackson, Larimer, Rio Blanco, Garfield, Eagle, Summit, Grand, Boulder, and Weld Counties
- In Utah: Daggett and Uintah Counties

Because the LAP for bald eagles is located entirely within the LAP for golden eagles, we focused this discussion on the past, present, and reasonably foreseeable future actions in the local area for golden eagles that may result in eagle take. Within the 140-mile radius, eagles could be affected by electrocution and collision with power lines; wind turbine collisions; vehicular collisions; illegal shooting and trapping, and poisoning; habitat loss and degradation; habitat fragmentation; and displacement and behavioral changes that lead to a loss of fecundity.

The public scoping meetings provided an opportunity for public input into the NEPA process. In total, 11 commenters provided considerations for the cumulative impacts assessment in this EIS. Commenters recommended assessment of the cumulative impacts of climate change; other sources of eagle take; the CCSM Phase II Project (which could be renamed or split into multiple projects in the future, but will be referred to as the CCSM Phase II Project throughout the cumulative impacts analysis); and projects in the area, such as transmission lines (including the TransWest Express Transmission Project) and oil and gas drilling and associated infrastructure (including the Atlantic Rim Natural Gas Project as well as the proposed Continental Divide-Creston Natural Gas Development Project).

The following sections describe actions in the 140-mile local area that, when considered with the Phase I wind turbine development and the infrastructure components of the CCSM Phase I Project, may cause cumulative impacts on those resources analyzed in this EIS. These actions could occur in the past or present, or be reasonably foreseeable projects. Reasonably foreseeable projects include any projects that have been publicly disclosed to be in the proposal or planning stage.

#### *4.3.2.1 Transmission Lines*

Transmission lines and towers can impact wildlife by direct mortality from electrocutions and collisions and indirectly by fragmentation of habitat and increased raptor perching. Eagles and other raptor species that perch on utility and transmission poles are vulnerable to electrocution and collisions when avian-safe spacing, wire marking, and insulating hardware are absent (Franson et al. 1995; Kochert et al. 2002; Wayland et al. 2003). Transmission lines are organized into three categories in this discussion: high-voltage transmission lines are usually considered to be those lines carrying electricity with voltages of 69 kilovolt (kV) and above; subtransmission lines have lower voltages between 69 kV and 33 kV; and distribution lines have voltages less than 33 kV.

Numerous studies indicate that electrocution from contact with power lines is the leading cause of death for golden eagles in the United States (Franson et al. 1995; Kochert et al. 2002; Wayland et al. 2003; Tetra Tech 2011, as cited in Allison 2012). Electrocution occurs when a bird comes into contact with two energized parts (such as two wires) or between an energized and a grounded metal part (such as when a bird perches on a metal structure and comes into simultaneous contact with a wire). Most commonly, birds are electrocuted where conducting wires (conductors) are placed closer together than the wingspan of the bird. Because conductors on distribution lines are placed closer together than high voltage transmission lines, birds are more frequently electrocuted on distribution lines, despite their lower voltage (Kochert et al. 2002; Tetra Tech 2011, as cited in Allison 2012).

In Wyoming, at least 60 golden eagle fatalities per year from electrocution with power lines were recorded over a 21-year period. Studies by Franson et al. (1995) and Wayland et al. (2003) reported similar numbers of golden eagle fatalities associated with electrocution. Most studies indicate that numbers of electrocution deaths are actually higher than reported in western states where power poles provide the majority of perches (Benson 1981; Harness and Wilson 2001). Immature and juvenile eagles appear to be the most susceptible to electrocution when rain or strong winds hamper flight or wet feathers increase conductivity (APLIC 1996, 2006).

Numerous rural electric associations own and operate distribution lines within the local area; these include, in Wyoming: High Plains Power, Carbon Power & Light, Wheatland Rural Electric Association, High West Energy, and Bridger Valley Electric Association; in Colorado: Yampa Valley Electric Association, White River Electric Association, Mountain Parks Electric, and Poudre Valley Rural Electric Association; and in Utah: Moon Lake Electric. These associations collectively own and operate more than 20,000 miles of distribution lines in the local area.

In the reasonably foreseeable future, several major transmission lines may be developed within the local area, including the TransWest Express and Gateway West Projects. The TransWest Express Transmission Project (BLM 2015a) would consist of an approximately 725-mile-long, 600-kV, direct current transmission line; a northern terminal located near Sinclair, Wyoming; and a southern terminal approximately 25 miles south of Las Vegas, Nevada. The project would provide transmission infrastructure and capacity to deliver approximately 3,000 MW of electric power from renewable and other energy resources in south-central Wyoming, including the CCSM Phase I Project, to a substation hub in southern Nevada. The Gateway West Project is comprised of 230- and 500-kV transmission lines in 10 segments from the Windstar Substation near Glenrock, Wyoming, to the Hemingway Substation near Melba, Idaho, with a total length of approximately 1,000 miles (BLM 2015b).

Known present and reasonably foreseeable transmission lines within the 140-mile local area are summarized in Table 4-1.

### Table 4-1. Transmission Lines in the Local Area for the CCSM Phase I Project in Wyoming

| Project | Owner/Applicant | County (State) | Status |
|---|---|---|---|
| High Plains Express | Various | Various | Reasonably foreseeable. Planned as a 500-kV AC transmission line. |
| Wyoming-Colorado Intertie | LS Power and Wyoming Infrastructure Authority | Various | Reasonably foreseeable. Proposed 345-kV electric transmission facility between southeast Wyoming and northeast Colorado. |

| Project | Owner/Applicant | County (State) | Status |
|---|---|---|---|
| Gateway West Transmission Line Project | Idaho Power and Rocky Mountain Power | Converse, Natrona, Albany, Carbon, Sweetwater, Lincoln (WY) and west into Idaho | Present. Line segments are scheduled to be completed in phases between 2015 and 2018. |
| Gateway South Transmission Line Project | PacifiCorp doing business as Rocky Mountain Power | Aeolus Substation near Medicine Bow, WY, to the Clover Substation near Mona, UT (total distance of approximately 400 to 425 miles) | Reasonably foreseeable 500-kV transmission line. FEIS anticipated to be published in spring 2016. |
| TransWest Express Transmission Line Project | TransWest Express LLC | From Carbon County, WY, through Colorado and Utah (total distance is roughly 725 miles) | Reasonably foreseeable 600-kV transmission line. ROD anticipated in spring 2016. |
| Overland Transmission Project | Jade Energy Associates, LLC | Carbon, Sweetwater (WY) | Delayed but reasonably foreseeable. |
| Zephyr Transmission Line Project | Duke American Transmission | Carbon, Sweetwater (WY) | Delayed but reasonably foreseeable. |
| Johnston to Casper | PacifiCorp | Converse, Natrona (WY) | Present. 230 kV. |
| Spence to Johnston | PacifiCorp | Converse, Natrona (WY) | Present. 230 kV. |
| Difficulty to Dave Johnston | PacifiCorp | Carbon, Natrona (WY) | Present. 230 kV. |
| Medicine Bow to Seminoe | Western Area Power Administration | Carbon (WY) | Present. 115 kV. |
| Oasis to Kortes | Western Area Power Administration | Carbon (WY) | Present. 115 kV. |
| Tap to Casper North | Western Area Power Administration | Natrona (WY) | Present. 115 kV. |

| Project | Owner/Applicant | County (State) | Status |
|---|---|---|---|
| Medicine Bow Coal Co. to Miners | PacifiCorp | Carbon (WY) | Present. 115 kV. |
| Platte to Miners | PacifiCorp | Carbon (WY) | Present. 230 kV. |
| Platte to Trowbridge | Tristate Generation and Transmission | Carbon (WY) | Present. 115 kV. |
| Platte to Point of Rocks | PacifiCorp | Carbon, Sweetwater (WY) | Present. 230 kV. |
| Mustang to Bridger | PacifiCorp | Sweetwater (WY) | Present. 230 kV. |
| Rock Springs to Bridger | PacifiCorp | Sweetwater (WY) | Present. 230 kV. |
| Bridger to Goshen | PacifiCorp | Lincoln, Sweetwater (WY) | Present. 345 kV. |
| Rock Springs to Atlantic City | PacifiCorp | Fremont, Sweetwater (WY) | Present. 230 kV. |
| Bridger to Kinport | PacifiCorp | Lincoln, Sweetwater (WY) | Present. 345 kV. |
| Bridger to Borah | PacifiCorp | Lincoln, Sweetwater (WY) | Present. 345 kV. |
| Spence to Mustang | PacifiCorp | Converse, Fremont, Sweetwater (WY) | Present. 230 kV. |

Sources: BLM 2012a, 2013, 2015a, 2015b, 2016b; EIA 2015.

Newer (post-2006) high-voltage transmission lines are generally, but not always, constructed in accordance with recommendations and standards outlined in APLIC's 2006 Suggested Practices and 2012 Collision Manual (APLIC 2006 and 2012). When transmission lines are designed and constructed in accordance with suggested practices in the APLIC manuals (APLIC 2006 and 2012), the risk of electrocution for birds should generally be low. However, high-voltage transmission lines can continue to cause impacts on avian species from the risk of collisions and other indirect impacts such as habitat fragmentation and increased wildfire risk.

Comprehensive geospatial data on transmission lines are difficult to obtain for a number of reasons, including confidentiality clauses and lack of a nationwide clearinghouse for the lines. Data on subtransmission and distribution lines are even more difficult to compile, due to the sheer number of lines. Based on available geospatial data, major high-voltage transmission lines (voltages of 69 kV and up) in the local area are depicted in Figure 4-2.

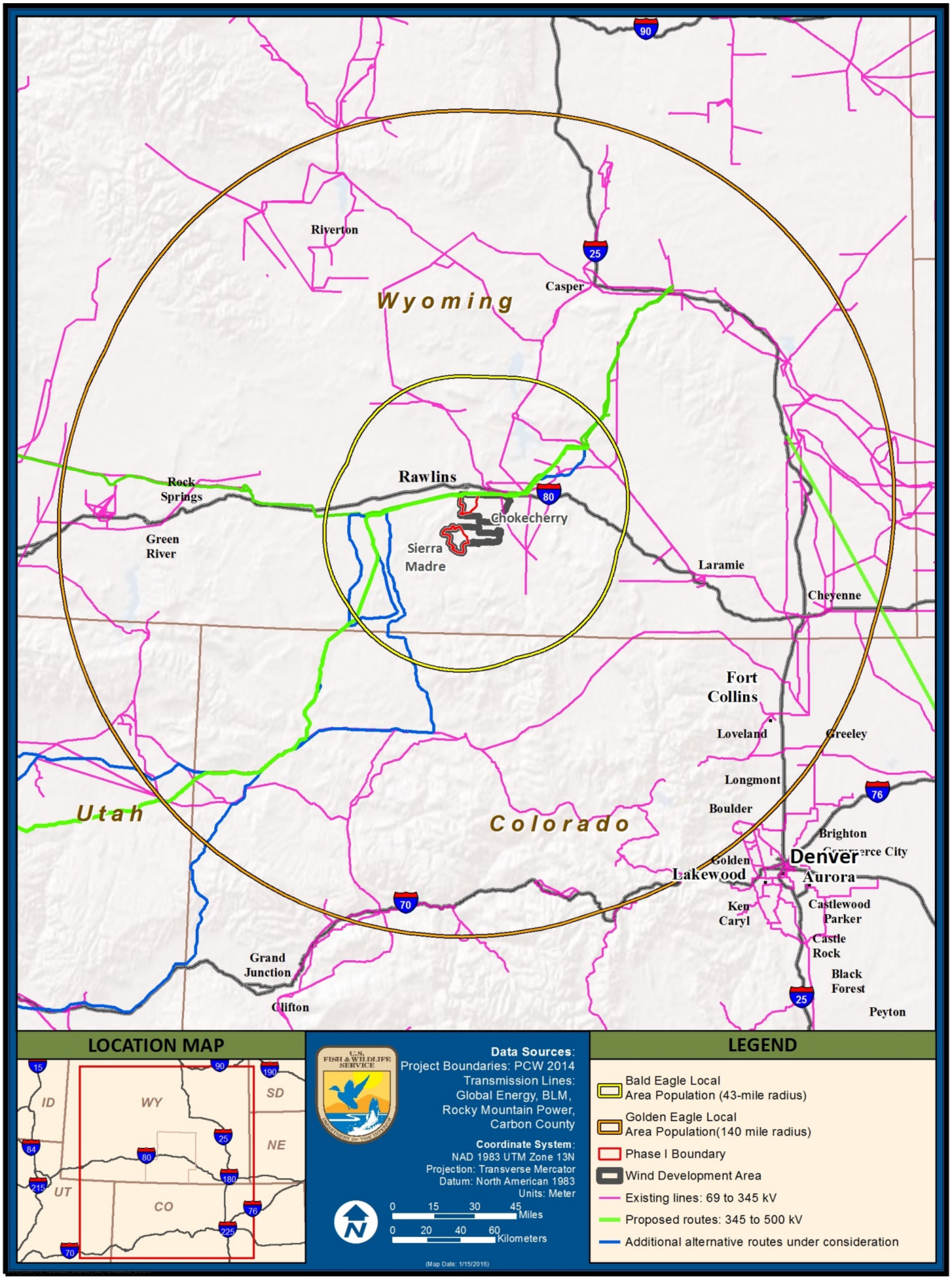


Figure 4-2. Transmission Lines in the Local Area Boundaries for the CCSM Phase I Project in Wyoming

#### *4.3.2.2 Wind Energy*

Twelve states, led by Iowa, Oklahoma, Texas, and California, produce more than 80 percent of the wind power in the United States (EIA 2015). Of the three states in the local area (Wyoming, Colorado, and Utah), only Colorado is in the top 12 wind energy producing states. Colorado produced the most wind energy (430 thousand megawatt hours [kMWh]) of the three local area states in the past year, followed by Wyoming (165 kMWh) and Utah (59 kMWh). However, the number of additional wind energy facilities expected to be constructed and go online is projected to increase in the local area in the future, primarily as a result of the high wind power potential north and east of the CCSM Phase I Project area (see Figure 2-9). Wyoming contains the largest amount of land-based class 6 and 7 wind power potential area of any state in the United States (EIA 2015).

Present and reasonably foreseeable wind energy facilities within the local area, defined as those facilities exporting energy to the transmission grid, are summarized in Table 4-2 and shown in Figure 4-3.

Table 4-2. Operating and Reasonably Foreseeable Future Wind Energy Projects within the Local Area of the CCSM Phase I Project in Wyoming

| Project | Owner/Applicant | County (State) | Status |
|---|---|---|---|
| Belvoir Ranch | Morely Co. | Laramie (WY) | Reasonably foreseeable. Planned operation for 300 MW, 130 turbines. |
| BLM JCI | BLM | Sweetwater (WY) | Present. Began operations in 2010, 0.1 MW, 1 turbine. |
| Campbell Hill | Duke Energy | Converse (WY) | Present. Began operations in 2009, 99 MW. |
| Casper Wind | Chevron Global Power Company | Natrona (WY) | Present. Began operations in 2009, 16.5 MW, 11 turbines. |
| CCSM Phase II | Power Company of Wyoming | Carbon, (WY) | Reasonably foreseeable. 1,500 MW, 500 turbines. |
| Dunlap Wind | PacifiCorp | Carbon (WY) | Present. Began operations in 2010, 111 MW, 74 turbines. |
| F.E. Warren AFB | F.E. Warren AFB | Laramie (WY) | Present. Began operations in 2005, 3.3 MW, 3 turbines. |

| Project | Owner/Applicant | County (State) | Status |
|---|---|---|---|
| Foote Creek Wind Energy Project, Phases I, II, III, and IV | PacifiCorp; SeaWest; Eugene Water and Electric Board; Foote Creek II LLC; Terra Gen | Carbon (WY) | Present. Began operations in 1999, 84.2 MW, 132 turbines. |
| Glenrock Rolling Hills (Glenrock I, III) | PacifiCorp | Converse (WY) | Present. Began operations in 2008, 138 MW, 92 turbines. |
| Happy Jack | Duke Energy | Laramie (WY) | Present. Began operations in 2008, 29 MW, 14 turbines. |
| High Plains Wind/McFadden Ridge Wind Energy | PacifiCorp | Albany (WY) | Present. Began operations in 2009, 127.5 MW, 85 turbines. |
| Lonesome Bronco | Pathfinder Renewable Wind Energy | Sweetwater (WY) | Reasonably foreseeable, but currently on hold. |
| Medicine Bow Wind Project | Medicine Bow Wind, LLC | Carbon (WY) | Present. Began operations in 1998, 5.77 MW, 9 turbines. |
| Pathfinder-Zephyr | Pathfinder Renewable Wind Energy | Platte (WY) | Reasonably foreseeable. Up to 2,100 MW. |
| Pioneer Wind Park | FTP Power LLC | Converse (WY) | Reasonably foreseeable. Permitted by Wyoming Industrial Siting Council, anticipated operation in 2017, 49.6 MW, 46 turbines. |
| Ponnequin | Public Service Company of Colorado | Weld (CO) | Present. Began operations in 1998, 30 MW, 44 turbines. |
| Quaking Aspen | EDF Renewable Energy | Sweetwater (WY) | Reasonably foreseeable. 80 MW, 40 turbines. |
| Rock River I LLC | Shell Wind Energy, Inc. | Carbon (WY) | Present. Began operations in 2009, 99 MW, 66 turbines. |
| Rolling Hills | PacifiCorp | Carbon (WY) | Present. Began operations in 2009, 99 MW, 66 turbines. |

| Project | Owner/Applicant | County (State) | Status |
|---|---|---|---|
| Sand Hills Ranch | Shell Wind Energy, Inc. | Albany (WY) | Reasonably foreseeable. Up to 50 MW, up to 25 turbines. |
| Seven-Mile Hill | PacifiCorp | Carbon (WY) | Present. Began operations in 2008, 99 MW, 66 turbines. |
| Silver Sage | Duke Energy | Laramie (WY) | Present. Began operations in 2009, 42 MW, 20 turbines. |
| Sweeney Ranch | Sweeney Ranch Wind Park LLC | Sweetwater (WY) | Reasonably foreseeable. Up to 250 MW, up to 199 turbines. |
| Top of the World | Duke Energy | Converse (WY) | Present. Began operations in 2010, 200 MW, 110 turbines. |
| Wheatland Wind | GreenHunter Wind Energy LLC | Platte (WY) | Proposed/reasonably foreseeable. Up to 600 MW, up to 300 turbines. |
| Whirlwind I | Pathfinder Renewable Wind Energy | Carbon (WY) | Reasonably foreseeable. Preliminary study, proposed construction 2017 to 2021. |
| White Mountain Wind Energy Project | Teton Wind | Sweetwater (WY) | Proposed/reasonably foreseeable. BLM EA issued in 2010. Up to 240 turbines. |

Sources: BLM 2013, 2015a, 2015b, 2016b; EIA 2015.

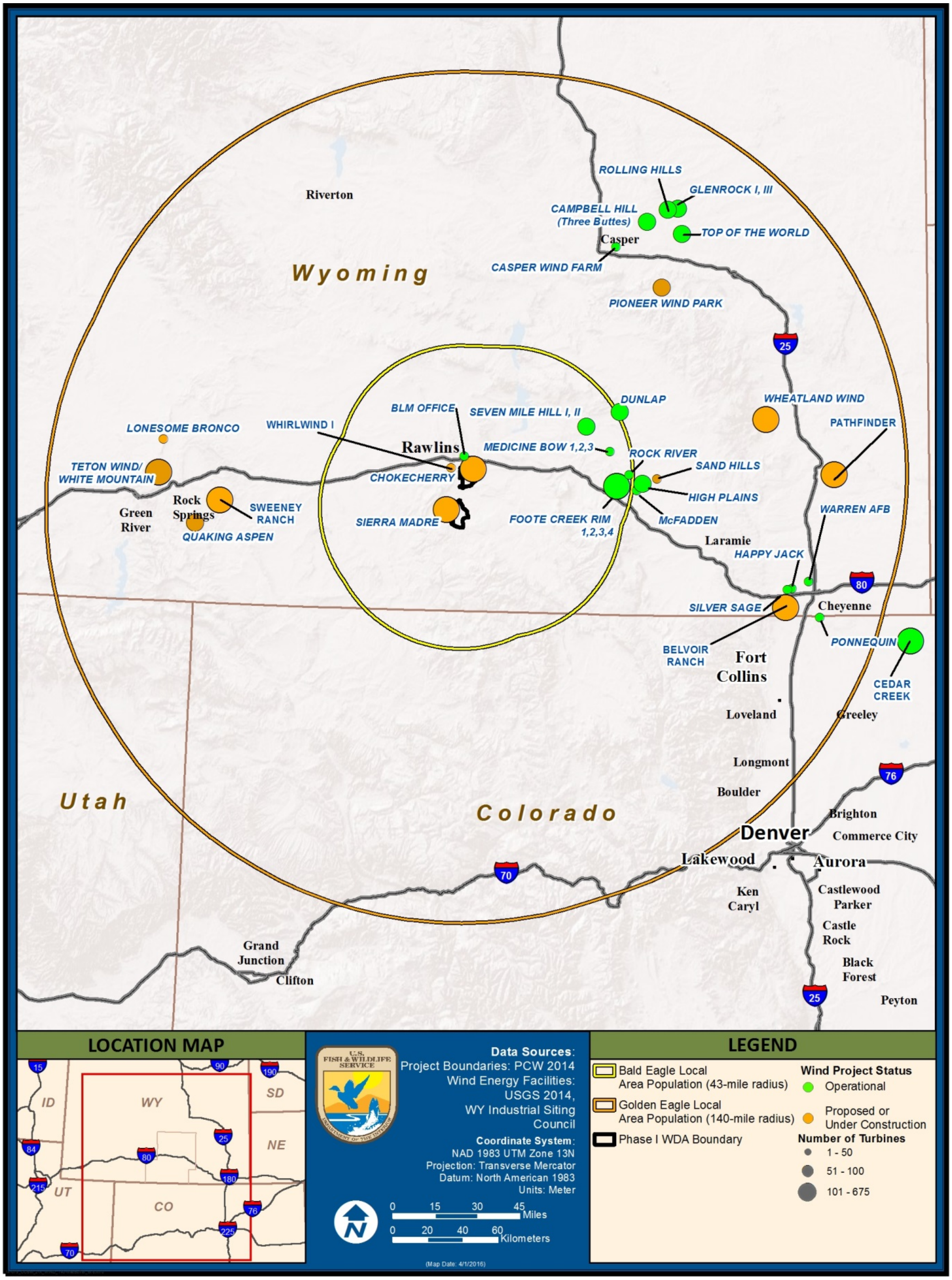


Figure 4-3. Wind Energy Projects in the Local Area Boundaries for the CCSM Phase I Project in Wyoming

Operation of many present and reasonably foreseeable wind energy facilities may result in take of protected avian species. Limited anecdotal information exists on the amount of take that may be occurring in the local area from wind energy facilities. However, in recent years, the U.S. Department of Justice pursued legal action against wind facilities operated by Duke and PacifiCorp in Wyoming because those facilities were causing the death of migratory birds and, in the process, were violating both the MBTA and BGEPA. Both Duke and PacificCorp pleaded guilty to those charges and entered into legal settlements with the U.S. Department of Justice. The plea agreement by Duke is filed as *United States of America v. Duke Energy Renewables, Inc., Case No. 13-CR-268, Plea Agreement, ECF No 2* (D. Wyoming Nov. 7, 2013), and the plea agreement by PacifiCorp is filed as *United States of America v. PacifiCorp Energy, Case No. 14-CR-301, Plea Agreement, ECF No. 2* (D. Wyoming Dec. 19, 2014).

Of the reasonably foreseeable projects included in Table 4-2, the CCSM Phase II Project is particularly noteworthy in the cumulative analysis because it would be adjacent to the CCSM Phase I Project. The CCSM Phase II Project would consist of up to 500 turbines located on the eastern portions of the CCSM Project area. If for any reason the CCSM Phase I Project would not be built, for the purposes of this analysis, we assumed that the CCSM Phase II Project was still a reasonably foreseeable option. If PCW proceeds with development of a second project adjacent to the CCSM Phase I Project, they would consult with us to identify avoidance and minimization measures, including recommendations on placement of turbines. These measures would be designed to avoid and minimize take of eagles to the maximum extent practicable and would need to be identified prior to PCW submitting a permit application containing an ECP for a separate programmatic ETP. During the permit evaluation process, we would perform fatality modeling to predict the average number of eagle fatalities per year for the CCSM Phase II Project.

With the substantial caveat that no avoidance and minimization measures or avoidance areas have been considered, we developed initial fatality estimates for golden and bald eagles using eagle use data collected from the area east of the Phase I development and infrastructure areas and using the turbine layout assessed in the BLM FEIS. The same version of the model code and assumptions that we used to determine predicted fatalities from the CCSM Phase I Project was used to predict fatalities for the CCSM Phase II Project. The initial prediction of annual take from a second 500-turbine project is presented in Table 4-3 by species and wind turbine blade diameter.

Table 4-3. Initial Prediction of Annual Eagle Take for the CCSM Phase II Project in Wyoming

| Species | 394-foot-diameter (120-meter-diameter) Wind Turbine Blade | 338-foot-diameter (103-meter-diameter) Wind Turbine Blade |
|---|---|---|
| Golden Eagle | 32 | 25 |
| Bald Eagle | 2 | 1 |

If PCW does apply for an ETP for the CCSM Phase II Project, the fatality estimates would likely decrease from the initial prediction for the following reasons:

- The initial fatality modeling does not include avoidance and minimization measures.
- The initial fatality modeling does not include seasonal curtailment.
- The initial fatality modeling includes only a 3 percent non-operational period (the expected value may be closer to 7 to 9 percent).
- For part of the dataset, eagle observations were recorded above or below 150 meters rather than 200 meters, but eagle observations above 150 meters were included in the initial fatality model run even though the model code was adjusted for that part of the dataset to assume observations are truncated at 150 meters, which may overestimate the amount of eagles in the flight path of turbines.
- Flight paths of eagles have not been evaluated in order to refine eagle minutes included in the initial fatality model run (eagle minutes may be reduced upon more detailed evaluation of eagle flight paths).

#### *4.3.2.3 Mineral and Energy Development*

Wyoming supplies more energy to other states and has more producing federal oil and natural gas leases than any other state. Although much of Wyoming's coal mining is located northwest of the local area, crude oil and natural gas production are located throughout the local area, as listed in Table 4-4 and shown in Figure 4-4. Oil and natural gas extraction have occurred in the local area since at least 1884. Production increased steadily for over a century, until the past 5 years when increases in oil and gas development and production increased dramatically (EIA 2015). For example, oil production associated with the Niobrara formation increased 960 percent (from 365,000 barrels to 3.5 million barrels) from 2010 to 2013 in Converse, Campbell, and Laramie Counties, Wyoming (EIA 2015). This trend is largely predicted to continue in the local area for the reasonable foreseeable future for both oil and gas production, particularly from the Greater Green River basin in Colorado and Wyoming, and the Uintah basin in Utah (EIA 2015).

Large oil and gas activity areas located west of the CCSM Phase I Project area, and immediately west of Rawlins, include the Continental Divide-Creston Natural Gas Project, Atlantic Rim Project, Desolation Road Natural Gas Project, and Seminoe Road Development Projects. Natural gas fields in this area are composed of well pads, gathering pipelines, electrical distribution lines, buried pipelines, and access roads. Access roads are subject to daily traffic that includes light and heavy trucks, water trucks, truck and trailer rigs, and motor graders (BLM 2015b, 2016b).

Active surface and underground mining activities are located in Carbon, Sweetwater, and Albany Counties in Wyoming. Mining projects in these counties include coal-to-liquids projects as well as uranium and limestone mining. Major mineral, energy development, and associated infrastructure projects within the local area are summarized in Table 4-4.

### Table 4-4. Mineral, Energy Development, and Associated Infrastructure Projects in the Local Area for the CCSM Phase I Project in Wyoming

| Project | Owner/ Applicant | County (State) | Status |
|---|---|---|---|
| Medicine Bow Fuel & Power Coal-to-Liquids Project | Medicine Bow Fuel & Power | Carbon (WY) | Reasonably foreseeable (project delayed). |
| Lost Creek Uranium In Situ Recovery Project | UR Energy; Lost Creek ISR, LLC | Sweetwater (WY) | Present and reasonably foreseeable. Proposed expansion of 5,750 acres to the existing project area of approximately 4,254 acres. |
| Jonathon Project Limestone Quarry | Pete Lien and Sons | Albany (WY) | Present. Limestone quarry developed on 640 acres. |
| Nichols Ranch/Hank Unit Uranium In-Situ Recovery (ISR) Project | Uranerz Energy Corporation | Campbell, Johnson (WY) | Present and reasonably foreseeable (Plan of Operations for expansion approved July 2015). Uranium mining within a 2,250-acre area. |
| Continental Divide-Creston Natural Gas Development | BP America and 20 other lease holders | Carbon, Sweetwater (WY) | Reasonably foreseeable (FEIS expected spring 2016). Proposal includes 8,950 natural gas wells, including 100 to 500 coal bed natural gas wells, on 1.1 million acres. |
| Atlantic Rim Natural Gas Field Development Project | Anadarko E&P Company and other operators | Carbon (WY) | Present. Project includes 2,000 gas wells and associated facilities; total new surface disturbance limited to 7,600 acres at any given time for an estimated total of 13,600 acres within a 211,000-acre area. |

| Project | Owner/ Applicant | County (State) | Status |
|---|---|---|---|
| Desolation Flats Natural Gas Development Project | Samson Resources, Mountain Gas Resources, LLC, and other operators | Carbon, Sweetwater (WY) | Present and reasonably foreseeable (ROD issued 2004; subsequent tiered NEPA in 2013). Development includes up to 385 wells at 361 locations (supporting facilities include up to 450 miles of upgraded and new roads; 361 miles of pipelines; and 4 compressor stations, one gas processing plant, 3 water evaporation ponds, 2 disposal wells, and 10 water wells). Disturbance estimated at 4,900 acres within a 233,542-acre area. |
| Seminoe Road Gas Development | Dudley & Associates, LLC | Carbon (WY) | Present. 19 natural gas wells. |
| South Baggs Area Natural Gas Development | Merit Energy Company | Carbon (WY) | Past and present. 93 natural gas wells and associated facilities on approximately 500 acres. |
| Jonah Infill Drilling Project | Encana and other operators | Sublette (WY) | Past and present. Approved for 3,500 additional natural gas wells in 2006. Disturbance limited to 14,030 acres of the field (30,500 acres) at any given time. |
| Pinedale Anticline Project | Questar, Shell, and Ultra Resources Inc. | Sublette (WY) | Past and present. Approved for up to 4,399 wells. Surface disturbance estimated at 12,272 acres of the 198,000-acre area. |
| Blacks Fork Hydrocarbon Development Project (formerly Moxa Arch Area Infill) | Anadarko Petroleum Corporation | Sweetwater, Uinta, Lincoln (WY) | Present and reasonably foreseeable Expansion (NEPA on hold). Proposed expansion of 7,500 hydrocarbon wells and 1,000 well pads on 633,532 acres of land. |
| Hiawatha Field Project | QEP, along with Wexpro Company | Sweetwater (WY) and northern Moffat (CO) | Reasonably foreseeable (DEIS is currently being revised). 157,335-acre project area with 2,200 exploratory and development wells. |

| Project | Owner/ Applicant | County (State) | Status |
|---|---|---|---|
| Wattenberg Gas Field | Noble Energy, Anadarko, and Encana | Weld, Boulder, Broomfield, Larimer (CO) | Past and present. Includes more than 20,000 wells across 2,000 square miles. Eight wells are generally permitted per 160 acres. |
| Normally-Pressured Lance (NPL) Natural Gas Development Project | Encana | Sublette (WY) | Reasonably foreseeable (DEIS is under development). Project would encompass 141,080 acres with up to 3,500 wells. Most wells would be co-located on a single pad, with no more than four well pads being constructed per 640 acres. On average, each well pad would be 18 acres in size. |
| Moneta Divide Natural Gas and Oil Development Project | Encana Oil and Gas (USA) Inc. and Burlington Resources Oil and Gas Company LP | Fremont, Natrona (WY) | Present and reasonably foreseeable (DEIS is scheduled for mid-2016). Project includes expansion with 4,250 natural gas and oil wells on approximately 265,000 acres of land. The life of the proposed project is estimated to be 40 years. |
| Bird Canyon Field Infill Project | Koch Exploration and Memorial Resource Development | Sublette, Lincoln (WY) | Reasonably foreseeable (NEPA on hold). Project includes 348 oil and gas wells over 10 to 20 years on 17,612 acres. |
| Horseshoe Basin Unit Project | Linn Energy | Sweetwater (WY) | Reasonably foreseeable (NEPA on hold). Includes 20 new oil or gas wells on 24,972 acres. |
| Converse County Oil and Gas Project | 6 companies | Converse (WY) | Reasonably foreseeable (DEIS anticipated mid-2016). Project includes 5,000 new oil or gas wells on roughly 1.5 million acres. |
| Riley Ridge to Natrona (RRNP) | Denbury Green Pipeline–Riley Ridge, LLC | Fremont, Sublette, Sweetwater, Natrona (WY) | Reasonably foreseeable (NEPA in development). Project includes 243-mile pipeline. |

| Project | Owner/ Applicant | County (State) | Status |
|---|---|---|---|
| Greater Crossbow Oil and Gas Project | EOG Resources | Campbell, Converse (WY) | Reasonably foreseeable (DEIS anticipated in summer 2017). Project includes 1,500 new oil and gas wells on roughly 120,000 acres. |
| Desolation Road | Mustang Resources | Sweetwater (WY) | Reasonably foreseeable (NEPA on hold). Project includes 17 wells on up to five well pads on 117 acres, within 2 miles of the Adobe Town Wilderness Study Area. |
| Overland Pass Pipeline Project | ONEOK Partners and Williams | Crook County (WY) Wyoming to Colorado | Past. 760-mile natural gas pipeline. |
| Black Butte Mine | Ambre Energy, Anadarko Petroleum, and Black Butte Coal Company | Sweetwater (WY) | Present. Operating coal mine on 42,421 acres. |
| Jim Bridger Mine | Pacific Minerals and Idaho Energy Resources | Sweetwater (WY) | Present. Operating surface, underground, and highwall coal mine on 28,514 acres. |
| Colowyo Mine | Colowyo Coal Company | Moffat (CO) | Present. Operating coal mine on 12,275 acres. |
| EDC Coal Mine | Energy Development Company | Carbon (WY) | Reasonably foreseeable project on 13,250 acres. |
| Carbon Basin Coal Mine | Arch of WY, LLC | Carbon (WY) | Reasonably foreseeable project on 17,154 acres. |
| Medicine Bow Coal Mine | Arch of WY, LLC | Carbon (WY) | Reasonably foreseeable project on 20,352 acres. |
| Stansbury Coal Mine | Rocky Mountain Coal Company | Sweetwater (WY) | Reasonably foreseeable project on 5,501 acres. |

| Project | Owner/ Applicant | County (State) | Status |
|---|---|---|---|
| Desarado Mine | Blue Mountain Energy, Inc. | Rio Blanco (CO) | Present. Operating coal mine on 11,819 acres. |
| Foidel Creek Mine | Twentymile Coal Company | Routt (CO) | Present. Operating coal mine on 21,821 acres. |
| Sage Creek Mine | Sage Creek Coal Company, LLC | Routt (CO) | Present. Operating coal mine on 10,154 acres. |
| Seneca II-W Mine | Seneca Coal Company | Routt (CO) | Present. Operating coal mine on 3,880 acres. |
| Trapper Mine | Trapper Mining, Inc. | Moffat (CO) | Present. Operating coal mine on 10,390 acres. |
| Yoast Mine | Seneca Coal Company | Routt (CO) | Present. Operating coal mine on 2,154 acres. |
| Williams Fork Coal Mine | BTU Empire Corporation | Moffat (CO) | Reasonably foreseeable project on 5,829 acres. |
| Dragon Trail Oil and Gas Field | Encana Oil and Gas USA and 9 others | Rio Blanco (CO) | Present. Oil/gas operation with 599 wells. |
| Desert Springs Oil and Gas Fields | Urban Oil and Gas Group and 13 others | Sweetwater (WY) | Present. Oil/gas operation with 118 wells. |
| Rangely Oil and Gas Fields | Chevron USA and 99 others | Rio Blanco (CO) | Present. Oil/gas operation with 2,480 wells. |
| Barrel Springs/Echo Springs/Standard Draw Fields | BP America, Linn Operating, Inc., and 21 others | Carbon, Sweetwater (WY) | Present. Oil/gas operation.<br>Barrel Springs – 469 wells.<br>Echo Springs – 1,041 wells.<br>Standard Draw – 616 wells. |
| Siberia Ridge/Wamsutter/ Tierney | BP America and 22 others | Sweetwater (WY) | Present. Oil/gas operation.<br>Siberia Ridge – 647 wells.<br>Wamsutter – 986 wells.<br>Tierney – 540 wells. |

| Project | Owner/ Applicant | County (State) | Status |
|---|---|---|---|
| Table Rock/Delaney Rim | Chevron USA, Anadarko, and 6 others | Sweetwater (WY) | Present. Oil/gas operation.<br>Table Rock – 219 wells.<br>Delaney Rim – 31 wells. |

Sources: BLM 2012a, 2013, 2015b, 2016b; Colorado Division of Reclamation Mining and Safety 2010; Colorado Oil and Gas Conservation Commission 2016a, 2016b; Utah Division of Oil, Gas, and Mining 2014a, 2014b, 2016; WDEQ 2015; Wyoming Oil and Gas Conservation Commission 2016; Wyoming State Geological Survey 2012a, 2012b, 2014.

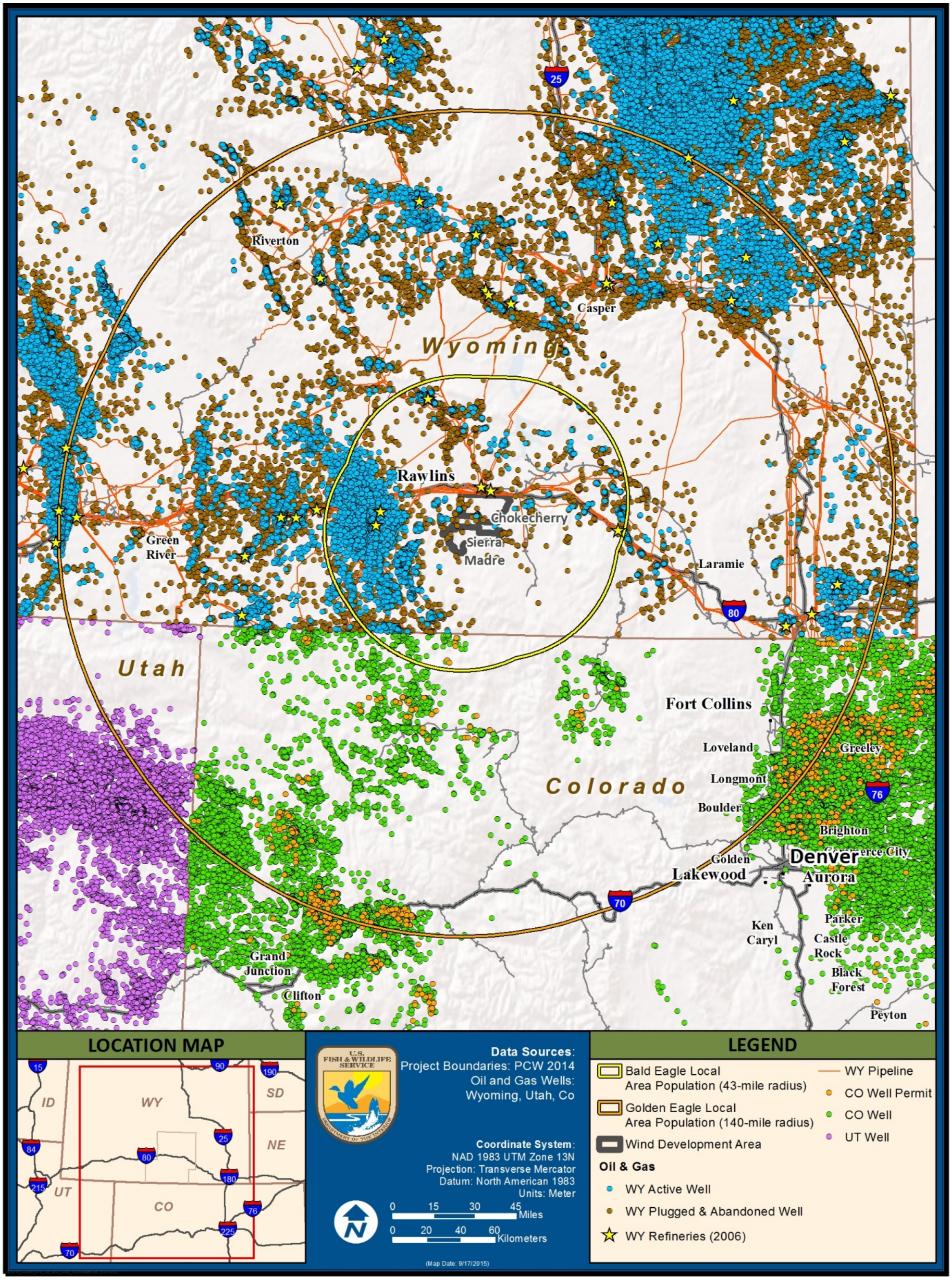


Figure 4-4. Oil and Gas Development in the Local Area for the CCSM Phase I Project in Wyoming

#### *4.3.2.4 Transportation Infrastructure*

As discussed in Section 2.2.2.4.3, wildlife can be killed by vehicles while crossing roadways or railroads or while scavenging on roadkill such as deer, coyotes, or other mammals. Scavenging increases during the winter months when other food sources are less available. Data on big game carcasses found along roadways within the local area were collected from State Departments of Transportation to identify high-density carcass areas (Colorado Department of Transportation 2015a; Wyoming Department of Transportation 2015). For purposes of this EIS, high-density carcass areas were identified as those stretches of highway where more than 50 carcasses were found within a 2-square-mile area over the past 7 to 8 years, for Colorado and Wyoming. Data for Utah were not available. High-density carcass areas within the local area are shown in red on Figure 2-8.

High-density carcass areas are generally associated with cities and municipalities in the local area. However, several high-density areas occur on more rural roads, including Routes 789 and 60 in Carbon County, Wyoming, just north of the state border with Colorado. Additional high-carcass areas in the local area of Wyoming include Wyoming State Highway (WYO) 120 near Thermopolis in Hot Springs County; WYO 28 between Lander and South Pass; WYO 131 (Sinks Canyon Road); U.S. 26 west of Riverton; U.S. 26/287 between Diversion Dam and Dubois; and U.S. 20/Wyoming 789 between Wind River Canyon and Kirby (Wyoming Department of Transportation 2013). High-density carcass areas identified in Fremont County, Wyoming, occur largely within the Wind River Reservation, which could be attributed to higher amounts of carcass reporting and documentation.

In Colorado, Larimer and Moffat Counties average more than 3,600 wildlife-vehicle collisions annually (Meyers 2014). According to the Colorado Department of Transportation, wildlife-vehicle collisions have been on a downward trend since 2006 and can be attributed to the wildlife zone designations, which double fines for speeding at night in 100 miles of designated “wildlife crossing zones” (Colorado Department of Transportation 2012). Within the local area, the counties of Moffat, Routt, Jackson, Larimer, Rio Blanco, Garfield, Eagle, Summit, Grand, Boulder, and Weld had a combined total of 871 vehicle-wildlife collisions in 2013 (Colorado Department of Transportation 2014).

The Wyoming, Colorado, and Utah Departments of Transportation have forecast a variety of roadway infrastructure projects over the next 5 years that include rehabilitation, widening, pavement overlays, microsurfacing or resurfacing, slope repair, and bridge replacement. Based on the State Transportation Improvement Plans for the three states within the LAP, there are no widening projects or new highways planned in the LAP area during 2016 through 2021 (Wyoming Department of Transportation 2016; Colorado Department of Transportation 2015b; Utah Department of Transportation 2016).

#### *4.3.2.5 Hunting*

Hunting is a popular recreational activity in the portions of Wyoming, Colorado, and Utah that comprise the local area. These states prohibit the use of lead shot when hunting waterfowl. Within the local area of analysis, however, wetland areas subject to such restrictions are limited in extent. More typically within the local areas, permitted hunters use lead ammunition to hunt for a variety of small game, upland game birds, and big game species. Unpermitted hunting of wildlife also introduces lead into the environment. Although the use of non-lead ammunition has been recommended by USFWS and other organizations, the use of lead ammunition remains legal for non-waterfowl hunting and its use will likely continue. As discussed in Section 2.2.2.4.2, lead concentrations in carcasses can impact eagles when they scavenge these animals.

The 2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation determined that more than 500,000 people over the age of 16 hunted in Wyoming, Colorado, and Utah in that year, spending an average of $90 each on ammunition (USFWS and U.S. Census Bureau 2014). The survey did not distinguish between types of ammunition and analyzed data only at the state level.

The WGFD and Utah's Division of Wildlife Resources manage discrete sets of hunting units for most species, whereas Colorado Parks and Wildlife manages a single set of hunting units for most species, with separate unit divisions for bighorn sheep and Rocky Mountain goats. The number of hunting units within the LAP boundary, per big game species, is summarized in Table 4-5. Hunters in these units harvested nearly 61,000 big game animals in 2014 (Colorado Parks and Wildlife 2015; Utah Division of Wildlife Resources 2015; WGFD 2015a). Harvest data were not available for small game and upland game birds for all three states for 2014; however, Wyoming issues nearly 120,000 permits annually for small game and upland game birds that may be hunted with lead ammunition (WGFD 2015b).

Table 4-5. Hunting Units within the LAP Boundary for the CCSM Phase I Project in Wyoming

| Big-Game Species | Wyoming | Colorado | Utah |
|---|---|---|---|
| Antelope/Pronghorn | 69 | 59 | 4 |
| Bear | 14 | 59 | 3 |
| Big-Horn Sheep | 7 | 18 | 4 |
| Bison | 2 | - | 1 |
| Mule Deer | 63 | 59 | 4 |
| White-Tailed Deer | 39 | | |
| Elk | 50 | 59 | 3 |
| Moose | 12 | 59 | 2 |
| Mountain Lion | 22 | - | - |
| Rocky Mountain Goat | - | 9 | 2 |

Sources: Colorado Parks and Wildlife 2015; Utah Division of Wildlife Resources 2015; WGFD 2015a.

## 4.4 Impacts by Resource

### 4.4.1 Water Resources

The effects of large landscape trends on water resources occur at a regional scale as well as at the local area scale. Because the local area includes portions of all four BCRs, and many of the impacts are fairly similar, we determined that it is more efficient to combine the discussion of landscape-level effects. Several of the past, present, and reasonably foreseeable future actions described in Section 4.3 affect regional and local water resources significantly. As noted in Section 4.2, we are focusing the analysis of cumulative impacts on the LAP for resources other than eagles and cultural resources.

The criteria we used to evaluate impacts on water resources in Chapter 3.0 are the same criteria that we use to evaluate cumulative impacts on water resources here. Therefore, the impact criteria table from Section 3.3.3 is included below as Table 4-6.

Table 4-6. Impact Criteria for Water Resources for the CCSM Phase I Project in Wyoming

| Impact Category | Intensity Type | Definition |
|---|---|---|
| Magnitude | Major | The action would substantially affect water resources in the study area. Adverse impacts would include any of the following:<br>• Impacts on surface waters would affect a large portion of a major waterbody or watershed, substantially reducing the ability of these areas to support fish or bird use.<br>• Water quality impacts would alter baseline water quality conditions and cause impairment of waters.<br>• Surface water use from the action would limit existing aquatic life or adversely affect special status fish species.<br>• Floodplains would be substantially altered to limited functionality.<br>• Groundwater conditions would be noticeably affected, and hydrologic connectivity with surface waters or other habitat supported by shallow groundwater would be altered. |
| | Moderate | The action would measurably affect water resources in the study area. Adverse impacts would include any of the following:<br>• Impacts on surface waters would affect a medium portion of a major waterbody or watershed (or sub-watershed), somewhat reducing the ability of these areas to support |

| Impact Category | Intensity Type | Definition |
|---|---|---|
| | | fish or bird use.<br>• Water quality impacts would be detectable, but would be at or below water quality standards and would not cause impairment of any waters.<br>• Surface water use from the action would measurably affect aquatic life or special status fish species, but would not imperil any populations or species.<br>• Floodplains would be measurably altered to somewhat reduced functionality.<br>• Groundwater conditions would be measurably affected, but hydrologic connectivity with surface waters or other habitat supported by shallow groundwater would not be substantially altered. |
| | Minor | The action could result in some change to water resources in the study area. Adverse impacts would include any of the following:<br>• Impacts on surface waters would affect a small portion of a waterbody or sub-watershed that might slightly affect the ability of these localized areas to support fish or bird use.<br>• Water quality impacts would be detectable but would be well below water quality standards and within desired water quality conditions.<br>• Surface water use from the action would be measurable, but would be relatively small and would not affect aquatic life or special status fish species.<br>• Floodplain impacts could be measurable, but would be limited to minor and localized effects on floodplain functions.<br>• Groundwater conditions could be measurably affected, but hydrologic connectivity with surface waters or other habitat supported by shallow groundwater would not be measurably affected. |
| | No effect | Any changes to waterbodies, watersheds, water quality, floodplains, or groundwater would not be |

| Impact Category | Intensity Type | Definition |
|---|---|---|
| | | measurable or perceptible and would have no consequence on water resources that provide habitat for special status species, migratory birds, or eagle prey species. |
| Duration | Long-term | 30 years (proposed project duration) |
| | Medium-term | 5 years (permit term) |
| | Temporary | Lasting for the duration of construction |
| Potential to occur | Probable | More likely than not to occur |
| | Possible | Potential to occur |
| | Unlikely | Not reasonably likely to occur |
| Geographic extent | Extensive | Within the two EMUs and four BCRs |
| | Regional | Within the 140-mile local area |
| | Limited | Within 1 mile of Phase I development and infrastructure areas |

Surface waters provide direct habitat and sustain adjacent habitat such as wetlands and riparian zones habitat for migratory birds and eagle prey species. Water resources at both landscape scales have been impacted extensively by agricultural conversion and hydrologic modifications such as stream channelization and water diversion. As discussed above, issues of water supply and demand from continued expansion of human development (that is, urbanization, agriculture, mining, and energy extraction) place significant strains on water supplies, resulting in dewatering of streams and other water bodies, degradation of natural stream channels and floodplain functions, groundwater depletions, and impacts on water quality (Pool and Austin 2006; Gupta 2007; IWJV 2013). If climate change results in reduced annual precipitation, the impacts from diversion would be magnified (Zahniser et al. 2009; IWJV 2013; IPCC 2014).

Cropland conversion, livestock grazing, and other development (including transmission lines and transportation projects) also contribute to increased levels of disturbance and reduced vegetative cover, which lead to increased erosion (Marston and Dolan 1988). Watersheds are degraded by increased erosion and human-caused exceedances to other water quality constituents (that is, elevated phosphorous and nitrogen from farming and grazing, metals from mining and energy extraction, and other contaminant emissions, leaks, and spills from various development activities) (Stevens 2001; WDEQ 2012, 2014; IWJV 2013).

Many of the impacts on water resources described above have occurred and are expected to continue to occur within and immediately adjacent to the CCSM Phase I Project. Other nearby projects have their own requirements for use of groundwater or surface water, with potential for surface water impacts through vegetation and topsoil disturbance. Reasonably foreseeable future wind energy development may include the CCSM Phase II Project (proposed east of the CCSM Phase I Project), which is the closest reasonably foreseeable project with the highest potential for cumulative impacts. This would include an additional

500 turbines within both the Chokecherry and Sierra Madre WDAs immediately east of the Phase I WDAs. The CCSM Phase I Project also includes multiple avoidance and minimization measures to reduce the anticipated impacts on surface waters at and near the site. Additionally, PCW has proposed conservation measures that would provide probable benefits to surface waters, including the following:

- Land management commitments to conserve or enhance aquatic habitat, water development projects associated with greater sage-grouse conservation, and mesic habitat improvements. These conservation measures would likely improve water resources within the local area as habitat for migratory birds and eagle prey species and would possibly improve floodplain function of select streams.
- Wildfire emergency stabilization efforts that would help reduce potential erosion that could otherwise impact water quality, and burned area rehabilitation projects that would help re-establish hydrologic function of burned areas.

With implementation of avoidance and minimization measures, the CCSM Phase II Project in combination with Alternative 1 (Proposed Action) would result in probable, limited, minor temporary to long-term impacts on local and regional water resources, but these impacts would likely be offset by conservation measures. The impacts under Alternative 2 (Proposed Action with Different Mitigation) and Alternative 3 (Issue ETPs for Only the Sierra Madre Portion of the CCSM Phase I Project) would be comparable to the impacts under Alternative 1, but would be slightly less because of more mitigation occurring in the local and regional area, and a smaller area of disturbance, respectively. The No Build scenario under Alternative 4 (No Action: Denial of ETPs) would cause fewer impacts than the other alternatives, and the Build Without ETPs scenario under Alternative 4 would likely cause impacts similar to those under Alternative 1. On a cumulative basis with the CCSM Phase II Project, all but the No Build scenario under Alternative 4 would likely have comparable impacts on water resources.

The cumulative effects of past, present, and reasonably foreseeable impacts on water resources within and immediately near the CCSM Phase I Project would have probable, regional, temporary to long-term, moderate, adverse effects on surface water resources and surface water quality.

### 4.4.2 Vegetation and Wetlands

The effects of large landscape trends on vegetation and wetlands occur at a regional as well as a local area scale. Several of the past, present, and reasonably foreseeable future actions described above in Section 4.3 would affect vegetation and wetlands. As noted in Section 4.2, we are focusing the analysis of cumulative impacts on the LAP for resources other than eagles and cultural resources.

The criteria we used to evaluate impacts on vegetation and wetlands in Chapter 3.0 are the same criteria that we use for evaluating cumulative impacts on vegetation and wetlands here. Therefore, the impact criteria table from Section 3.4.3 is included below as Table 4-7.

## Table 4-7. Impact Criteria for Vegetation and Wetlands for the CCSM Phase I Project in Wyoming

| Impact Category | Intensity Type | Definition |
|---|---|---|
| Magnitude | Major | The action would noticeably change the amount or condition of vegetation or wetlands in the study area. Adverse impacts would result in a relatively large reduction in acreage or extensive degradation of vegetation types and wetlands that provide habitat for special status species, migratory birds, or eagle prey species. Major degradation would include a proliferation of noxious weeds or invasive plants across large areas. Major adverse impacts would also include the following:<br>• Loss of any populations or subpopulations of special status plant species or their designated critical habitat<br>• Measurable unmitigated consequences to wetlands |
| | Moderate | The action would result in some change to the amount or condition of vegetation or wetlands. Adverse impacts would result in a measurable but relatively modest reduction in acreage or degradation of vegetation types and wetlands that provide habitat for special status species, migratory birds, or eagle prey species. Moderate adverse impacts would also include the following:<br>• Measureable but moderate adverse consequence to populations or subpopulations of special status plant species<br>• Readily apparent effects on wetlands over a relatively small area that would have a moderate effect on habitat for special status species, migratory birds, or eagle prey species<br>Beneficial impacts would result in a moderate increase or enhancement of vegetation types and wetlands that provide habitat for special status species, migratory birds, or eagle prey species. |
| | Minor | The action could result in some change to the amount or condition of vegetation or wetlands. Adverse impacts would result in a measurable but relatively small reduction in acreage or degradation of vegetation types and wetlands that provide habitat for special status species, migratory birds, or eagle prey species. Minor adverse impacts would also include |

| Impact Category | Intensity Type | Definition |
|---|---|---|
| | | the following:<br>• Measureable but small adverse consequence to special status plant species<br>• Relatively minor impacts on wetlands that would have a limited effect on habitat for special status species, migratory birds, or eagle prey species<br>Beneficial impacts would result in a slight increase or enhancement of vegetation types and wetlands that provide habitat for special status species, migratory birds, or eagle prey species. |
| | No effect | Any change to vegetation or wetlands would not be measurable or perceptible and would have no consequence on habitat for special status species, migratory birds, or eagle prey species. |
| Duration | Long-term | 30 years (proposed project duration) |
| | Medium-term | 5 years (permit term) |
| | Temporary | Lasting for the duration of construction |
| Potential to occur | Probable | Not avoidable |
| | Possible | Potential to occur (may be able to mitigate) |
| | Unlikely | Not reasonably likely to occur |
| Geographic extent | Extensive | Within the two EMUs and four BCRs |
| | Regional | Within the 140-mile local area |
| | Limited | Within 1 mile of Phase I development and infrastructure areas |

Vegetation communities, including wetlands and riparian zones, provide habitat for migratory birds and eagle prey species. Vegetation resources at both landscape scales have been impacted extensively by human development (that is, urbanization, agriculture, infrastructure including transmission lines and transportation, mining, and energy extraction). As a result of cropland conversion and domestic livestock grazing, native vegetation communities have been dramatically altered in many areas and entirely removed in some places. The shift from native wildlife grazing patterns to livestock grazing patterns has resulted in less diversity of vegetation and spread of invasive species that alter plant community diversity and abundance (Pool and Austin 2006; IWJV 2013). For example, cheatgrass invasion from livestock grazing changes the structure of the understory, providing more complete and continuous ground cover in contrast to the sparse cover of native perennials (Pool and Austin 2006; IWJV 2013). Invasive plants can have a negative influence on other undisturbed areas in the landscape. Brandt and Rickard (1994) documented that non-native species were able to colonize relatively undisturbed grasslands and shrublands.

Therefore, even relatively undisturbed vegetation communities are affected by disturbed areas within the landscape.

As discussed above, water diversion and other development activities have substantially reduced the amount and condition of wetlands and riparian zones. If climate change results in reduced annual precipitation, wetlands and riparian zones would be further reduced. Fire suppression contributes to the expansion of coniferous woodland into former grassland habitat, and it may also be allowing for the expansion of deciduous vegetation along ephemeral drainages (Pool and Austin 2006). Fire can also act as a disturbance, which promotes the introduction and spread of invasive species that further increase the probability of fire (Milberg and Lamont 1995). Transmission lines and transportation facilities also contribute to direct loss and degradation of vegetation communities, including wetlands and riparian zones.

Many of the impacts on vegetation and wetlands described above have occurred and are expected to continue to occur within and immediately adjacent to the CCSM Phase I Project. Reasonably foreseeable future wind energy development may include the CCSM Phase II Project, which is the closest reasonably foreseeable project with the highest potential for cumulative impacts. The CCSM Phase I Project also includes multiple avoidance and minimization measures to reduce the anticipated impacts on vegetation and wetlands at and near the site. Additionally, PCW has proposed conservation measures that would provide probable benefits to vegetation and wetlands. Several conservation measures that would be implemented by PCW as part of its sage-grouse conservation plan would benefit vegetation. The sage-grouse conservation plan includes wind conservation easements, habitat improvement measures, enhancements to relic agricultural fields, and other stabilization and revegetation measures. Improvements to mesic habitats would likely enhance some wetlands and riparian zones and create new wet meadows. Wind conservation easements would protect lands from future wind development but would not necessarily protect vegetation communities from other land uses. Relic agricultural field enhancements would establish desirable types of vegetation communities within portions of the approximately 2,023 acres of identified relic fields that are currently dominated by monocultures of cheatgrass, crested wheatgrass, and other introduced species. Similarly, stabilization and burned area revegetation projects would help protect intact sagebrush communities and re-establish native species.

With implementation of avoidance and minimization measures, the CCSM Phase II Project (proposed east of Phase I) would result in probable, limited, moderate temporary to long-term impacts on vegetation and wetlands, but some of these impacts would be offset by conservation measures. The cumulative effects of past, present, and reasonably foreseeable impacts on vegetation and wetlands within and immediately near the CCSM Phase I Project would have probable, regional, long-term, moderate, adverse effects on vegetation and wetlands.

Alternative 2 (Proposed Action with Different Mitigation) and Alternative 3 (Issue ETPs for Only the Sierra Madre Portion of the CCSM Phase I Project) would cause impacts comparable to those under Alternative 1 (Proposed Action), but with slightly less impact because of more mitigation (especially habitat enhancement and wind conservation easements) occurring in the local and regional area, and a smaller area of disturbance, respectively. The No Build scenario under Alternative 4 (No Action: Denial of ETPs) would not contribute to cumulative impacts, and the Build Without ETPs scenario under Alternative 4 would likely cause impacts similar to the impacts under Alternative 1.

### 4.4.3 Fish, Amphibians, and Reptiles

The effects of large landscape trends on fish, amphibians, and reptiles can occur at a regional as well as a local scale. Several of the past, present, and reasonably foreseeable future actions described above in Section 4.3 would affect fish, amphibians, and reptiles. As noted in Section 4.2, we are focusing the analysis of cumulative impacts on the LAP for resources other than eagles and cultural resources.

The criteria we used to evaluate impacts on fish, amphibians, and reptiles in Chapter 3.0 are the same criteria that we use for evaluating cumulative impacts on fish, amphibians, and reptiles here. Therefore, the impact criteria table from Section 3.5.3 is included below as Table 4-8.

Table 4-8. Impact Criteria for Fish, Amphibians, and Reptiles for the CCSM Phase I Project in Wyoming

| Impact Category | Intensity Type | Definition |
|---|---|---|
| Magnitude | Major | The action would result in substantial indirect habitat impacts from disruption, alteration, or irreplaceable loss of vital and high value habitats, or of a large amount of suitable habitat for fish, amphibians, or reptiles.<br>The action would result in substantial direct fatality of fish, amphibians, or reptiles.<br>The action would adversely affect special status fish, amphibian, or reptile species with substantial consequence to the individual, population, or habitat. |
| | Moderate | The action would result in some indirect disruption, alteration, or loss of habitat that would be expected to result in measureable but modest impacts on fish, amphibians, or reptiles.<br>The action would result in some direct but localized fatality of fish, amphibians, or reptiles.<br>The action would have a measureable but modest effect on special status fish, amphibian, or reptile species or their critical habitat. |
| | Minor | The action would result in some indirect change in the amount or condition of habitat for fish, amphibians, or reptiles.<br>The action would result in a limited amount of direct |

| Impact Category | Intensity Type | Definition |
|---|---|---|
| | | but localized fatality of fish, amphibians, or reptiles that would not be expected to have any long-term effects on any populations of fish, amphibians, or reptiles.<br>The action would slightly affect special status fish, amphibian, or reptile species or their critical habitat. |
| | No effect | The action would not result in any measureable or observable indirect or direct impacts on fish, amphibians, or reptiles or their habitat. |
| Duration | Long-term | 30 years (proposed project duration) |
| | Medium-term | 5 years (permit term) |
| | Temporary | Lasting for the duration of construction |
| Potential to occur | Probable | More likely than not to occur |
| | Possible | Potential to occur |
| | Unlikely | Not reasonably likely to occur |
| Geographic extent | Extensive | Within the two EMUs and four BCRs |
| | Regional | Within the 140-mile local area |
| | Limited | Within 1 mile of Phase I development and infrastructure areas |

Habitat for fish, amphibians, and reptiles has been impacted extensively by human development (that is, urbanization, agriculture, infrastructure including transmission lines and transportation, mining, and energy extraction). Diversion has depleted many water bodies that provide habitat for fish and some reptiles and amphibians. Cropland conversion and domestic livestock grazing has resulted in direct habitat loss, habitat alternation, and fragmentation, across aquatic and terrestrial habitat. Through hydrologic modifications and impacts on water quality (including impacts from mining and energy extraction), some water bodies have become unsuitable for some species of fish and amphibians. The reduction in wetlands and riparian zones represents direct loss of important habitat for many reptile and amphibian species, and removal of these areas also degrades aquatic habitat for fish. If climate change results in reduced annual precipitation, wetlands and riparian zones would be further reduced. Invasive plant species degrade habitat suitability for some reptiles and amphibians. Transmission lines and transportation facilities also contribute to direct loss and degradation of habitat for fish, amphibians, and reptiles. Fire suppression leading to vegetation shifts could result in reduced habitat suitability for some reptiles and amphibians. Climate change may reduce habitat suitability for some fish, amphibians, and reptiles (Zahniser et al. 2009; National Fish, Wildlife and Plants Climate Adaptation Strategy 2012; IPCC 2014). Agriculture, mining and energy extraction, transmission lines, and transportation infrastructure also result in disturbance and direct mortality to reptiles and amphibians, and often create movement barriers that can impede fish, amphibians, and reptiles from completing life-cycle requirements (Forman and Alexander 1998; Jochimsen et al. 2004; PLJV 2015; van der Ree et al. 2011; IWJV 2013).

Many of the impacts on fish, amphibians, and reptiles described above have occurred and are expected to continue to occur within and immediately adjacent to the CCSM Phase I Project. Reasonably foreseeable future wind energy development may include Phase II of the CCSM Project, which is the closest reasonably foreseeable project with the highest potential for cumulative impacts. The CCSM Phase I Project also includes multiple avoidance and minimization measures to reduce the anticipated impacts on vegetation and wetlands at and near the site. Additionally, PCW has proposed conservation measures that would provide probable benefits to fish, amphibians, and reptiles, including:

- Land management commitments to conserve or enhance aquatic habitat, water development projects associated with greater sage-grouse conservation, and mesic habitat improvements that would likely either directly improve habitat or improve water quality functions and enhance downstream habitat for fish, amphibians, and reptiles.
- Wildfire emergency stabilization efforts and burned area rehabilitation projects that would provide direct habitat improvements for amphibians and reptiles and watershed improvement that could enhance downstream fish habitat.
- Relic agricultural field enhancements that would improve upland habitat for some amphibians and reptiles.

With implementation of avoidance and minimization measures, the CCSM Phase II Project would result in probable, limited, moderate temporary to long-term impacts on fish, amphibians, and reptiles, but some of these impacts would be offset by the above conservation measures. The cumulative effects of past, present, and reasonably foreseeable impacts within and immediately near the CCSM Phase I Project would have probable, limited, long-term, minor, adverse effects on fish, amphibians, and reptiles.

Alternative 2 (Proposed Action with Different Mitigation) and Alternative 3 (Issue ETPs for Only the Sierra Madre Portion of the CCSM Phase I Project) would cause impacts comparable to those under Alternative 1 (Proposed Action), but with slightly less impact because of more mitigation (especially habitat enhancement and wind conservation easements) occurring in the local and regional area, and a smaller area of disturbance, respectively. The No Build scenario under Alternative 4 (No Action: Denial of ETPs) would not contribute to cumulative impacts, and the Build Without ETPs scenario under Alternative 4 would likely cause impacts similar to those under Alternative 1.

### 4.4.4 Mammals

Cumulative impacts of past, present, and future actions on mammals within the Phase I development and infrastructure areas result primarily from the following:

- Disturbance and displacement from development.
- Habitat loss, degradation, and fragmentation from development, agriculture, and fire suppression.

- Water diversion leading to changes in hydrology, wetland loss, and habitat suitability
- Global climate change resulting in shifting geographic ranges, seasonal activities, migration patterns, and abundances.

Cumulative impacts on mammals from past and present development (most notably energy-related development, agriculture, fire suppression, and water diversion) include habitat loss, fragmentation, disturbance, and displacement. These impacts are considered cumulatively significant to all mammals, but in particular to big game species that migrate long distances and use habitat over a broad range. Cumulative impacts have the potential to affect multiple seasonal ranges as well as result in barriers to movement. WGFD has determined that crucial winter range is a determining factor for meeting or maintaining big game population objectives. For example, species such as mule deer require high-quality forage during the winter in order to meet their energy needs. Individuals whose needs are not met are unlikely to reproduce and may not survive a particularly harsh season or climate event (WGFD 2013b). As noted in Section 4.2, we are focusing the analysis of cumulative impacts on the LAP for resources other than eagles and cultural resources.

The criteria we used to evaluate impacts on mammals in Chapter 3.0 are the same criteria that we use for evaluating cumulative impacts on mammals here. Therefore, the impact criteria table from Section 3.6.3 is included below as Table 4-9.

Table 4-9. Impact Criteria for Mammals for the CCSM Phase I Project in Wyoming

| Impact Category | Intensity Type | Definition |
|---|---|---|
| Magnitude | Major | The action would result in substantial indirect impacts on habitat from disruption, alteration, or irreplaceable loss of vital and high-value habitats, or of a large amount of suitable habitat for mammals.<br>The action would result in substantial direct fatality of mammals.<br>The action would adversely affect special status mammal species with substantial consequence to the individual, population, or habitat. |
| | Moderate | The action would result in some indirect impacts on habitat from disruption, alteration, or loss of habitat that would be expected to result in measureable but modest impacts on mammals.<br>The action would result in some direct but localized fatality of mammals.<br>The action would have a measureable but modest effect on special status mammal species or their critical habitat. |

| Impact Category | Intensity Type | Definition |
|---|---|---|
| | Minor | The action would result in some indirect change in the amount or condition of habitat for mammals.<br>The action would result in a limited amount of direct but localized fatality of mammals that would not be expected to have any long-term effects on any populations of mammals.<br>The action would slightly affect habitat for special status mammals. |
| | No effect | The action would not result in any measureable or observable direct or indirect impacts on mammals or their habitat. |
| Duration | Long-term | 30 years (proposed project duration) |
| | Medium-term | 5 years (permit term) |
| | Temporary | Lasting for the duration of construction |
| Potential to occur | Probable | More likely than not to occur |
| | Possible | Potential to occur |
| | Unlikely | Not reasonably likely to occur |
| Geographic extent | Extensive | Within the two EMUs and four BCRs |
| | Regional | Within the 140-mile local area |
| | Limited | Within 1 mile of Phase I development and infrastructure areas |

Sagebrush and wetland habitats in Wyoming have been characterized as having the highest potential exposure to development (Pocewicz et al. 2014) due to the current and projected increase in energy and residential development. Cumulative impacts on sagebrush, riparian habitat, and wetlands affect furbearers, big game, and bats, which use these important habitats for travel corridors, refuge, and foraging.

Loss of habitat can also expose mammals to more urbanized areas, making them more vulnerable to vehicle collisions, hunting, poaching, and disturbance. Additionally, human development often results in an increase in noise and lighting, which in turn can increase stress levels of individuals by reducing the time they spend on important biological activities such as feeding, breeding, or resting (Barber et al. 2010). Cumulative impacts from habitat loss and degradation may lead to increased mortality and increased stress levels of individuals, both of which could reduce the overall fitness of a population.

Construction and operation of Phase I and the infrastructure components of the CCSM Project (under all alternatives) would result in long-term, minor disturbance and displacement impacts for all species and species groups (small game and furbearers, big game, bats, and special status species). Global climate change could exacerbate these effects, on big game in particular, by resulting in shifting geographic ranges, seasonal activities, and migration patterns. The CCSM Phase I Project would contribute negligible to minor impacts on the cumulatively significant impact of habitat loss and disturbance, when considered in context with the impacts of development, agriculture, and global climate. Alternative 2 (Proposed Action with Different Mitigation) could result in beneficial effects on mammals by reducing the number of carcasses in roadsides or by conserving additional habitat.

Direct impacts on bats from operation of the CCSM Phase I Project would be major, as discussed in Section 3.6.3.2.1. When considered in context with other development projects that would result in bat fatalities, including the reasonably foreseeable CCSM Phase II Project and the effects of climate change, the CCSM Phase I Project could contribute a minor amount to cumulatively significant impacts on bats. Alternative 2 (Proposed Action with Different Mitigation) could result in beneficial effects on bats by decommissioning or upgrading existing wind energy facilities. Alternative 3 (Issue ETPs for Only the Sierra Madre Portion of the CCSM Phase I Project) would cause impacts comparable to those under Alternative 1 (Proposed Action), but the impacts would be slightly less because of a smaller area of disturbance. The No Build scenario under Alternative 4 (No Action: Denial of ETPs) would not contribute to cumulative impacts, and the Build Without ETPs scenario under Alternative 4 would likely cause impacts similar to those under Alternative 1.

Within the local area, the cumulative impacts on mammals from transmission lines, mineral and energy development, transportation infrastructure, and hunting include habitat loss, conversion, and fragmentation; behavioral changes such as avoidance, disturbance, and displacement; and increases in fatalities from construction activities, vehicle collisions, hunting, and turbine operations. Overall, these cumulative impacts on mammals are adverse and significant. The CCSM Phase I Project would contribute minor to moderate impacts on cumulative impacts on mammals in the local area.

### 4.4.5 Birds (Other than Eagles)

The effects of large landscape trends can occur at a regional as well as a local area scale. Below we discuss the impacts on birds (other than eagles) from agricultural conversion, fire suppression, water diversion, mineral and energy development, climate change, transmission lines, transportation, and hunting. As noted in Section 4.2, we are focusing the analysis of cumulative impacts on the LAP for resources other than eagles and cultural resources.

The criteria we used to evaluate impacts on birds (other than eagles) in Chapter 3.0 are the same criteria that we use for evaluating cumulative impacts on birds (other than eagles) here. Therefore, the impact criteria table from Section 3.7.3 is included below as Table 4-10.

### Table 4-10. Impact Criteria for Birds (Other than Eagles) for the CCSM Phase I Project in Wyoming

| Impact Category | Intensity Type | Definition |
|---|---|---|
| Magnitude | Major | The action would result in substantial indirect impacts on habitat from a large reduction or alteration of habitat, making it unusable by birds for nesting, foraging, wintering, or other life history activities.<br>The action could result in direct injury or fatality of birds, including special status species, resulting in a local population-level effect on a bird species. |
| | Moderate | The action would result in some indirect impacts on habitat from loss of habitat or alterations that are expected to result in a measureable but moderate change in bird use, including localized reductions in reproductive success or survival.<br>The action could result in some direct injury or fatality of birds, including special status species, but would not result in population-level effects. |
| | Minor | The action would result in some indirect change in the amount or condition of habitat for birds.<br>The action would result in a limited amount of direct but localized fatality of birds that would not be expected to have any long-term effects on any populations of birds. |
| | No effect | The action would not result in any measureable or observable direct or indirect impacts on birds or their habitat and would have no consequence. |
| Duration | Long-term | 30 years (proposed Project duration) |
| | Medium-term | 5 years (permit term) |
| | Temporary | Lasting for the duration of construction |
| Potential to occur | Probable | More likely than not to occur |
| | Possible | Potential to occur |
| | Unlikely | Not reasonably likely to occur |
| Geographic extent | Extensive | Within the two EMUs and four BCRs |
| | Regional | Within the 140-mile local area |
| | Limited | Within 1 mile of Phase I development and infrastructure areas |

#### *4.4.5.1 Agricultural Conversion*

In addition to habitat loss due to conversion to agricultural cropland, habitat has been lost due to conversion to domestic livestock grazing. As a consequence of rangeland grazing, the composition of many of the major habitats in the region has been substantially altered or degraded, especially in areas of naturally occurring water that attract livestock, such as riparian zones (Pool and Austin 2006). The shift from native wildlife grazing patterns to livestock grazing patterns has resulted in less diversity of vegetation and habitat, which negatively affects bird species (Fleischner 1994). Birds vary in their responses to grazing, which results in shifts in avian community structure in grazed landscapes (Bock et al. 1993). Cropland and grazing conversion have led to declines in many grassland- and shrubland-dependent species and favored increases in more generalist species. This shift has altered the species composition and relative abundance within bird communities throughout the LAP and on a continental scale (Knopf 1994; Fleischner 1994).

The spread of invasive species has accompanied agricultural conversions. Invasive grasses have influenced the structure and function of grassland and sagebrush habitat throughout the region. Invasive grass species alter plant community diversity, abundance, and ecological function (IWJV 2013). For example, cheatgrass invasion changes the structure of the understory, providing more complete and continuous ground cover in contrast to the sparse cover of native perennials (Pool and Austin 2006; IWJV 2013). While shrubland-associated birds may not be sensitive to cheatgrass understory, grassland-associated birds tend to use native bunchgrass more than cheatgrass (Earnst and Holmes 2012). Invasive vegetation can have a negative influence on other undisturbed areas in the landscape. Brandt and Rickard (1994) documented that non-native species were able to colonize relatively undisturbed grasslands and shrublands. Therefore, even in relatively undisturbed habitats, avian communities are affected by altered or degraded habitats within the landscape. Additionally, an increase in cheatgrass and other invasive plant species increases both the threat and extent of actual wildfires, which ultimately heighten habitat loss and degradation.

#### *4.4.5.2 Fire Suppression*

Fire suppression contributes to the expansion of coniferous woodland into former grassland habitat, and it may also be allowing for the expansion of deciduous vegetation along ephemeral drainages (Pool and Austin 2006). Bird communities impacted by woody encroachment are anticipated to favor species tolerant of a higher tree cover in lieu of grassland-obligate species (Coppedge et al. 2004; Chapman et al. 2004). Some studies document that wooded edge effects result in higher nest predation (Schneider et al. 2012; Knight et al. 2014). On a landscape level, these impacts have had negative effects on shrub-steppe and grassland avian populations (Knight et al. 2014). Conversely, greater sage-grouse and other sagebrush obligates are dependent on healthy sagebrush vegetation, and wildfires represent a serious threat. Fire suppression is an effective management tool to protect greater sage-grouse habitat (Connelly et al. 2000). Fire can also act as a disturbance, which promotes the introduction and spread of invasive species that further increase the probability of fire (Milberg and Lamont 1995).Water Diversion

Issues of water supply and demand from continued expansion of human development (that is, urbanization, agriculture, mining, and energy extraction) place significant strains on water resources. In arid and semi-arid regions, riparian zones and other mesic habitats are important habitat types for many avian species. Mesic habitats exhibit higher species richness and abundance and can act as havens for grassland species (Kim et al. 2008; Sanders and Edge 1998). Demands on the water supply result in direct wetland loss, as well as indirect depletion of water tables and diminished recharge of aquifers. Also, increasingly limited water resources prolong the effects of periodic droughts. As the human population continues to grow locally and regionally, demands on the water supply will continue to have detrimental effects on bird populations through loss of mesic habitats, especially in arid and semi-arid landscapes (Kim et al. 2008).

#### *4.4.5.3 Mineral and Energy Development*

Oil and gas exploration and development activities have increased dramatically in recent years and are projected to continue to increase in the reasonably foreseeable future. Coal mining has occurred for many years, and coal-bed methane production is projected to expand in some of the coal-producing areas, especially in northeastern Wyoming (EIA 2015).

Risks to avian communities from oil, gas, and mining activities include habitat loss and fragmentation; increased spread of invasive weeds; disturbance of birds during road construction, drilling, and operation; water depletions; contamination of water and soils; spread of disease; and direct mortality in oil and gas reserve pits, compressors, or collisions with infrastructure. Renewable energy developments can carry many of the same risks and impacts associated with fossil fuel development, including habitat loss and fragmentation from transmission lines and transportation infrastructure (Jones et al. 2015). These effects on avian habitat are described in greater detail in Section 3.7. Other effects from mineral and energy development, such as water depletion, soil and water contamination, and increased spread of invasive species, would result in indirect effects on avian populations through alterations in vegetation communities. This could make some areas unsuitable or less productive and could bring potential changes in invertebrate prey abundance in response to changing water regimes or contamination events (Jones et al. 2015). The presence of ponds associated with oil and gas development, particularly coal-bed natural gas, has been shown to increase mosquito populations and facilitate the spread of West Nile virus among avian populations, including greater sage-grouse (Zou et al. 2006; Doherty 2007; Walker et al. 2007).

Present and reasonably foreseeable wind energy facilities within the local area, defined as those facilities exporting energy to the transmission grid, are summarized in Table 4-2 and shown in Figure 4-3. The direct and indirect impacts from proposed wind energy on bird populations are described in Section 3.7.3. The bird communities at other wind facilities would experience similar effects from habitat loss, habitat fragmentation, disturbance, displacement, and collision risk.

#### *4.4.5.4 Climate Change*

Evidence of present climate-change impacts includes changing precipitation patterns; more frequent hot and fewer cold temperature extremes; and shifting geographic ranges, seasonal activities, migration patterns, and abundance of terrestrial and aquatic species (IPCC 2014). Projected future effects due to climate change include declines in soil moisture; increases in catastrophic events, including landslides and fires; and altered surface water flows, water quality, and water quantity.

The declines in soil moisture, changing precipitation patterns, and temperature extremes in a changing climate could affect frequency and duration of heat waves and droughts. Albright et al. (2010) found that the combination of heat waves and droughts results in lower abundance of ground-nesting birds. Coupled with changing temperature regimes, this is expected to cause birds to shift their current geographic ranges. Langham et al. (2015) projected that, based on decades of North American Breeding Bird Survey data, 314 species are vulnerable to losing more than half of their current geographic range across three scenarios of climate change through the end of the century. For 40 percent of these species, the range loss is not balanced by range shift, but rather by a shrinking of the populations. The remaining species are likely to colonize new areas where appropriate environmental conditions and habitat exist. However, not all species respond the same to environmental changes, and some species do not have the same dispersal traits as others (Langham et al. 2015).

A shift in the seasonal activities and migration timing of birds could potentially result in timing mismatches between the period when bird species are breeding and the period of highest prey abundance to support successful nesting attempts (Visser and Both 2005). In addition, for some grassland species, initiating nests earlier in the season tends to be a more successful strategy (Hatchett et al. 2013); however, milder winters with earlier warming could potentially cause snakes, a major avian nest predator for grassland and shrubland nesting birds, to become active earlier than usual in the nesting season (DeGregorio et al. 2015).

#### *4.4.5.5 Transmission Lines*

In the reasonably foreseeable future, several major transmission lines may be developed and will supplement current lines, as noted in Table 4-1. Although direct habitat loss associated with transmission line construction may be low, species avoidance of tall structures that provide perching habitat for predators in open landscapes may result in indirect habitat loss (Pitman et al. 2005; Pruett et al. 2009). Also, transmission line maintenance roads through woodlands and shrublands create fragmentation, facilitate greater human access, and increase the spread of invasive species and travel corridors for avian nest predators (DeGregorio et al. 2014). These factors typically result in greater edge effects, disturbance from human activities, vegetation community alterations, and potentially higher nest predation by species that use edges created by transmission lines more frequently (DeGregorio et al. 2014). In addition, the increase of power line corridors in the local landscape increases the collision and electrocution risk for birds.

#### *4.4.5.6 Transportation*

In addition to the direct habitat loss from the construction of transportation corridors, indirect habitat loss and habitat degradation through avian species avoidance of roads can be significant. Benítez-López et al. (2010) reported that bird species abundance declined 28 to 36 percent within 2.6 kilometers of roads and 25 to 38 percent within 17 kilometers of infrastructure. However, some bird groups, such as raptors, are more abundant near road corridors (Benítez-López et al. 2010). This study suggested that traffic intensity, or the amount of traffic on a road, is not a consistent predictor of this effect.

Some studies have shown that traffic noise can have an indirect effect on avian populations through shifts in community composition. For some species, nest success was lowest near roads, suggesting that the species is intolerant to high ambient noise (Francis et al. 2009). A potential reason for noise sensitivity in some species may result from the traffic noise disruption of important signaling and communication necessary for establishing breeding territories and maintaining pair bonds (Parris and Schneider 2009). Also, on low-traffic rural roads, avian nest survival can be lower due to higher predation from some predators that use the roads as movement corridors (DeGregorio et al. 2014). Proximity to roads can also increase collision fatalities (Bennett et al. 2011). Conversely, Francis et al. (2009) documented that some species had higher nest success near roads with high noise levels, suggesting that the noise reduced nest predation. Fugitive dust from gravel roads, trucks hauling materials, and windborne soil can also affect wildlife.

Habitat fragmentation is another major impact of road networks. As road density increases, the average habitat patch size decreases. Habitat fragmentation creates variable, isolated populations of species. The long-term viability of species in meta-populations (that is, species with irregular distributions) depends on patch size and the permeability between the populations. Roads, fencing, and other obstructions present barriers to wildlife movement. If too many barriers exist and the patch sizes are not large enough to sustain a population, then the local extirpation of species increases, with the associated loss of genetic information, further reducing population viability (Bennett et al. 2011). As road density and traffic volumes increase on a landscape scale, fugitive dust and habitat loss and fragmentation also increase; this can have significant consequences on the population viability of some species, while other, tolerant species may increase near roads.

#### *4.4.5.7 Hunting*

Hunting is a popular recreational activity in the local and regional areas. Although the use of lead shot is prohibited for hunting waterfowl, hunters often use lead ammunition for vermin, small game, upland game birds, and big game. Illegal poaching and fishing with lead sinkers can also introduce lead into the environment. Higher blood lead levels have been documented in vultures during deer and wild pig hunting seasons (Kelly and Johnson 2011). A study on 19 raptor species documented the highest mean blood lead levels in turkey vultures, and 2 percent of the individuals sampled had blood lead levels that exceeded clinical thresholds, indicating sub-lethal and acute toxicity (Martin et al. 2008). Although USFWS and other organizations recommend the use of non-lead ammunition, it is legal except for hunting waterfowl and is likely to continue (USFWS 2014c; Frommer 2010). The presence of lead in the environment would impact non-game bird populations, primarily affecting vultures and other avian scavengers.

#### *4.4.5.8 Impact Analysis*

Many of the impacts on birds described above in Sections 4.4.5.1 through 4.4.5.8 are expected to occur within and immediately adjacent to the CCSM Phase I Project. Reasonably foreseeable future wind energy development may include the CCSM Phase II Project, which is the closest reasonably foreseeable project with the highest potential for cumulative impacts. Impacts on birds could include injury or fatality from collision with wind turbines, overhead power lines, meteorological or communication towers, buildings, or vehicles, as well as electrocution with power lines. Habitat loss, degradation, fragmentation, and displacement/disturbance could also occur as a result of construction and operation of wind facilities, which could result in various detrimental impacts on the bird community. The addition of this wind facility could compound impacts within the area and contribute to population-level impacts throughout the region and local area. The CCSM Phase I Project includes multiple avoidance and minimization measures to reduce the anticipated impacts at and near the site. In addition to compensatory mitigation, PCW has proposed conservation measures for the permitted take of eagles, by improving habitat for the eagle prey base, including:

- A commitment to work with local private landowners to improve wildlife habitat on private ranch land in the area;
- Restoration of cheatgrass-dominated pastures and restoration of burned areas to shrublands and grasslands;
- Improvement of mesic habitats and creation of wet meadows;
- Implementation of a greater sage-grouse conservation plan to restore and protect sage-grouse habitat;
- Suspension of sage-grouse hunting, reducing potential exposure to lead shot; and
- Procurement of a conservation easement on land along the North Platte River.

While the CCSM Phase II Project would cause detrimental impacts on birds, some of these would be offset by the above conservation measures. The cumulative effects of past, present, and reasonably foreseeable impacts on birds (other than eagles) could result in large-scale, population-level impacts for some bird species. It is probable that the combined impacts on birds (other than eagles) would result in impacts ranging from minor to moderate that are long-term and regional.

The cumulative effects of past, present, and reasonably foreseeable impacts on birds (other than eagles) within and immediately near the CCSM Phase I Project would have long-term, moderate, regional adverse effects on some bird species.

The impacts under Alternative 2 (Proposed Action with Different Mitigation) would be comparable to those under Alternative 1 (Proposed Action), but slightly less because more mitigation (especially habitat enhancement and wind conservation easements) would occur in the local and regional areas. Mitigation to remove or avoid carcasses would also benefit other scavenger species. The impacts under Alternative 3 (Issue ETPs for Only the Sierra Madre

Portion of the CCSM Phase I Project) would be slightly less than impacts under Alternative 1 because a smaller area would be affected. The No Build scenario under Alternative 4 (No Action: Denial of ETPs) would not contribute to cumulative impacts, and the Build Without ETPs scenario under Alternative 4 would likely cause impacts similar to those under Alternative 1.

### 4.4.6 Eagles

The criteria we used to evaluate impacts on eagles in Chapter 3.0 are the same criteria that we use for evaluating cumulative impacts on eagles here. Therefore, the impact criteria table from Section 3.8.3 is included below as Table 4-11.

Table 4-11. Impact Criteria for Eagles for the CCSM Phase I Project

| Impact Category | Intensity Type | Definition |
|---|---|---|
| Magnitude | Major | The action would result in a large indirect impact on habitat from reduction or alteration of habitat, making it unusable by eagles for nesting, foraging, wintering, or other activities resulting in a population-level effect.<br>The action could result in direct injury or fatality of eagles resulting in a population-level effect. |
| | Moderate | The action would result in some indirect loss of habitat or alterations that are expected to result in a measureable but moderate change in eagle use, including localized reductions in reproductive success or survival.<br>The action could result in some direct injury or fatality of eagles, but would not result in population-level effects. |
| | Minor | The action could result in some indirect change to the amount or condition of habitat, but changes would have little risk of injury or fatality of eagles.<br>The action would not be expected to result in any direct injury or fatality of eagles. |
| | No effect | The action would not result in any measureable or observable direct or indirect impacts on eagles or their habitat and would have no consequence. |
| Duration | Long-term | 30 years (proposed project duration) |
| | Medium-term | 5 years (permit term) |

| Impact Category | Intensity Type | Definition |
|---|---|---|
| | Temporary | Lasting for the duration of construction |
| Potential to occur | Probable | More likely than not to occur |
| | Possible | Potential to occur |
| | Unlikely | Not reasonably likely to occur |
| Geographic extent | Extensive | Within the two EMUs (for bald eagles) and four BCRs (for golden eagles) |
| | Regional | Within the 140-mile local area |
| | Limited | Within 1 mile of Phase I development and infrastructure areas |

#### *4.4.6.1 Conversion of Habitat to Agriculture*

The primary consequence of conversion to cropland is large-scale habitat loss for a majority of eagle prey species, which reduces the suitability of breeding territories. Eagles occupy nest sites in areas with a sufficient prey base to support successful breeding (Steenhof et al. 1997). Kochert et al. (1999) documented that the presence of a vacant neighboring territory, the amount of agricultural land, and the proportion of shrubs within 3 kilometers of a nest territory best predicted the probability of golden eagle territory occupancy. Nest success was not associated with these variables, but was positively associated with previous nesting success (Kochert et al. 1999).

Agriculture is a major source of ground and surface water use, accounting for as much as 90 percent of water consumption in parts of the western United States (U.S. Department of Agriculture 2015). Increased agriculture on the landscape can also result in adverse impacts on water quality through the non-point discharge of agricultural chemicals (that is, pesticides, fertilizers, or herbicides). The loss of surface water and contamination of water bodies could reduce the quality or quantity of aquatic prey available to bald eagles. Alternatively, creation of reservoirs for agricultural or potable water use could provide water sources for aquatic prey and eagle use. Poorly managed livestock grazing can result in changes to vegetation composition and structure, which can alter small mammal communities (Davies et al. 2014). As these changes escalate across the region, increased pressure on the eagles' prey base could result in lower productivity of and distributional shifts in the eagle population, as suitable nesting territories are lost to agriculture.

#### *4.4.6.2 Fire Suppression*

Fire suppression and the resulting expansion of coniferous woodland into former grassland can remove and degrade habitat for eagle prey and affect aquatic prey through impacts on water quality and quantity. Upland game birds, particularly greater sage-grouse, are important prey species for golden eagles, at least on a local basis, and a major threat to these species is conifer encroachment, causing loss of sagebrush habitat. Wildfires remove sagebrush habitat, which can take 15 to 50 years or longer to return. Wildfires also result in conditions that promote the introduction of invasive weeds and hinder re-establishment of native plant communities, which can degrade or remove sagebrush vegetation and increase the likelihood of additional wildfires. For instance, the spread of cheatgrass could lower small mammal abundance in affected areas (Hall 2012; Gano and Rickard 1982). The expansion of woody vegetation with high water requirements into riparian areas can lower water tables and reduce available foraging habitat for bald eagles (Pool and Austin 2006). Non-native plants, such as saltcedar (*Tamarix* spp.), have higher evapotranspiration rates than grass species, so water is more likely to evaporate before recharging streams and aquifers. The increased demand, increased evaporation due to more trees and woody vegetation, and dwindling water supply are likely to result in prolonged drought effects in the LAP and beyond (Pool and Austin 2006; IWJV 2013). Increased risk and severity of wildfires and altered fire regimes are a threat to greater sage-grouse and other eagle prey, and for this reason fire suppression has been suggested as a management tool for golden eagles (Kochert et al. 1999).

#### *4.4.6.3 Water Diversion*

Water diversion for agricultural and urban uses results in long-term wetland loss and altered flow regimes, and compounds the effects of ongoing droughts. Eagle prey species, both terrestrial and aquatic, rely heavily on healthy, functioning wetlands, ephemeral and perennial streams, and their associated riparian areas. Prolonged drought affects not only aquatic species, but also terrestrial species that rely on plant productivity. Small-mammal communities can be profoundly affected by droughts, and effects can linger for many years following drought conditions. Effects include poor body condition, changes in community species composition, and reduced abundance (Schramm et al. 1992). The most frequently documented effects of droughts on fish communities include population declines, loss of habitat, changes in the community, movement within catchments, and crowding of fish in reduced microhabitats (Matthews and Marsh-Matthews 2003). A higher frequency of droughts or prolonged droughts could have a significant effect on the prey base of eagles in the region, resulting in lower productivity of the eagle population on a regional level.

#### *4.4.6.4 Mineral and Energy Development*

Oil and gas development in the region has expanded greatly in the last 50 years and is projected to continue. The patterns of development and road infrastructure associated with oil and gas development result in habitat loss and extensive habitat fragmentation (Jones and Pejchar 2013). Oil and gas development can also result in direct eagle fatalities due to electrocution or collision with overhead power lines, buildings, or vehicles. In addition, oil and gas development can result in high amounts of water consumption, noise and light pollution, introduction of invasive species, and soil and water contamination, as well as impacts on ecosystem services (Jones et al. 2015). These impacts represent degradation of and disruption to eagle nesting and foraging habitat. There is a documented association between ponds affiliated with oil and gas development, particularly coal-bed natural gas, and the spread of West Nile Virus to birds (Zou et al. 2006). Both bald and golden eagles are susceptible to infection with West Nile Virus (Jimenez-Clavero et al. 2008; Ip et al. 2014), or could become potential sources of the virus in its sub-lethal form (Nemeth et al. 2006).

Non-hydrologic renewable energy development, such as solar and wind, is anticipated to increase due to the high commercial potential of these resources in the BCRs. In addition to the direct habitat loss and fragmentation associated with renewable energy development, eagles also experience direct collision mortality with wind turbines. Transmission lines and towers that accompany solar and wind energy development also result in habitat fragmentation and direct fatality due to electrocution and collision (Erickson et al. 2005).

The proliferation of mineral and energy development and associated infrastructure in the LAP and surrounding area is likely to result in additive effects of direct collision mortality as well as reduced productivity, due to alterations in the eagles' prey base from water depletion, water contamination, habitat loss, and habitat fragmentation. In general, the negative impacts on small mammal and upland game bird populations, as well as development impacts on fish habitat, are likely to result in lower eagle productivity in areas where energy infrastructure intensifies or where previously undisturbed areas experience new disturbance from multiple impacts. In addition, occupancy of nesting territories may decrease in areas where road infrastructure density increases, which would result in higher densities of top predators (eagles) in areas that are less impacted, putting increased pressure on the prey base.

#### *4.4.6.5 Climate Change*

Present evidence of climate change includes changing precipitation patterns, more severe weather events, and more frequent hot and fewer cold temperature extremes. These anomalies result in shifts in geographic range, seasonal activities, migration, and abundance of terrestrial and aquatic species (IPCC 2014). The reduction or increase in abundance of terrestrial and aquatic prey base would likely have corresponding effects on eagle productivity and territory occupancy. The geographic ranges and the seasonal activities of the bald and golden eagle could shift with their respective prey bases. An increase in the number of extremely hot days could have a regional negative effect on golden eagle nesting success and brood size (Steenhof et al. 1997).

Projected future effects of climate change include declines in soil moisture, increases in catastrophic events such as fires, altered surface water flow, and changes in water quality and quantity (BLM 2009). Due to the increased demand for water in this region described above, the reduction in supply and impairment of water quality could potentially have detrimental effects on eagles.

#### *4.4.6.6 Impact Analysis*

The cumulative effects of past, present, and reasonably foreseeable impacts on bald and golden eagles in combination with the CCSM Phase I Project were evaluated in detail within the LAP; eagle populations and migration within the EMU, which includes the four-BCR area for golden eagles, were also considered. Figure 2-1 illustrates the EMUs for bald eagles, and Figure 4-1 shows the BCRs for golden eagles.

##### *4.4.6.6.1 Bald Eagle*

The LAP for bald eagles is delimited by a circle with a radius of 43 miles around the project footprint, with 43 miles representing the mean natal dispersal distance for bald eagles. The management units currently used by USFWS to manage bald eagle populations are the Northern Rocky Mountains and the Rocky Mountains and Plains EMUs.

The LAP of bald eagles for the CCSM Phase I Project is approximately 117 eagles, as shown in Table 4-12, and the 1 percent and 5 percent benchmarks for this LAP are 1 and 6 bald eagles, respectively. We have identified that a take rate of 1 percent of the estimated total eagle population at the LAP scale (referred to as the 1 percent benchmark) is a level of take that would be of concern to us (USFWS 2013b). We have determined that the 5 percent benchmark (a take rate of 5 percent of the estimated eagle population at the LAP scale) is the upper end of what would be appropriate under the BGEPA preservation standard, whether offset by compensatory mitigation or not (USFWS 2013b).

### Table 4-12. Estimated Bald Eagle Local Area Population for the CCSM Phase I Project in Wyoming

| Eagle Management Unit (EMU) | Estimated Number of Bald Eagles |
|---|---|
| Northern Rocky Mountains | 114 |
| Rocky Mountains and Plains | 3 |
| Total Local Area Population | 117 |
| 1% LAP Benchmark | 1 |
| 5% LAP Benchmark | 6 |

We established take thresholds for bald eagle populations by EMU in the Final Environmental Assessment for the 2009 BGEPA take regulations. For the Northern Rocky Mountains EMU, the annual take threshold for the portion within the USFWS Region 6 boundary is 31 bald eagles per year, and for the Rocky Mountains and Plains EMU, the annual take threshold is 13 eagles per year; the combined annual take threshold is 44 bald eagles per year (USFWS 2009).

Based on the USFWS eagle mortality database and an additional set of eagle mortality records available from the WGFD, there were 11 reported bald eagle mortalities within the bald eagle LAP between 2005 and 2014, as shown in Table 4-13. These mortalities were identified as due to human causes, including three records of collisions with wind turbines, three records of highway accidents (assumed to be cases where vehicles collided with eagles), two records of electrocution on power lines, and one record of a collision with a power line (see Table 4-13). The lack of mortalities due to natural causes such as disease or starvation should not be interpreted as meaning that these mortality types did not occur within the local-area population between 2005 and 2014; undoubtedly these types of mortalities did occur, but we simply lack information on them for this time period.

Table 4-13. Known Bald Eagle Mortalities within 43 Miles of the CCSM Phase I Project in Wyoming, 2005 through 2014

| Type of Mortality | Number of Mortalities | Percent of Total Mortalities |
|---|---|---|
| Human Causes | | |
| Electrocution | 2 | 18.1 |
| Collision with Power Line | 1 | 9.2 |
| Collision with Wind Turbine | 3 | 27.3 |
| Collision with Vehicle | 3 | 27.3 |
| Unknown | 2 | 18.1 |
| Total Mortalities | 11 | 100 |

The mortality database included two other bald eagle mortalities for which the cause was unknown. Again, a major caveat is that these records are biased due to the manner in which they were obtained and reported. Although most of the available bald eagle mortality records in our database and the WGFD database are related to power lines, wind turbines, and collisions with vehicles, we cannot say that these sources of eagle mortality are more important as factors in eagle mortality within the LAP than other potential mortality sources such as shooting, poisoning, or other human sources. Facility maintenance practices for electric utility and wind energy companies ensure that these facilities are on a regular inspection schedule which may explain the higher rates of reporting of eagle mortalities for these industries. It is certainly possible that other anthropogenic eagle mortality factors, such as shooting or poisoning, or natural mortality causes such as disease and starvation, could be more important in terms of total eagle take within this area; however, we simply lack the data to meaningfully assess the relative importance of different mortality factors.

To assess bald eagle mortalities due to collisions with wind turbines at existing wind energy facilities, we used a USFWS cumulative effects tool to calculate that less than 1 eagle per year is taken by existing online wind facilities at the LAP level. Again, a caveat on this estimate is that it is based only on bald eagle mortality records self-reported to us by online operating wind facilities. There are other online wind energy facilities within the LAP that are not reporting bald eagle mortalities to us, but for which eagle mortalities are likely occurring at some level. However, in this analysis we elected not to assign a value for bald eagle mortalities to these wind facilities because estimates of unreported wind energy fatalities would be too speculative. The above estimate of 1 bald eagle taken per year within this LAP by online wind facilities should be viewed as a minimum estimate for this type of take. If we subtract the estimate of 1 eagle taken by wind facilities per year from the above 1 percent and 5 percent benchmarks, we are left with approximately 0 eagles at the 1 percent level and 5 eagles at the 5 percent level.

For bald eagle fatalities due to power line impacts, the total number reported from 2005 through 2014 was 3 (see Table 4-13), or less than 1 eagle per year. Again, since not all eagles taken by electrocutions or collisions with power lines are discovered and reported to us, the average of 1 bald eagle killed by power line impacts should be considered a minimum estimate for this type of take. If we subtract the estimate of 1 bald eagle per year taken by power lines from the above numbers for wind turbine impacts, we are left with -1 bald eagle at the 1 percent level and 4 eagles at the 5 percent level.

For bald eagle fatalities due to collisions with vehicles on highways, the total number from 2005 through 2014 was 3 (see Table 4-13), or less than 1 eagle per year. Again, since not all eagles killed in vehicle collisions are discovered or reported, an average of 1 eagle taken per year could be considered a minimum estimate for this type of take. If we subtract the estimate of 1 eagle per year taken by vehicle collisions from the above combined numbers for take due to wind turbine and power line impacts, we are left with -2 eagles at the 1 percent level and 3 eagles at the 5 percent level.

Using our eagle fatality prediction model (USFWS 2013c), we used eagle data from pre-construction eagle surveys to predict the number of bald eagles the CCSM Phase I Project would take per year. At the upper 80th credible interval level, we estimate this wind project would take 1 or 2 bald eagles per year, depending on the size of the wind turbines used for the Project. Using this estimate and the above combined reductions against the 1 percent and 5 percent benchmarks due to wind energy, power lines, and vehicle collisions, if 1 bald eagle were taken by the CCSM Phase I Project per year, then the combined cumulative take would be -2 eagles at the 1 percent level and 2 eagles at the 5 percent level; and the combined take would be -4 eagles at the 1 percent level and 1 eagle at the 5 percent level if the permitted take level was 2 eagles per year. So, the combined take of bald eagles from the CCSM Phase I Project, with permitted take of 1 eagle per year added to other bald eagle take from existing power lines and collisions with turbines and vehicles, is about 4 eagles per year, or about 3 percent of the LAP. The combined take of bald eagles from the CCSM Phase I Project, with permitted take of 2 eagles per year added to other bald eagle take from existing power lines and collisions with turbines and vehicles, is about 5 eagles per year, or about 4 percent of the LAP. Total eagle take per year due to the CCSM Phase I Project, in addition to other ongoing take due to other unpermitted activities resulting in take, would be either 4 or 5 bald eagles per year (again, with either 1 eagle or 2 eagles predicted per year for the CCSM Phase I Project, depending on the size of turbines used for the Project, added to 1 eagle per year due to other ongoing take at wind facilities plus 1 eagle per year ongoing take due to power lines plus 1 eagle per year ongoing take due to vehicle collisions), or about 3.6 or 4.3 percent of the LAP. In both cases, this combined annual take of bald eagles (3.6 or 4.3 percent of the LAP) exceeds the 1 percent benchmark level, but is below the 5 percent benchmark level for this LAP.

The CCSM Phase II Project is estimated to result in up to 1 or 2 additional takes of bald eagles per year (see Table 4-3), depending on the wind turbine blade diameter. Combined with the estimated results reported above, an estimated combined take of 5 to 7 bald eagles would occur. The shorter blade dimension is estimated to result in take below the 5 percent benchmark level of 6 eagles, but take estimated for the longer blade diameter would exceed the 5 percent benchmark level.

We also considered the cumulative take of bald eagles associated with the CCSM Phase I Project in terms of the bald eagle thresholds for the bald eagle EMUs provided in the 2009 Final Environmental Assessment, Table C.3 (USFWS 2009). The estimated take of 4 or 5 bald eagles per year (estimated from the CCSM Phase I Project plus other ongoing eagle take), subtracted from the combined threshold level for the Northern Rocky Mountains and Rocky Mountains and Plains EMUs (44 eagles), leaves 40 or 39 bald eagles per year that could still be taken from the combined EMUs in Region 6. Most of the bald eagles in the LAP associated with the CCSM Phase I Project are from the Northern Rocky Mountains EMU. If only the Northern Rocky Mountain EMU threshold of 31 eagles per year is considered, and the estimated take above of 4 or 5 eagles per year is subtracted, this leaves 27 or 26 eagles per year that could be taken—a reduction for the Northern Rocky Mountain EMU of about 13 or 16 percent. It is probable that the CCSM Phase I Project combined with past, present, and reasonably foreseeable future actions within the LAP would result in minor to moderate, long-term, extensive impacts on bald eagles.

Alternative 2 (Proposed Action with Different Mitigation) and Alternative 3 (Issue ETPs for Only the Sierra Madre Portion of the CCSM Phase I Project) would cause impacts comparable to those under Alternative 1 (Proposed Action), but with slightly less impact because of more mitigation occurring in the local and regional areas, and a smaller area of disturbance, respectively. The No Build scenario under Alternative 4 (No Action: Denial of ETPs) would not contribute to cumulative impacts. However, the Build Without ETPs scenario under Alternative 4 would cause greater impacts than the Proposed Action, since many of the provisions of the ECP would not be implemented.

##### *4.4.6.6.2 Golden Eagle*

For the CCSM Phase I Project, the LAP of golden eagles is comprised of eagles within the 140-mile radius. The LAP of golden eagles for the CCSM Phase I Project is approximately 1,932 eagles, as shown in Table 4-14, and the 1 percent and 5 percent benchmarks for this LAP are about 19 and 97 golden eagles, respectively. We have identified that take rates of between 1 percent and 5 percent of the total estimated local-area eagle population size are a concern to us, with 5 percent being at the upper end of what would be appropriate under the BGEPA preservation standard, whether offset by compensatory mitigation or not (USFWS 2013b).

Table 4-14. Estimated Golden Eagle Local Area Population for the CCSM Phase I Project in Wyoming

| Bird Conservation Region (BCR) | Estimated Number of Golden Eagles |
|---|---|
| BCR 17: Badlands and Prairies | 357 |
| BCR 10: Northern Rockies | 1,126 |
| BCR 16: Southern Rockies/Colorado Plateau | 422 |
| BCR 18: Shortgrass Prairie | 27 |
| Total Local Area Population | 1,932 |
| 1% LAP Benchmark | 19 |
| 5% LAP Benchmark | 97 |

Based on combined records from our USFWS eagle mortality database and the WGFD eagle mortality database, 430 golden eagle mortalities were documented within the LAP between 2005 and 2014, as shown in Table 4-15. About 99 percent of these reported mortalities were due to human causes, with only 4 reported cases of mortality due to natural causes. Given that there were undoubtedly other eagle mortalities due to natural causes within this 10-year span, this further illustrates a bias with these mortality records since there was no systematic mortality survey effort, and no standardized method of data collection, on found deceased eagles. Of the anthropogenic causes of mortality, 50 percent were related to power lines, with 217 cases of electrocutions and 4 cases of collisions with power lines (see Table 4-15). The remaining eagle mortalities due to human causes were due to either collisions with wind turbines (97 records; 23 percent of all records) or collisions with vehicles along highways/roads (60 records; 14 percent).

Additionally, there were seven records of golden eagles being shot, three records of collisions with trains along railroad lines, two records of mortality due to collision with a fence, two records of non-target snaring, one record of mortality due to collision, but where the type of structure collided with was unknown, and one record where an eagle was killed due to management/research trapping (see Table 4-14). All types of collision mortalities combined comprised 37 percent of the documented mortalities between 2005 and 2014. While there are numerous sources of golden eagle fatality in the LAP analysis area, the three sources of fatality that are most common are electrocution, collisions with wind turbines, and collisions with vehicles. As such, our calculations of combined eagle take consider only electrocution, collisions with wind turbines, and collisions with vehicles.

Although most of the available golden eagle mortality records combined from our database and the WGFD database are related to power lines (mostly electrocutions) or collisions with wind turbines or motor vehicles, we cannot say that these sources of eagle mortality are more important as factors in eagle mortality within the LAP than shooting, poisoning, or any other human-related source of eagle mortality. Facility maintenance practices for electric utility and wind energy companies ensure that these facilities are on a regular inspection schedule, which may explain the higher rates of reporting of eagle mortalities for these industries. Similarly, eagle remains are more visible along highways than in areas away from roadways. It is certainly possible that other eagle mortality factors that our sample suggests occur infrequently, such as shooting, could be much more important in terms of total eagle take within this area; however, we simply lack the data to meaningfully assess the relative importance of these mortality factors.

Table 4-15. Known Golden Eagle Mortalities within 140 Miles of the CCSM Phase I Project in Wyoming, based on available data from 2005 through 2014

| Type of Mortality | Number of Mortalities | Percent of Total Mortalities |
|---|---|---|
| Natural causes | | |
| Killed by another animal | 1 | <1 |
| Emaciation/Starvation | 2 | <1 |
| Physiological Stress | 1 | <1 |
| Human Causes | | |
| Electrocution | 217 | 50 |
| Collision with Power Line | 4 | 1 |
| Collision with Wind Turbine | 97 | 23 |
| Collision with Vehicle | 60 | 14 |
| Collision with Fence | 2 | <1 |
| Collision on Railroad | 3 | <1 |
| Collision (Unknown structure) | 1 | <1 |
| Shot | 7 | 2 |
| Non-target snaring | 2 | <1 |
| Management/Research Trapping | 1 | <1 |
| Unknown | 19 | 4 |
| Other | 13 | 3 |
| Total Mortalities | 430 | 100 |

For golden eagle mortalities due to collisions with wind turbines at wind energy facilities, we used the USFWS cumulative effects tool to calculate that approximately 17 eagles per year are taken by existing online wind facilities at the LAP level. The estimate is based on available data from 2005 through 2014, with the likelihood that more recent data include more mortalities. A further caveat on this estimate is that it is based only on golden eagle mortality records self-reported to us by online operating wind facilities. There are other online wind energy facilities within the LAP that have not reported golden eagle mortalities to us but for which eagle mortalities are likely occurring at some level. However, in this analysis we elected not to assign a value for golden eagle mortalities to these wind facilities because estimates of unreported wind energy fatalities would be speculative. Therefore, the above estimate of 17 golden eagles taken per year within this LAP by online wind facilities should be viewed as a minimum estimate of mortalities due to this mortality type. Subtracting the estimate of 17 eagles taken by wind facilities per year from the above 1 percent and 5 percent benchmarks leaves approximately 2 eagles at the 1 percent level and 80 eagles at the 5 percent level for the LAP.

For golden eagle mortalities due to power line impacts (combination of electrocutions and collisions with power lines), the total number from 2005 through 2014 was 221 (see Table 4-15), for an average of about 22 per year. Again, since not all eagles that are killed by electrocutions or collisions with power lines are discovered and reported to us, the average of 22 golden eagles per year killed by power line impacts should be viewed as a minimum estimate of this type of take. If we subtract the estimated 22 eagles per year taken by power lines from the above numbers for wind turbine impacts, we are left with -20 eagles at the 1 percent level and 58 eagles at the 5 percent level for the LAP. Subsequently, the combined golden eagle take due to wind turbines (approximately 17 eagles) and power lines (approximately 22 eagles) is approximately 39 eagles per year.

For golden eagle mortalities due to collisions with vehicles on highways, the total number from 2005 through 2014 was 60 (see Table 4-15), for an average of about 6 eagles per year. Again, since not all eagles killed along highways in collisions with motor vehicles are discovered and reported, this average of 6 eagles taken per year should be viewed as a minimum estimate for this type of take. If we subtract the estimated 6 eagles per year taken by vehicle collisions along highways from the above combined numbers for take due to wind turbine and power line impacts, we are left with -26 eagles at the 1 percent level and 52 eagles at the 5 percent level for the LAP. Consequently, the current combined take of eagles due to wind turbine, power line, and vehicle collision impacts is approximately 45 eagles per year.

Using our eagle fatality prediction model (USFWS 2013c) and eagle data from pre-construction eagle surveys provided by PCW for the CCSM Phase I Project, we predicted the number of golden eagles the CCSM Phase I Project would take per year. At the upper 80$^{th}$ credible interval level, we estimate that the proposed project would take either 10 or 14 golden eagles per year (depending on the size of wind turbines used for the Project; see Chapter 2, Section 2.2.1.3.3). Using this estimate and the above reductions against the 1 percent and 5 percent benchmarks due to existing wind energy, power lines, and vehicle collisions, if 10 or 14 golden eagles were taken by the CCSM Phase I Project per year, then the combined take would be -36 eagles at the 1 percent level and 42 eagles at the 5 percent level for the LAP if the permitted take level was 10 eagles per year; and the combined take would be -40 eagles at the 1 percent level and 38 eagles at the 5 percent level if the permitted take level was 14 eagles per year. So, the combined take of golden eagles from the CCSM Phase I Project, with permitted take of 10 eagles per year added to other golden eagle take from existing power lines and collisions with turbines and vehicles, is about 55 eagles per year or about 3 percent of the LAP. The combined take of golden eagles from the CCSM Phase I Project, with permitted take of 14 eagles per year added to other golden eagle take from existing power lines and collisions with turbines and vehicles, is about 59 eagles per year or also about 3 percent of the LAP. In both cases, the 3 percent combined take level for golden eagles at the LAP scale exceeds the 1 percent benchmark, but is still below the 5 percent benchmark level.

The CCSM Phase II Project is estimated to take up to 32 or 25 additional golden eagles per year (see Table 4-3), depending on the wind turbine blade diameter. The estimated numbers of take are based on conservative assumptions, providing anticipated high values. Combined with the estimated results reported above, an estimated 91 to 84 combined take of golden eagles could occur from both the CCSM Phase I and Phase II Projects, which is below the current 5 percent benchmark level.

The CCSM Phase I Project would contribute moderate to major adverse impacts on other past, present, and reasonably foreseeable future actions in the local area, which would result in probable long-term, extensive impacts on golden eagles.

Alternative 2 (Proposed Action with Different Mitigation) and Alternative 3 (Issue ETPs for Only the Sierra Madre Portion of the CCSM Phase I Project) would cause impacts comparable to those under Alternative 1 (Proposed Action), but with slightly less impact because of more mitigation occurring in the local and regional area, and a smaller area of disturbance, respectively. The No Build scenario under Alternative 4 (No Action: Denial of ETPs) would not contribute to cumulative impacts. However, the Build Without ETPs scenario under Alternative 4 would cause greater impacts than the Proposed Action, since many of the provisions of the ECP would not be implemented and compensatory mitigation would not occur.

### 4.4.7 Cultural Resources

This section focuses on the cumulative impacts on the cultural value of eagles in the context of national symbolism and the importance of eagles to Native American cultures. Cumulative impacts on the cultural value of eagles result primarily from the cumulative number of eagle takes, the resulting impact on the stability of eagle populations, and the cultural impacts of administration of religious-use permits under BGEPA. Cumulative eagle take and population stability are discussed in Section 4.4.6; therefore, this section discusses primarily the latter source of impacts, which has particular relevance to the cultural value of eagles to Native Americans. The section concludes with an analysis of how the CCSM Phase I Project contributes to cumulative impacts from all sources on the cultural value of bald and golden eagles.

As discussed in Section 3.9.3, culture is not geographically bound, and most cumulative impacts would be consistent whether the affected individual or community is in the EMU or the LAP. Therefore, cumulative impacts at the EMU and LAP levels are discussed jointly, and, in a broader sense, national implications as they relate to Native American tribes are also discussed.

The criteria we used to evaluate impacts on cultural resources in Chapter 3.0 are the same criteria that we use for evaluating cumulative impacts on cultural resources here. Therefore, the impact criteria table from Section 3.9.3 is included below as Table 4-16.

Table 4-16. Impact Criteria for Eagles as a Cultural Resource for the CCSM Phase I Project in Wyoming

| Impact Category | Intensity Type | Definition |
|---|---|---|
| Magnitude | Major | The action would clearly change resource conditions. Adverse impacts would result in blocked or greatly reduced access to eagles, feathers, or parts, or would alter the relationship between eagles and a cultural group’s practices and beliefs to the extent that the survival of those practices and beliefs would be jeopardized. The impacts would substantially deteriorate or destabilize eagles’ condition or culturally valued elements. These conditions and elements may be tangible, such as the stability of |

| Impact Category | Intensity Type | Definition |
|---|---|---|
| | | local eagle populations, or intangible, such as the perception of eagles' ability to give power to tribal members. Beneficial impacts would facilitate access, empower groups in their traditional practices or beliefs, or substantially improve the quality of the resource. |
| | Moderate | The action would result in some change to resource conditions. Adverse impacts would result in reduced access to eagles, feathers, or parts, or would alter the relationship between eagles and a cultural group's practices and beliefs, although those practices and beliefs would survive. Beneficial impacts would encourage access or contribute to the relationship between eagles and cultural groups' traditional practices or beliefs. |
| | Minor | The action could result in some change to the resource. Adverse impacts would not appreciably alter access to eagles, feathers, or parts, or the relationship between eagles and the affiliated group's practices and beliefs. Beneficial impacts would temporarily or slightly improve access to eagles or the relationship between eagles and cultural groups' practices and beliefs. |
| | No effect | Any change to the resource would be barely perceptible and would not appreciably alter access to eagles, feathers, or parts, or the relationship between eagles and cultural groups' practices and beliefs. |
| Duration | Long-term | 30 years (proposed Project duration) |
| | Medium-term | 5 years (permit term) |
| | Temporary | Lasting for the duration of construction |
| Potential to occur | Probable | More likely than not to occur |
| | Possible | Potential to occur |
| | Unlikely | Not reasonably likely to occur |
| Geographic extent | Extensive | Within the two EMUs and four BCRs |
| | Regional | Within the 140-mile local area |
| | Limited | Within 1 mile of Phase I development and infrastructure areas |

#### *4.4.7.1 Administration of Religious-Use Permits*

We administer several types of religious permits under BGEPA. The most common is a permit to obtain eagles or eagle parts through the USFWS National Eagle Repository (NER). BGEPA also allows for religious take permits, which cover all manners of take, including capture, harassment, and killing an eagle; however, only a few of these permit types have been issued, as discussed further below. We also administer Native American Eagle Aviary Permits. These types of BGEPA permits are available only to members of federally recognized tribes.

The National Congress of American Indians has identified access to and usage of eagle feathers for traditional cultural purposes as an important issue in the protection of Native cultures (2010a). Native American requests for eagles, feathers, and parts through the repository currently outstrip supply, a situation that contributes to Native American dissatisfaction with the repository system. Further, demand can be expected to rise as tribal enrollment and Native American interest in traditional practices increase (Kovacs 2014).

To understand how BGEPA impacts Native American cultures, it is necessary to summarize important aspects of the law, its implementing regulations, and related policies. The initial law, Act for the Protection of Bald Eagles, was enacted in 1940 and amended in 1962 to include golden eagles. The 1962 amendment also introduced the law's religious exception for Native American tribes. The DOI released implementing regulations in 1963 that outlined the permitting process and requirements, including proof of enrollment in a federally recognized tribe; 50 CFR 22 governs eagle take permit requirements, with 50 CFR 22.22 applying to Indian religious purposes, 22.26(e)(4)(ii) addressing Native American religious use for rites and ceremonies that require eagles be taken from the wild, and 22.27 (d)(6) applying to removal of eagle nests for Native American religious use for rites and ceremonies.

In 1975, the DOI introduced the Morton Policy, which established certain activities in which Native Americans can engage "without fear of Federal prosecution, harassment, or other interference" (DOI 1975). These activities include the possession, use, and wearing of federally protected birds, their feathers, and their parts. The policy also allows gifting, loaning, or exchange of the same, provided this occurs between Native Americans and does not involve compensation. Native Americans may also collect naturally molted feathers.

BGEPA's primary impact on Native American culture is the addition of a permitting process that may interfere with traditional relationships between tribes, members, and eagles (Kovacs 2014). Traditionally, access to eagles often followed strict cultural rules that established who may obtain or handle eagles or their parts. The eagle-cultural relationship was maintained through prayer, ceremony, or direct interaction. The permitting process imposed on top of traditional practices is in some cases simply an inconvenience, but in other cases may interfere with those practices and beliefs. BGEPA also restricts traditional practices pertaining to the transfer and transportation of eagles and their feathers or parts, including prohibitions on bartering and gifting or bestowing of feathers to non-Native Americans and a limitation on international transportation and gifting. Furthermore, the DOI's regulations implementing BGEPA (50 CFR 22) and the U.S. Department of Justice policy on possession (2012) are limited to federally recognized tribes. Although this is consistent with the fiduciary trust responsibility the United States has with such tribes, the result is that non-federally recognized tribes and unenrolled Native Americans are denied a legal means for performing traditional practices as they relate to eagles.

Few tribes have acquired religious take permits under BGEPA (Kovacs 2014). Nationally, nine religious take permits were filed and granted between 2001 and 2014 (USFWS 2014d). There is a widespread perception that these permits are rarely granted and that submitting an application is futile. Furthermore, some individuals object to the permitting process on religious or political grounds. Many Native Americans feel they are unfairly required to have a permit to exercise their religion (Kovacs 2014; USFWS 2014d). This perception extends to the permit to obtain feathers or parts from the NER.

Native Americans who do not obtain religious take permits are faced with the challenge of maintaining their traditional practices. Some find they can meet their needs through the NER. Others change their practices to accommodate the requirements of the law or choose not to engage in certain traditional practices. Some pursue illicit means of obtaining eagles through illegal collection or illegal take, or from an expanding black market trade of eagles, feathers, and parts (Kovacs 2014).

Although the Morton Policy allows Native Americans to possess legally obtained eagles, feathers, and parts, investigations into illicit activities involving bald and golden eagles have led to fear among Native Americans that their use of eagle feathers may subject them to detention, seizure of their feathers, and possibly prosecution (National Congress of American Indians 2010b). The National Congress of American Indians has identified undercover investigations as a primary source of fear by tribal practitioners that threatens to force traditional religious beliefs and practices ‘underground’ (National Congress of American Indians 2009, 2010b, 2011). Tribal working groups, the USFWS, U.S. Department of Justice, Bureau of Indian Affairs, and White House and Congressional personnel have jointly and independently worked on solutions to some of these problems. Such efforts contributed to the 2012 U.S. Department of Justice policy announcement regarding Native American possession of feathers.

As noted above, the NER is the primary means by which federally recognized tribal members obtain eagles, feathers, and parts for their traditional ceremonies and practices. The NER distributes eagle remains, feathers, and parts from birds sent in by agencies, land owners, industries, and others across the nation. Applicants must be Native Americans enrolled in a federally recognized tribe who have obtained a permit from USFWS, and distribution occurs on a first-come, first-served basis. Wait times for certain requests can exceed 5 years due to the number of requests received at the NER. The NER received more than 4,000 requests in fiscal year 2014 and filled 3,868 orders from 2,309 birds (USFWS 2014e).

Although the NER system fulfills some needs, many Native Americans are dissatisfied with the system, in part due to the waitlist, but also because of the regulatory burden, poor condition of some feathers and parts upon receipt, and conflict with traditional practices (Kovacs 2014). Much like religious take permits, the repository and permitting system may interfere with traditional knowledge and beliefs related to the acquisition of eagles, feathers, and parts. For some tribes, the manner of death has implications on the usefulness of the eagle or its parts; however, the practitioner may not know the manner of death when he or she receives eagles or parts from the repository. Likewise, some ceremonies require ‘pure’ or ‘clean’ eagles, which means they cannot have died from causes such as electrocution, collision, and poisoning (Kovacs 2014). Many eagles at the repository died from such causes and are considered unsuitable. Reliance on the NER system to fulfill Native American religious needs does not address the cultural importance of the interaction between the individual and eagle as part of traditional practices.

We recognize the shortcomings of the NER system and the impact on Native American tribes. We have held annual summits with Native American tribes to discuss eagles and eagle management since 2011 and continue to implement improvements to the administration of the NER and permitting process. Additional improvements have also been suggested by tribes and legal scholars, including the permitting of tribes that could subsequently distribute eagles, feathers, and parts according their own laws and needs (Kovacs 2014).

Some Native Americans have pursued tribal eagle aviaries as a solution to some of their religious needs. Seven tribes have established aviaries in Arizona, New Mexico, and Oklahoma (USFWS 2015f). These tribes are able to provide feathers to their own members and other Native Americans with naturally molted feathers, as well as interaction with eagles. Establishment of tribal aviaries, religious take permits, and use of the repository system are examples of the ways tribes negotiate the requirements of BGEPA and fulfill eagle-related practices and beliefs in ways that are culturally meaningful.

#### *4.4.7.2 Impact Analysis: Native American Cultures*

As discussed in Section 4.4.6, the cumulative effects of past, present, and reasonably foreseeable impacts on bald and golden eagles across the EMUs, including the four BCRs for golden eagles, combined with the CCSM Phase I Project were analyzed.

If bald and golden eagle populations were to decline, this could have a major impact on tribes, not only regarding their access to eagles but also their underlying cultural relationship with the species. As noted in Section 3.9, eagles are considered sacred and in some cases connect tribes with their spiritual environment. Some tribes describe the health and well-being of their communities as inextricable from the health and well-being of eagles. Scholarship on cultural risk assessment supports this view, describing the health and well-being of Native American individuals and communities as derived in part from access to traditional resources and the ability to participate in traditional community activities (Harris and Harper 2000). Decline of these species’ populations could impact Native American cultural identity and religious beliefs.

The effects of past and present impacts on eagle populations, combined with the effects of federal laws, regulations, and policies related to bald and golden eagles, have an ongoing cumulatively significant impact on Native American cultural relationships with eagles. Although BGEPA and associated regulations and policies accommodate certain religious needs, the law has historically reduced access to eagles and their parts, and has precipitated changes in traditional cultural practices as a result of that reduced access and fear of prosecution. These regulatory impacts may make Native American cultural practices and beliefs regarding eagles more vulnerable to the effects of eagle take and population-level decline.

Future operation of the NER system in its current form will continue to restrict access to bald and golden eagles, feathers, and parts. Increases in demand, as public knowledge, tribal enrollment, and interest in traditional practices increase, would exacerbate the problem, as would decreased supply, whether from successful mitigation of anthropogenic eagle fatalities or decreased eagle populations (Kovacs 2014). Increased knowledge and issuance of religious take permits could alleviate the burden on eagle-related cultural practices; however, eagle populations may not be able to sustain the level of demand for religious take permits. Future changes to regulations and policies that implement BGEPA could also moderate the cumulative impact on tribes.

The CCSM Phase I Project would contribute to probable moderate, long-term, extensive impacts on the cultural value of eagles by contributing to the moderate impacts on bald and golden eagle populations in the LAP and a reduction in population at the four-BCR area. Bald and golden eagle impacts would also be recognized by tribal interests outside the LAP and EMU areas. Whereas eagles are considered sacred in many Native American cultures, those tribes are likely to be concerned about the welfare of eagles and eagle populations regardless of geography. Therefore, the CCSM Phase I Project could possibly contribute to minor, long-term, extensive impacts on the cultural value of eagles to tribes outside the four-BCR area. The magnitude of cumulative impacts on tribes outside the four BCRs is considered less than on tribes within the four BCRs since there would be no direct impacts on access to eagles, parts, or feathers or on individual eagles or eagle populations with which tribes have specific cultural relationships. Alternative 2 (Proposed Action with Different Mitigation) could possibly contribute a minor, long-term, extensive beneficial impact under the rehabilitation option if funding were made available to tribes to develop or expand rehabilitation facilities that would provide tribes with an alternate means of interacting with eagles and acquiring naturally molted feathers.

Alternative 3 (Issue ETPs for Only the Sierra Madre Portion of the CCSM Phase I Project) would cause impacts comparable to those under Alternative 1 (Proposed Action), but the impacts would be slightly because of a smaller area of disturbance. The No Build scenario under Alternative 4 (No Action: Denial of ETPs) would not contribute to cumulative impacts. However, the Build Without ETPs scenario under Alternative 4 could possibly contribute to major cumulative impacts on tribes' access to eagles, feathers, and parts if local or regional eagle populations were to decline and fewer eagles were available through the NER. This would represent a disproportionately high and adverse impact on Native American tribes and a possible environmental justice issue.

#### *4.4.7.3 Impact Analysis: National Symbolism*

Cumulative impacts that threaten the stability of bald eagles within the LAP and EMU areas could also impact the bird's symbolic value. Americans view eagles as symbolically representative of the United States and of values such as freedom, strength, perseverance, and environmental protection. On one hand, American symbolic investment in bald eagles is abstract; as discussed in Section 3.9.3.2, individuals may devalue certain aspects of eagles as a species at the same time they value its symbolic attributes. On the other hand, the symbolism of freedom, strength, and perseverance could be undermined if bald eagle populations were to become threatened. Such a situation could also change the meaning of the bird's symbolism for the environment, from a symbol of success to one of regression. The cumulative effects of past, present, and reasonably foreseeable impacts combined with the CCSM Phase I Project would result in possible minor, long-term, extensive impacts on the value of bald eagles as the national symbol. The magnitude of impacts could increase if the vitality of bald eagle populations decline.

Alternative 2 (Proposed Action with Different Mitigation) and Alternative 3 (Issue ETPs for Only the Sierra Madre Portion of the CCSM Phase I Project) would cause impacts comparable to those under Alternative 1 (Proposed Action), but with slightly less impact because of more mitigation occurring in the local and regional area, and a smaller area of disturbance, respectively. The No Build scenario under Alternative 4 (No Action: Denial of ETPs) would not contribute to cumulative impacts, and the Build Without ETPs scenario under Alternative 4 would likely cause impacts similar to those under Alternative 1.

## 4.5 Unavoidable Adverse Impacts

Unavoidable adverse impacts would result from implementation of Alternative 1 (Proposed Action) or any of the other alternatives carried forward for detailed review in this EIS. Unavoidable impacts could occur from construction and operation of the Phase I facilities and infrastructure.

Construction activities would directly and unavoidably impact natural and physical resources, including those that relate to eagles or are under our jurisdiction (as discussed in Section 3.1), such as water resources, vegetation and wetlands, and mammals. For example, vegetation clearing for construction of facilities and infrastructure (which were optimally sited based on a variety of factors) would be unavoidable. Impacts on wetlands and floodplains from water crossings would also be unavoidable. Due to habitat impacts and noise from construction, impacts on fish, amphibians, reptiles, mammals, and birds (including potential eagle take associated with nest abandonment) would be unavoidable. Vehicle collisions could unavoidably result in adverse effects on mammals and birds (including eagles).

Operation of the wind turbines would result in unavoidable eagle take, and would also adversely affect birds and flying mammals through collisions and by producing behavioral responses such as avoidance. Noise from the turbines and vehicles used by personnel operating and maintaining the proposed project would be unavoidable. Visual impacts on the CDNST, Overland Trail, and Cherokee Trail would also be unavoidable.

Monitoring, adaptive management, compensatory mitigation, and additional conservation measures as proposed by PCW and enforced by either us or BLM, would help reduce the extent of impacts and offset some of the unavoidable impacts under Alternative 1 (Proposed Action). Alternative 3 (Issue ETPs for Only the Sierra Madre Portion of the CCSM Phase I Project) would result in less unavoidable impact as a result of less disturbance compared to Alternative 1 (Proposed Action), Alternative 2 (Proposed Action with Different Mitigation), and the Build without ETPs scenario under Alternative 4 (No Action: Denial of ETPs). The Build without ETPs scenario would likely result in more unavoidable adverse impacts on various resources than the other alternatives, because under this scenario, the ETP stipulations described in 2.2.1.4 would not be implemented.

## 4.6 Short-Term Uses and Long-Term Productivity

NEPA requires consideration of the relationship between short-term uses of the environment and long-term productivity associated with a proposed action. This involves the consideration of whether a proposed action is sacrificing a resource value that might benefit the environment in the long term, for some short-term value to the sponsor or the public. Long-term productivity accounts for impacts on land foreclosed by use or affect as part of implementation of a project, plan, or policy. For example, conversion of crop or grazing land to a facility or roadway would decrease the natural resource productivity of the land. However, the use of land for wind power would result in less productivity impact than elimination of habitat for solar power or for establishment of coal mines.

NEPA and its implementing regulations, and subsequent guidance provided by DOI and USFWS, do not define what is considered a short-term versus long-term impact. However, the BLM FEIS defines short-term impacts as those being associated with construction and the first 5 years of operation, and long-term applies to beyond 5 years of operation to the project life of 30 years or longer. Our analysis applies these subjective timelines for the consideration of long-term productivity impacts.

Balancing the relationship between short-term impacts and long-term productivity is an important consideration in project planning. The following text addresses short-term impacts on and use of resources, and long-term effects and benefits or losses that could be expected. We evaluated short-term impacts on and use of resources in relation to long-term productivity in accordance with NEPA regulations and guidelines published by CEQ and DOI on implementing NEPA.

Data were gathered from the review of construction and operation impacts and all applicable resources analyzed in this EIS. This analysis qualitatively discusses the relationship between short-term impacts on and use of resources, and the long-term benefits and productivity of the environment.

Construction for the CCSM Phase I Project could contribute to potential short-term construction impacts related to (but not limited to) the following:

- Water quality (erosion and sedimentation, and potential fuel and lubricant spills)
- Vegetation and wetlands (removal, fugitive dust, and sedimentation)
- Eagle disturbance take at nests

In addition, short-term employment, use of materials, and purchases of goods and services generated by project construction would occur, and would decrease substantially on an annual basis for operation and maintenance of the facilities once the construction phase is completed.

Long-term adverse impacts would occur as described in the main body of this EIS. Long-term productivity could be minimally affected as noted in the BLM FEIS, with some reduction in grazing land, slight increases in noise and vibration impacts on sensitive receptors, and increased collision impacts with wildlife. Alternative 1 (Proposed Action) and other alternatives with construction would result in some permanent impacts on waterways, water bodies, vegetation and wetlands, and wildlife, which could affect long-term productivity of eagles. Although eagle take would increase in the Phase I development area, the long-term productivity of eagles would be maintained or improved through implementation of monitoring, adaptive management, compensatory mitigation, and additional conservation measures.

The addition of wind power generation to the CCSM Phase I development and infrastructure areas would contribute to a long-term increase in power generation capability and provide a competitive energy resource to meet current and future demands. A long-term reduction in air pollution emissions would occur as a result of use of wind power versus coal- and oil-generated power. Given the Nation’s focus on shifting to renewable energy sources, this project and other proposed projects (see Section 4.3) would progress towards that goal over the long-term.

Improved employment opportunities would exist in the CCSM Phase I development and infrastructure areas, with increased economic activity. Another long-term benefit would be an increased tax basis for Carbon County. Some of the infrastructure added via this project could support future energy resource development and distribution within Carbon County and surrounding counties. Alternative 1 (Proposed Action) could improve eagle and other bird productivity within the BCRs, based on the retrofitting of high-risk power poles. Alternative 2 (Proposed Action with Different Mitigation) could potentially result in habitat enhancement and benefits associated with other mitigation measures, and could improve the area’s long-term productivity compared to the Proposed Action and the other alternatives considered. Alternative 3 (Issue ETPs for Only the Sierra Madre Portion of the CCSM Phase I Project) would result in less short-term use and less impact on long-term productivity than Alternative 1, Alternative 2, and the Build without ETPs scenario under Alternative 4 (No Action: Denial of ETPs). The Build without ETPs scenario would likely result in more impacts on long-term productivity than the other alternatives because of the lack of implementation of EACPs.

## 4.7 Irreversible and Irretrievable Commitment of Resources

NEPA requires that environmental analysis include identification of “…any irreversible and irretrievable commitments of resources which would be involved in the Proposed Action should it be implemented” (42 U.S.C. 4332). Irreversible and irretrievable commitments of resources relate directly to the trade-offs of implementing a project versus not implementing a project. We evaluated irreversible and irretrievable impacts in accordance with NEPA regulations and subsequent guidance published by CEQ and DOI. We assessed potential commitments for the alternatives identified in Chapter 2.0.

*Irreversible resource commitments* are related to the use of nonrenewable resources, such as soils, wetlands, and visual resources, and the effects that the uses of these resources would have on future generations. Such actions are considered irreversible because their implementation would affect a resource that has deteriorated to the point that renewal can occur only over a long period of time or at great expense, or because they would cause the resource to be destroyed or removed.

*Irretrievable resource commitment* of natural resources means loss of production or use of resources as a result of a decision. It represents opportunities forgone for the period of time that a resource cannot be used. Irretrievable refers to the permanent loss of a resource, including extinction of a threatened or endangered species, disturbance of a cultural site, loss of land production, or use of natural resources (including minerals and coal). For example, production or loss of agricultural lands can be irretrievable, while the action itself may not be irreversible.

We assessed data from the applicable resources analyzed in Chapter 3.0, especially the consumption of energy (for example, fuel use for equipment and vehicles, production of system components) and natural resources (as derived from the assessment of water resources, natural habitats and wildlife, and wetlands). Additionally, we evaluated the land use change of the land proposed for conversion to support Phase I and infrastructure development of the CCSM Phase I Project.

We qualitatively assessed the potential use of existing resources and land, and identified the potential for irreversible and irretrievable use of these resources. Resources considered in this analysis were those resources on which the CCSM Phase I Project would have a direct or indirect effect.

Various resources within the Phase I development and infrastructure areas would be impacted to implement the CCSM Phase I Project, such as grazing land, streams, wetlands, wildlife habitat, and cultural resources. Resources that would not originate directly within the Phase I development and infrastructure areas would most likely need to be acquired from outside the areas and could include steel and other components for the wind turbines, petroleum, natural gas, and concrete materials. Rock would be available from the Road Rock Quarry.

Construction under the Proposed Action and other alternatives would result in the irreversible and irretrievable commitment of land. The land would be converted from its current condition to support installation of wind turbines and infrastructure. Construction materials would consist largely of steel and other components for the wind turbines, concrete, and rock. Whereas the use of these materials would be largely irretrievable, these resources are not in short supply, and many of the materials could be recycled for other uses after decommissioning.

Several energy resources would be committed to the CCSM Phase I Project, including petroleum, natural gas, electrical, and manpower expenditures for construction, operation, and maintenance activities. These resources would generally be irretrievable.

Compared to Alternative 1 (Proposed Action), Alternative 2 (Proposed Action with Different Mitigation) would have nearly the same irreversible and irretrievable impacts, with potentially slightly less impact from mitigation of older wind facilities, wind conservation easement, habitat enhancement, and rehabilitation of injured eagles. Alternative 3 (Issue ETPs for Only the Sierra Madre Portion of the CCSM Phase I Project) would result in less irreversible and irretrievable impacts through less disturbance compared to Alternatives 1 and 2, as well as the Build without ETPs scenario under Alternative 4 (No Action: Denial of ETPs). The Build without ETPs scenario would likely result in more irreversible and irretrievable impacts than the other alternatives because of the likely lack of implementation of EACPs.

Irreversible and irretrievable impacts from the Proposed Action and its alternatives do not require mitigation; consequently, no mitigation measures are proposed.