5.0 Cumulative Impacts

NEPA requires an assessment of potential cumulative impacts. Federal regulations (40 CFR 1500-1508) define cumulative impacts as:

> …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.

Potential cumulative impacts are assessed at the resource level. This discussion of potential cumulative impacts assumes the successful implementation of the environmental protection and mitigation measures discussed in the various appendices and Chapter 4.0 of this EIS, as well as compliance with the Rawlins RMP and all applicable federal, state, and local regulations and permit requirements. The analysis of cumulative impacts addresses both potential negative and positive impacts and is applicable to all alternatives.

5.0.1 Past, Present, and Reasonably Foreseeable Actions

- Oil exploration and extraction;
- Natural gas exploration and extraction;
- Pipeline construction;
- Electric transmission line construction;
- Wind power generation projects;
- Coal gasification; and
- Uranium exploration and extraction.

5.0.2 Historical Land Use

- Grazing;
- Road development; and
- Private land actions.

5.0.2.1 Physical and Temporal Boundaries of Cumulative Impacts

The CIA area includes past, existing, and reasonably foreseeable actions that may generate cumulative impacts. The CIA physical and temporal boundaries of cumulative impacts will vary depending on the resource under consideration. For example, the CIA area for air quality effects is regional in nature; therefore, the scope of cumulative impacts considered due to project activities is necessarily broad. In contrast, the CIA area for geology and minerals considers the area associated with the proposed project; therefore, the scope of potential cumulative activities considered is much narrower. For wide-ranging wildlife, such as elk, the cumulative impact area may include offsite habitats that are used by onsite populations and that are subject to impacts from development in the offsite areas. And, for water resources, the cumulative impact area includes all of the 6th order HUC-12 sub-watersheds that have a portion of the Application Area within their boundary.

Although these are only examples, they illustrate that cumulative impact boundaries may not only differ considerably among resources, but that the boundaries may be either natural or artificial (see the CIA for each resource below).

5.0.3 Current and Planned Projects

Projects considered in the cumulative analysis include those that have either been permitted or are in the permitting process (**Table 5.0-1** and **Figure 5.0-1**).

Table 5.0-1 List of Current and Planned Projects

Project	Owner/Proponent	Location	County
Atlantic Rim Natural Gas Field Development Project	Anadarko E&P Company, and other operators	Atlantic Rim Project Area (ARPA)	Carbon
Continental Divide-Creston Natural Gas Development Project Area	British Petroleum America Production company and other operators	N and S of I-80 near Wamsutter	Carbon and Sweetwater
Desolation Flats Natural Gas Field Development Project	Marathon Oil Company and other operators	South Central Wyoming	Carbon and Sweetwater
Dunlap Wind Energy Project	PacifiCorp Energy	North of Medicine Bow	Carbon
Dry Creek Wind Power Project	Eurus Dry Creek LLC	North of Medicine Bow	Carbon
Echo Springs TXP4 Gas Treatment Plant Expansion	Williams, Inc. dba Wamsutter LLC	Near Wamsutter	Carbon
Foote Creek Wind Energy Project Phase I	SeaWest, PacifiCorp Energy, EWEB (Eugene Water and Electric Board), and Bonneville Power Administration (BPA)	Near Arlington	Carbon
Foote Creek Wind Energy Project, Phases II, III, and IV	SeaWest, PacifiCorp Energy, EWEB and BPA	Near Arlington	Carbon
Gateway West Transmission Line Project	PacifiCorp Energy and Idaho Power	Windstar Substation at Glenrock, Wyoming, to the 20 miles southwest of Boise, Idaho	Converse, Natrona, Albany, Carbon, Sweetwater, Lincoln, and west into Idaho
Gateway South Transmission Line Project	PacifiCorp Energy	Wyoming to central Utah	Car bon, Sweetwater
High Plains and McFadden Ridge Wind Energy Projects	PacifiCorp Energy	Near McFadden	Albany and Carbon
Jonathon Project Limestone Quarry	Pete Lien	North of Laramie	Albany

Table 5.0-1 List of Current and Planned Projects

Project	Owner/Proponent	Location	County
Lost Creek In-situ Uranium Project	UR Energy	North of Rawlins/Wamsutter	Sweetwater
Medicine Bow Fuel & Power Coal-to-Liquids Project	Medicine Bow Fuel & Power	South of Medicine Bow	Carbon
Middlewood Wind Power Project	Eurus Middlewood Wind LLC	Southcentral Carbon County	Carbon
Overland Transmission Project	Jade Energy	Southern Wyoming and Idaho to Twin Falls, ID	Carbon, Sweetwater
Sand Hills Ranch Wind Farm	Shell Wind Energy LLC	Near Rock River	Albany
Seven-Mile Hill Wind Energy Project	PacifiCorp Energy	West of Medicine Bow	Carbon
South Baggs Area Natural Gas Development Project	Merit Energy Company	Southcentral Carbon County, near the Wyoming/Colorado border	Carbon
TransWest Express Transmission Line Project	TransWest Express LLC and Western Area Power Administration	South of Rawlins to Northwest Colorado, through Utah and terminating in Las Vegas, Nevada	Carbon, Sweetwater
White Mountain Wind Energy Project	Teton Wind, LLC (subsidiary of Tasco Engineering)	Top of White Mountain, west, north-west of Rock Springs	Sweetwater
Zephyr Transmission Line Project	TransCanada	Southern Wyoming and Idaho south to Las Vegas, NC	Carbon, Sweetwater
Other mine projects	Various	Various	Sweetwater, Carbon, Albany
Other oil and gas , wind and transmission line projects	Various	Various	Sweetwater, Carbon, Albany

5.0.3.1 Other Oil and Gas Projects

An oil and gas lease grants the lessee the “right and privilege to drill for, mine, extract, remove, and dispose of all oil and gas deposits” in the leased lands, subject to the terms and conditions incorporated in the lease (BLM Form 3100-11, Lease for Oil and Gas). The Secretary of the Interior has the authority and responsibility to protect the environment within federal oil and gas leases; therefore, restrictions are imposed on the lease terms.

New O&G development may be allowed under some of the alternatives, but actual development would only occur after any proposed well locations, road and/or pipeline alignments, and/or other facilities/infrastructure have gone through a permitting process and NEPA analysis. Furthermore, while

the assumptions associated with the alternatives represent reasonable projections of what could occur, it is impossible to predict with certainty the precise location of potential development or a structure, or the precise outcome of any of the alternatives, because of the large number of variables involved.

5.0.4 Other Wind Projects

Development of other wind projects could occur in the Application Area, but none are far enough along in the planning process to define the location, scale, and impacts of their potential development. Therefore, potential future wind energy projects are not included in the cumulative impact assessment.

5.0.5 Other Transmission Line Projects

Development of other transmission projects could occur in the Application Area, but none are far enough along in the planning process to define the location, scale, and impacts of their potential development. Therefore, potential future transmission projects are not included in the cumulative impact assessment.

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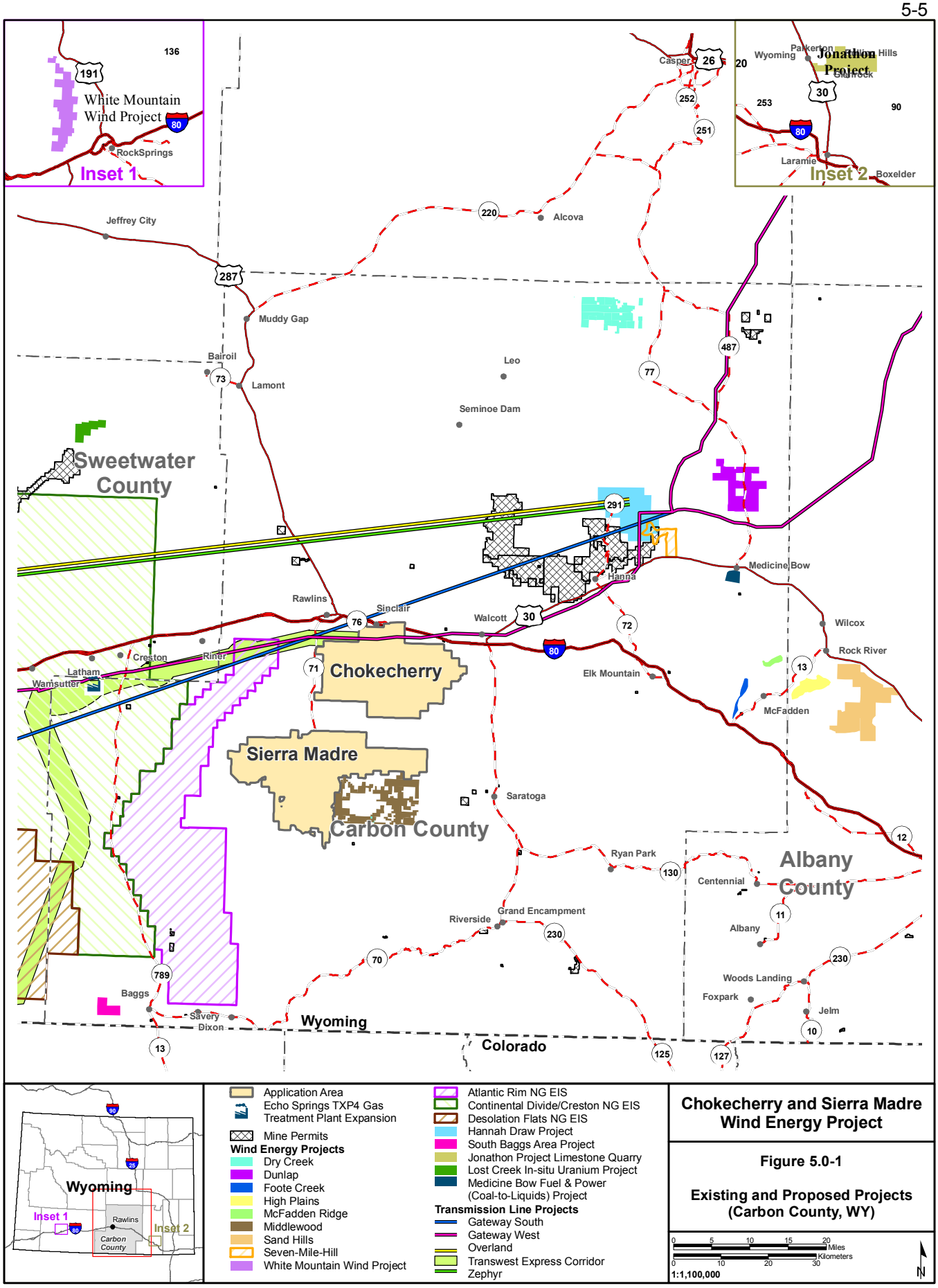

Chokecherry and Sierra Madre Wind Energy Project

Figure 5.0-1

Existing and Proposed Projects (Carbon County, WY)

5.1 Cumulative Impacts for Air Quality

The study area includes the Sierra Madre and Chokecherry boundaries plus a 5 km buffer around the development areas. The cumulative impact study area also include any Class I areas within 100 km of the project boundary. This study area was chosen to include areas that are likely to be affected by emissions from the proposed project. The cumulative impacts area was chosen large enough to address concerns by USEPA and other stakeholders regarding impacts related to regional ozone formation, visibility in Class I areas, and climate change.

Activities related to construction of the proposed project would be a source of the ozone precursors NO_x and VOCs from internal combustion engines associated with construction of roads, WTG pads, WTG installation, and transmission lines. The prevailing winds are strong enough to disperse these pollutants in such a manner that it is highly unlikely that ozone would form and accumulate to the extent that the project would cause or contribute to regional ozone. Wintertime ozone formation in the Pinedale anticline region of western Wyoming has led to some concern that other projects might also result in high ozone levels during months that have not been considered “ozone season”. This clearly is not the situation for CCSM. Ozone occurs where there are strong temperature inversions, low winds, snow cover, bright sunlight, and VOC emissions. The prevailing winds would tend to disperse the pollutants during all seasons of the year, and emissions from construction vehicles would occur during the summer construction season.

Federal Class I areas are protected by the regulation of AQRVs within their borders. Federal land managers are responsible for the management of PSD Class I areas. It is unlikely that the moderate to low levels of emissions from the proposed project would affect Bridger Wilderness Area and Rawah Wilderness Area, which are roughly 150 km from the development area.

The GHG emissions from construction of the proposed project would be negligible in terms of impacts to climate change. The first year of construction would produce less than 700 tons of CO_2. An equivalency calculation indicates that the total CO_2e emissions from the proposed project in the first year would release about the same amount of CO_2e as the energy use for about 54 average households. Once completed, the proposed project would have the capacity to generate 2,000 to 3,000 MW of electrical energy, thereby potentially reducing GHG from power production in fossil fuel-fired electrical generating stations by about 2,000 tpy. Once completed, the project will be capable of meeting the electricity needs of between 450,000 and 900,000 U.S. households each year (PCW 2010a).

5.2 Cumulative Impacts for Cultural Resources

As directed by law, cultural resources inventories are conducted for any actions (e.g., wind farms, pipelines, oil and gas development) involving public lands, and adverse effects to NRHP-eligible sites avoided or mitigated as appropriate. Avoidance through project redesign is the preferred method of mitigation; however, when avoidance is not feasible, data recovery (archaeological excavation) or other forms of mitigation are implemented prior to ground-disturbing activities. Direct impacts to all NRHP-eligible sites located in the project APE that cannot be avoided would be mitigated in accordance with the PA developed in consultation with the SHPO, ACHP, and interested tribes and parties (e.g., Oregon-California Trails Association, Alliance for Historic Wyoming). In addition, any previously unknown NRHP-eligible sites that may be discovered during construction activities would be mitigated in accordance with the PA and applicant-committed protection measures. Therefore, the proposed project is not expected to cumulatively contribute to direct effects to NRHP-eligible sites. However, if data recovery is necessary to mitigate unavoidable adverse effects to NRHP-eligible sites, it would recover a significant amount of data but ultimately the site would be destroyed by the undertaking. Over time, this represents a cumulative loss.

Indirect effects, such as illegal collecting of artifacts, have occurred and most likely would continue to occur in the cumulative effects study area through increased access, development, and increased human presence, as a result of past, present, and reasonably foreseeable future actions.

Cumulative effects to the Overland Trail where the setting is an important aspect of integrity are expected to occur. Past, present, and reasonably foreseeable future actions have altered and most likely would continue to alter the landscape surrounding the Trail to the point that the integrity of the setting would no longer contribute to the eligibility of the site. The incremental damage and loss of integrity would result in the fragmentation of the Trail and would destroy the values that make this resource significant.

5.3 Cumulative Impacts for Geological and Mineral Resources

The CIA for mineral resources is Carbon County. The study area for geological hazards for direct, indirect, and cumulative impacts, is the Application Area and associated ROWs.

5.3.1 Minerals

Since there are no anticipated impacts to oil and gas access, there are no cumulative impacts to those mineral resources. Since aggregate is to be derived from non-local sources, there would be no cumulative impacts associated with aggregate demand.

5.3.2 Geological Hazards

Incremental effects of the proposed project are difficult to quantify because of varying site conditions and construction. However, given appropriate design or avoidance, geologic hazards are not expected to contribute to cumulative impacts in the CIA.

5.4 Cumulative Impacts for Land Use

The CIA for land use and land management for all alternatives is the RFO. Past, ongoing, or reasonably foreseeable activities that would be expected to produce incremental and cumulative impacts within the CIA are summarized in **Table 5.0-1**. The cumulative impacts to land uses and land management actions would be the same for the proposed project under all action alternatives.

Effects to land uses and land management in the CIA from cumulative projects include the removal of land from past and current uses; changes in public access to public and state lands; changes in opportunities for land tenure adjustments and ROW authorizations and changes in land use designations on public and private land. Changes to resource-based land uses that include grazing, recreation, visual resources, and wildlife habitat are addressed in the cumulative impact analysis of the appropriate resource sections.

Cumulative impacts to land use from construction cause temporary disruptions of the daily activities of residents, grazing operators, and visitors to recreation areas. These effects occur intermittently at various project sites in the CIA for the duration of construction for the projects listed in **Table 5.0-1.** The proposed project would contribute a small incremental increase in these disruptions over the 4-year construction period.

Changes in public access to state and public lands from cumulative projects, including access to mineral resources and other types of leases and permits, include closures in some areas to reduce adverse health and safety conflicts. Additionally, the construction of project roads increases access opportunities and public use of some areas. The proposed project would not alter public access to public or state lands beyond the current conditions, and would not contribute to cumulative effects to public access in the CIA.

The checkerboard land ownership pattern is the most prominent land resource feature in the CIA, as it consists of a large swath of land approximately 40 miles wide that runs from east to west across the entire CIA. The checkerboard creates management difficulty that has the potential to increase over time, because there has been a trend over the past 20 years of selling private lands to realtors, who then sell 40-acre tracts to willing buyers. As this ownership and land use changes in the future, there is potential for management of the public lands to become much more complicated, with potential conflicts and increased impacts to public portions of the checkerboard (BLM 2008a). Land tenure adjustments provide solutions to some land management challenges in the checkerboard. The proposed project would not contribute to cumulative effects to opportunities for land tenure adjustments or increase the overall management challenges in the CIA checkerboard.

There are numerous ROW authorizations in the CIA. Ongoing changes in public and private land uses in the CIA have the potential to conflict with authorized uses in ROWs and easements issued by the RFO. The proposed project would not contribute to cumulative effects to opportunities ROW authorizations in the CIA.

There would be no changes in land use designations on public and private lands from the proposed project under any of the action alternatives; therefore, there would be no additional or incremental effect to cumulative changes in land designations from the proposed project.

5.5 Cumulative Impacts for Paleontological Resources

Carbon County was chosen as the CIA because of the large number of energy related projects in the county.

Cumulative impacts to paleontological resources would result from surface disturbance related to industrial developments (e.g., oil and gas and wind energy), unauthorized collection, and natural erosion processes in the analysis area. With the implementation of the recommended mitigation measures, the proposed project, when added to past, present, and reasonably foreseeable future actions would not be expected to significantly contribute to cumulative impacts to paleontological resources in the CIA.

5.6 Cumulative Impacts for Range

The CIA area includes the 13 allotments within the Application Area (i.e., Cottonwood Draw, Doolittle, Emigrant, Fillmore, Grizzly, McCarty Canyon, Middlewood Hill, North Savery, Pine Grove/Bolton, Platte River, Sage Creek, Sixteen Mile, Sulphur Springs allotments). Past and present actions and RFFAs are identified in **Table 5.0-1**; their locations are shown on **Figure 5.0-1**.

For the life of the project there would be a long-term cumulative impact to the grazing resource resulting in a net loss of total annual forage production (admittedly the majority of which would be on the proponent's allotments). This net loss may not meet the 10 percent significance criteria but would still need to be addressed through livestock management and possibly adjusting stocking rates. Dust impacts to vegetation as stated before can lower palatability as well as cause lower weight gain and health issues. Cumulatively, these impacts would increase, but the actual effect to each livestock operation would vary.

Increased traffic and overall access could affect several of the allotments in the Application Area. Many of these allotments are only accessible for a portion of the year, changing access to year round could further increase recreational trespass and associated issues such as open gates and private property damage. In contrast to other areas within the Rawlins District, many of the allotments within this CIA have very little current oil and gas development and provide these livestock operations with relatively undisturbed rangeland with few management constraints.

Other cumulative impacts to livestock grazing include damage to facilities, death, loss, or injury of animals due to collisions and poisonous plants/weeds. It is very hard to quantify the scope of these impacts to grazing operations, but the impacts can be significant. For instance, when fences are breached by power lines or road development and not repaired, there is an increase in associated labor costs rounding up the livestock, possibly reduced weight gains, increased potential disease transmission, and an overall reduction of time for other ranch work. Death loss or injury to animals can greatly depend on the kind and class of livestock and how effective compliance stipulations are. However, improved roads often just lead to greater vehicle speeds and potential collisions with animals. Poisonous plants/weeds increase with disturbance and reduce the usable grazing land available to permittees. For example, halogeton has greatly increased in the oil and gas development areas and has led to direct mortality in sheep. Although no permittee within this area runs sheep, vast patches of halogeton could have adverse impacts to livestock if not controlled adequately.

In summary, impacts to livestock operations include the above factors, but the level of impact will vary by each ranching operation. Development in one area at a time would allow permittees to plan accordingly for the time the project would be impacting their operation. Depending on the rate and associated impacts of construction activities, some operators may reduce use, change class of livestock, or request non-use during the development phase. Of the 13 allotments within the Application Area, the Pine Grove/Bolton is most impacted followed by Sage Creek, McCarty Canyon, Grizzly, Emigrant, Middlewood Hill, Doolittle, Sixteenmile, and Sulphur Springs allotments. The remaining allotments will have fewer impacts due to their location. Once the construction phase has been completed within a specific area, these allotments would likely return to initial levels of use as well as class of livestock.

5.7 Cumulative Impacts for Recreation Resources

The CIA for recreation resources for all alternatives is the Rawlins Resource Area. Past, ongoing, or reasonably foreseeable activities that would be expected to produce incremental and cumulative impacts within the CIA are summarized in **Table 5.0-1**.

Effects to recreation in the CIA from cumulative projects include the removal of land from past and current recreation uses; changes in public access to recreational opportunities on public and state lands; and air quality, noise, and visual disturbances to existing recreational uses.

Dispersed recreational opportunities in the CIA are similar to the opportunities available in the Application Area. Cumulative activities that include oil and gas exploration and development, utility and transportation corridors, and wind energy development have altered the quality of the recreational experience in the CIA for those users who value remoteness and solitude in natural landscapes. The long-term operations of the cumulative projects do not preclude the use of these areas for dispersed activities such as hunting, camping, fishing, and OHV uses; however, there may be reduced levels of satisfaction for any who might continue to use these areas. The proposed project under any action alternative would not contribute noticeable incremental effects on dispersed recreational opportunities and/or experiences in the CIA. The cumulative effect to recreational opportunities is expected to be small because of the wide availability of these activities elsewhere in the CIA.

The cumulative projects listed in **Table 5.0-1** generally require new or upgraded access roads, which provide potential increased access to public and state lands in the CIA. The proposed project under any of the action alternatives would contribute a small incremental increase in the number of miles of access roads that may increase public access to public lands.

Specific recreational activities and areas affected by cumulative projects include the Overland Trail, Little Robber Reservoir, and water-based activities on the North Platte River and the Seminoe Reservoir. These areas are wholly or partially within natural gas development areas. The Overland Trail crosses through several cumulative Application Areas in addition to the proposed project, including the Atlantic Rim, Blue Gap, and Continental Divide Crestone Application Areas. Air quality, noise, and visual

disturbances of cumulative projects to recreation users of these areas would occur for the duration of operational activities. These disturbances for the proposed project are evaluated in the appropriate sections of this EIS. Over the long-term the cumulative projects do not affect activities at developed recreation sites in the proposed Application Area or on multi-use activities on the CDNST within the CIA. There is likely to be an increase in visitors to the Teton Reservoir and Rim Lake from an influx of workers during the construction phase of the project. The proposed project under all action alternatives would contribute a noticeable increase in the sights and sounds of construction and operation activities on the Overland Trail, as well as constituting a substantial increase in effects to the CDNST and developed recreation sites within the Application Area.

Recreation users may sporadically experience travel delays and temporary disruptions to access or activities from cumulative construction activities. There would typically be some temporary displacement of hunters and recreationists during short-term construction periods for all cumulative projects.

The degradation or a perception of degradation in the quality of recreation resources on large areas of public, state, and private land from cumulative project construction and operation in the CIA could increase levels of dissatisfaction with recreational opportunities in the CIA among some residents and area visitors. A potential adverse impact would be a decline in tourism and visitor use that would affect local businesses, such as guides and outfitters that depend on outdoor recreational activities in the CIA.

5.8 Cumulative Impacts for Socioeconomics

The CIA area for socioeconomic conditions includes Carbon County and the eastern portion of Sweetwater County. Although Carbon and Sweetwater counties contain an abundance of mineral and energy resources, the current potential for cumulative socioeconomic effects in the CIA is associated with the past, ongoing, and reasonably foreseeable activities summarized in **Table 5.0-1**.

While many of the reasonably foreseeable projects identified in **Table 5.0-1** would require future regulatory approval, the drilling and field development activities associated with the previously authorized Atlantic Rim, Seminoe Road, Desolation Flats, and South Baggs Area natural gas development projects and authorized interim drilling associated with the Continental Divide - Creston Natural Gas Development Project could increase rapidly in response to higher natural gas prices. Increases in employment, workforce immigration, population gains, and demands on housing and public facilities and services would accompany the resurgence in activity, substantially altering the socioeconomic setting in which the CCSM project would occur.

In addition to the projects above, the foreseeable projects having the greatest potential to generate cumulative socioeconomic effects with the CCSM are the Medicine Bow Fuel & Power Coal-to-Liquids (CTL) Project, which has received authorization and is seeking financing, and the Lost Creek In-Situ Uranium, Gateway West and Gateway South transmission line, and Continental Divide Creston Natural Gas Development projects. The latter are currently in the environmental assessment and permitting stages. Subject to the completion of the permitting process, construction of the the Middlewood Wind Energy Project could overlap with CCSM project, resulting in temporary and short-term cumulative socioeconomic effects.

For all of these projects, the greatest potential for adverse cumulative socioeconomic effects within the CIA area would arise during periods of concurrent construction and development. The potential for adverse cumulative effects would be higher for the Middlewood Wind Energy Project due to its location and the likelihood for concurrent seasonal construction schedules associated with timing stipulations. With the exception of the Medicine Bow Fuel and Power CTL Project, future employment levels and demands on housing and local government services associated with these projects would decrease dramatically as each project transitions from construction to operation. The cumulative gains in operations employment would be beneficial.

Cumulative fiscal effects also are foreseeable. State and local sales tax revenues generally are higher during construction but then decrease, while ad valorem property tax revenues would increase and wind energy production taxes are generated. However, ad valorem tax revenues associated with energy production in unincorporated areas accrues primarily to counties, school districts, the state and other districts, rather than to the municipalities in which most energy-related workers live.

It is not yet possible to foresee which of these projects would have construction schedules that coincide with that for the CCSM. If construction levels were to overlap for all of these projects, and natural gas drilling levels were to increase to near or above 2007-2008 levels, another “boom” would ensue in the CIA. In that case, potential cumulative impacts on area socioeconomic conditions would include increased economic activity resulting in an increase in income, employment and population accompanied by increases in local and state government taxes and royalties and increases in demand for local services.

Concurrent development of two or more of the cumulative projects would result in a greater temporary population influx, with potential adverse cumulative effects including demand for temporary and long-term housing resources that would substantially exceed local supplies, demand for local government services that would exceed some service capacities, and changes in local social conditions that could include social disruption in some communities. Increased employment opportunities in relatively high paying construction and energy development jobs would result in competition for workers to the detriment of existing businesses and government who could lose existing employees and experience difficulty in recruiting new employees. On the other hand, workers could benefit from higher wages and salaries resulting from such competition. Implementation of the Phased Construction Sequencing Mitigation would reduce the potential for adverse cumulative effects during the peak periods, while increasing the potential during the last year of project development.

Deficits in temporary housing resources could be mitigated by the development of temporary housing facilities. Medicine Bow Fuel & Power has proposed such facilities to accommodate construction workers on its CTL Project and PCW has said it would consider the development of such facilities for CCSM. It also is common for some firms in the natural gas industry to develop such camps; three such camps and several rig camps and dormitory units placed in mobile home parks were operational locally in 2007-2008.

The pace of new residential construction in communities in the CIA would need to increase substantially over current levels to accommodate cumulative demand for longer-term housing units. Several subdivisions were approved in Rawlins and Wamsutter in recent years and several more were in the permitting process, but weak market conditions limited further progress on some of the proposed subdivisions. The development of temporary housing facilities could free up spaces in mobile home parks, providing a resource for longer-term demand until the conventional housing market would be able to respond.

Demands on local government services associated with CCSM construction, the Gateway West and Gateway South transmission line projects, the Middlewood Wind Power project, and much of the foreseeable natural gas development would be seasonal, presenting challenges for counties and communities to provide services and expand staff. Demands associated with the transmission line projects would be temporary as the locus of construction proceeds south and westward. Excess capacity exists in most public utility infrastructure systems (e.g., water and wastewater systems) in the local communities that would likely host the bulk of the construction and natural gas development workforce. The recent experience in the CIA has been that few families and school age children have accompanied construction and natural gas workers to the area, consequently school enrollment would not be anticipated to increase substantially in the near term and could likely be accommodated with the existing capacity of area schools.

Community services such as law enforcement, emergency response, social services and road and bridge departments, which have all experienced reductions in revenues and service and in some cases staff cutbacks in recent years, would be required to respond to increased demand from a diminished level of service. For most projects, substantial sales and use tax revenues do not flow until well into the construction phase, which coupled with a two month lag in distribution of revenues from the state to local governments, would require local governments to respond to increased demand without a corresponding increase in revenues in the beginning months of the boom. This lack of revenue, coupled with competition for workers and the difficulty in staffing for seasonal demand could present substantial challenges for local governments in the early years of a boom, although the increases in demand may arise incrementally over time.

The counties, local school districts and special districts will benefit from substantially increased revenues once ad valorem and production related revenues, and energy production tax revenues in the cases of the CCSM and Middlewood Wind Power projects. However, municipalities would typically benefit only indirectly from these revenues.

Cumulative development in the CIA also holds potential to affect local attitudes, opinions and lifestyles and these effects are likely to be mixed. Development of the projects listed above coupled with a moderate increase in natural gas development would result in economic growth, increased employment opportunities in relatively high-paying jobs in Carbon and eastern Sweetwater counties. These changes create the prospect for improvements in the financial status of many residents, which would correspondingly increase support for cumulative development activities, particularly among those segments of the community which benefit directly or indirectly from the increased economic activity. On the other hand, those residents whose economic activities and/or recreation activities use the same areas as the projects listed in **Table 5.0-1**, including ranchers, outfitters, hunters and other recreationists, are among those most likely to be dissatisfied. Moreover, if area residents perceive that wildlife habitat, scenic vistas and other resources are being degraded by development; levels of dissatisfaction could become greater and more widespread.

Following the short-term population gains in response to cumulative activities, Carbon County's population would decline as construction on cumulative projects is completed, perhaps dramatically. Given the cyclical nature of natural gas development and the potential for other energy development to occur, it is difficult to predict development and associated population levels with any certainty. But if population were to fall dramatically, businesses that have expanded or been developed to accommodate the temporary population influx would need to transition to accommodate the decreased demand. Effects on area housing conditions could be moderate if much of the construction and natural gas development industry were accommodated in temporary housing facilities or if housing to accommodate the temporary workforce was developed with a post-boom use in mind. In those cases, communities near the study area would be unlikely to have substantial unoccupied conventional housing after construction is completed or if a slowdown in natural gas development were to occur. Similarly, the fact that most community infrastructure water and sewer systems are already in place should help communities avoid substantial debt that would be difficult to service when population levels decrease.

5.9 Cumulative Impacts for Soil Resources

The CIA for soil resources consists of TOTCO and includes the Application Area, off-site features, and the Sage Creek area. Existing and reasonably foreseeable projects that would be expected to produce incremental and cumulative impacts within the analysis area are summarized in **Table 5.0-1** and discussed in further detail below. These projects would contribute incremental changes to the current level of effects to soil resources in the analysis area from historic and ongoing management activities.

Historic impacts to soil resources include activities such as sheep and cattle grazing, road development, water development, mining, recreation, wildfire, and other natural and anthropogenic activities within the analysis area. Mining impacts typically have localized impacts to soil quality and productivity. Where

public and private lands are grazed, soils generally see an increase in compaction, a decrease in soil cover, and an increase in invasive weeds, resulting in accelerated runoff and erosion and a reduction in soil quality. However due to intensive grazing management the rangeland in the Standards and Guidelines Assessment showed the general overall trend of the Lower North Platte Watershed and Upper Colorado River Basin to be moving upward with the exception of the riparian and wetlands in the Wolfe, Platte River, Middlewood Hill, Dana Ridge, Dana Meadows South, Sixteenmile, and Pine Grove/Bolten allotments (BLM 2004, 2002). These allotments are discussed in further detail in Sections 3.6.4, Range Resources and 5.6, Cumulative Impacts for Range.

Past, present, and reasonably foreseeable actions that contribute to impacts to soil resources in the study area include two-track, natural surface, graveled, and paved roads, oil and natural gas exploration and extraction projects, electric transmission line construction, additional wind development projects, pipeline construction, coal gasification projects, extraction activities, and water development. Impacts to soils from construction and operation activities associated with oil and gas activities would be similar to those described in Section 4.9, Impacts to Soil Resources. Numerous roads and well pads that would result in the long-term impacts include removal of vegetation, exposure of the soil, mixing of soil horizons, soil compaction, loss of topsoil productivity, and increased susceptibility of the soil to erosion. These impacts could increase runoff, erosion, and off-site sedimentation. Mining impacts would be expected to result in small to large localized impacts to soil productivity and quality. Pipeline and transmission line construction typically result in linear surface disturbance to soils with short-term impacts.

The alternatives would add to the surface disturbance to soil resources in both the short-term and long-term resulting in significant impacts to soil resources if successful interim and final reclamation is not achieved.

5.10 Cumulative Impacts for Transportation and Access

The CIA for transportation includes Carbon County and more specifically the transportation network that provides access to the CCSM Application Area. Past, ongoing, and reasonably foreseeable activities that would be expected to produce incremental and cumulative impacts within the CIA are summarized in **Table 5.0-1**.

Cumulative effects on transportation would include changes in traffic, that when combined with traffic associated with the CCSM project, would affect overall conditions on the CIA transportation network.

Cumulative effects are considered for two geographies: 1) the CCSM analysis area and the highways and roads that provide immediate access to the area; and 2) the segment of I-80 in the vicinity of Rawlins serving the Application Area and streets within the City of Rawlins, where most of the project workforce would be housed.

Historic and existing traffic within the CCSM analysis area and the highways and roads providing direct access is primarily associated with ranching, grazing, and outdoor recreation. This traffic is relatively low in volume, seasonal in nature, and not anticipated to increase substantially. The CCSM project is the only RFFA anticipated for the CCSM analysis area, therefore cumulative transportation and access impacts within the analysis area are anticipated to be similar to those attributable to Alternative 1R or other action alternatives.

WY 76/CR 407 (CIG Road), which would be the primary access route to the CCSM Application Area and internal haul road, also provides access to the CIG natural gas pipeline compressor plant, to ranches, and to the pipeline and utility corridors near I-80.

WY 71/CR 401 (Sage Creek Road) generally runs north-south, west of the Chokecherry site and through the eastern portion of the Sierra Madre site, providing access from the Rawlins area and I-80 to public

and private lands in southern Carbon County and is one access route to the Medicine Bow National Forest. WY 71 also provides access to rural residential development and the Rawlins water treatment plant south of Rawlins. Although WY 71/CCR provides access to public and private lands open for oil and gas exploration, it does not provide direct access to known oil and gas fields. At present, planned improvements to the Sage Creek Road by the county and state are the only anticipated actions that would generate cumulative effects. Unless highway or road improvement construction occurred on the affected segment of Sage Creek Road during the first 2 years of CCSM construction, cumulative impacts associated with highway construction would be minimal, short-term, and temporary.

Cumulative effects from the projects listed in **Table 5.0-1** are not anticipated on the WY 76/CCR 407. As noted above, WY 71/CCR 401 provides access from I-80 to the Medicine Bow-Routt National Forest, cumulative impacts associated with increases in forest visitor travel would be minimal given the relatively moderate volumes of traffic on WY 71/CCR 401 associated with the CCSM project. Medicine Bow National Forest visitor traffic would be intermittently impeded at the point where the CCSM internal haul road crosses CCR 401 during the first two CCSM project construction years when road and WTG construction would occur in the Sierra Madre site west of CCR 401, but delays would be short-term and temporary.

Cumulative effects from the projects listed in **Table 5.0-1** are not anticipated on WY 76/CR 407 or WY 71/CR 401. Although as noted above, WY 71/CR 401 provides access from I-80 to the Medicine Bow National Forest, cumulative impacts associated with increases in forest visitor travel would be minimal given the relatively moderate volumes of traffic on WY 71/CR 401 associated with the CCSM project. Increases in Medicine Bow National Forest visitor traffic would be intermittently impeded at the point where the CCSM internal haul road crosses CR 401 (Sage Creek Road) during the 7 months of the first two CCSM project construction years when road and WTG construction would occur in the Sierra Madre site west of CR 401, but delays would be short-term and temporary. At present, planned improvements to WY71/CR 401 by the County and State are the only anticipated actions that would generate cumulative effects. Unless highway or road improvement construction occurred on the affected segment of the WY 71/CR 401during the first 2 years of CCSM construction, cumulative impacts associated with highway construction would be minimal, short-term and temporary. Implementation of the Phased Construction Sequencing Mitigation would reduce the potential for adverse cumulative effects during the peak periods, while increasing the potential during the last year of project development.

Cumulative effects on transportation conditions along I-80 near the Application Area and on streets within Rawlins could occur from the effects of the CCSM project in combination with other projects listed in **Table 5.0-1**. Cumulative effects could occur in association with the existing and reasonably foreseeable future oil and gas projects listed in **Table 5.0-1**, particularly if drilling, field development and production activity in these fields were to increase in response to higher oil and natural gas prices. If oil and natural gas activity were to increase substantially during CCSM construction, the CCSM project's contribution to cumulative effects would be primarily associated with workforce commuting, since all construction materials for the project are anticipated to arrive by rail and be transported to the site via WY 76/CR 407.

Cumulative transportation effects associated with oil and gas development would be limited primarily to additional traffic on I-80 and traffic, congestion, delay and deterioration of LOS on streets and at key intersections in the Rawlins area. If a major increase in oil and natural gas activity were to coincide with CCSM construction activity, the congestion, delay and decreases in LOS could be substantial.

Cumulative transportation effects associated with oil and gas activity on the access routes providing direct access to the CCSM Application Area would be unlikely, given that these routes do not access currently known oil and gas fields.

Construction and operations of the Lost Creek Insitu Uranium Project could contribute to cumulative traffic impacts along I-80, although equipment coming from the north would likely access the Lost Creek project on US 287 from I-25. Construction and operations materials coming from the east or west on I-80 would travel through Rawlins to access US 287, and a portion of the project's construction and operations workforce would likely reside in Rawlins, both of which would result in cumulative transportation effects within the city if the two project's construction schedules were to coincide.

Cumulative effects associated with development and operations of the Medicine Bow Fuel & Power LLC's (MBFP 2007) Coal-to-Liquids Project near Medicine Bow would primarily occur on I-80 and within the City of Rawlins. Some construction materials could arrive from the west on I-80 although rail delivery is anticipated and a more likely route for highway transport may be via US 30 from Laramie. The Wyoming Industrial Siting Permit Application submitted for the project forecast that 47 direct workers would locate in Rawlins during the first year of construction and 247 workers would locate in Rawlins during the second and third years. It further assumes that MBFP would construct a 200 bed construction camp in Rawlins (MBFP 2007). If the construction schedules for the MBFP and CCSM Projects were to coincide, additional congestion, delays and reductions in LOS on streets and at key intersections in Rawlins would be anticipated. These cumulative impacts would be short-term, temporary, and only occur in the April through October period of each year when CCSM construction activities would occur. Implementation of the Phased Construction Sequencing Mitigation would reduce the potential for adverse cumulative effects during the peak periods, while increasing the potential during the last year of project development.

The wind energy projects listed in **Table 5.0-1**, other than the Middlewood Wind Power Project, are unlikely to contribute to cumulative transportation effects in the CIA because of their location in the eastern portion of Carbon County, although WTGs and other construction materials could be transported on the segment of I-80 near the CCSM Application Area depending on the origins of those materials. If the proposed intermodal facility east of Sinclair were to be used for delivery of equipment and materials for construction of other wind or energy development projects, cumulative impacts could occur if the construction schedule for those projects were to coincide with the construction schedule for the CCSM project. Cumulative effects also could occur at the I-80 Exit 221 interchange if other wind projects were to use the Sinclair intermodal facility during CCSM project operations. CCSM's contribution to such cumulative effects would primarily be associated with workforce commuting and operations materials, equipment and supplies deliveries. CCSM's long-term contributions to cumulative transportation effects at Exit 221 would be minor.

Construction of the Middlewood Wind Power could result in short-term and temporary cumulative increases in traffic and traffic-related effects on WY 71/CCR 401, if development were to occur concurrently with the CCSM project. Long-term cumulative effects also would arise during operations; however, such effects would be minimal.

Construction schedules for the CCSM and the Carbon County portions of the Gateway West and the Gateway South transmission line projects could overlap. The CCSM contribution to cumulative effects of those two projects would be limited to workforce commuting and materials delivery on I-80 and within Rawlins. Cumulative effects of these three projects on transportation conditions on I-80 would be minimal. Cumulative effects on streets and at key intersections in Rawlins would likely be moderate, short term and temporary.

It is possible that construction schedules for all of the above listed projects could coincide with increased oil and gas activity in the transportation and access CIA. Under these circumstances, cumulative effects would occur on I-80 near the CCSM Application Area and in Rawlins and could be substantial in these areas. Few cumulative transportation effects on the direct access routes leading to the CCSM Application Area would be anticipated.

5.11 Cumulative Impacts for Vegetation

5.11.1 Vegetation

The CIA for vegetation resources, noxious and invasive weeds, and poisonous plants consists of TOTCO and includes the Application Area, off-site features, and the Sage Creek area. Existing and reasonably foreseeable projects that would be expected to produce incremental and cumulative impacts within the analysis area are summarized in **Table 5.0-1**. These projects would contribute incremental changes to the current level of effects to vegetation resources in the analysis area from historic and ongoing management activities.

Historic impacts include grazing and soil disturbing activities such as road development, water development, mining, building development, etc. These activities and supporting developments are common in this rural landscape throughout the CIA. Evidence of human activity in the analysis area from past, present, and reasonably foreseeable actions include roads paved with asphalt or surfaced with gravel, numerous two track roads, oil and natural gas exploration and extraction projects, overhead electric transmission lines, pipelines, coal gasification projects, extraction activities, and water development.

These projects generally consist of large soil disturbing activities that have and will continue to impact the existing native vegetation. Some of the soil disturbance, especially older projects, likely mixed topsoil with subsoils and used weedy nonnative species as part of the reclamation effort. These techniques have had long lasting impacts in changing the vegetation communities to more disturbance oriented communities. In more recent years, improved techniques have been implemented and a greater understanding of the preservation of topsoil and other suitable soil horizons, in addition to using native plant species for reclamation.

The alternatives would add to the cumulative removal of vegetation in both the short-term and long-term. The most abundant vegetation communities, Wyoming big sagebrush and mountain big sagebrush would be impacted the most; however, impacts to these communities are a fraction of the native communities in the analysis area. Although the restoration of the more dominant communities such as big sagebrush, saltbush, and grasslands are well understood, there is limited research or examples of successful reclamation on the more pristine communities such as cushion plant communities. The reclamation of these less understood communities would likely require a higher level of experimentation and likely some unsuccessful attempts. In addition, there is a lack of native seed sources for many of the forbs in these communities which will make it challenging to achieve long-term species composition objectives. However, with successful reclamation of the majority of native communities, cumulative effects to vegetation would be relatively minor.

Indirect effects from the action alternatives would be cumulative issues with roads from existing and proposed development including dust and desertification with existing and potential development in the region. Dust accumulation on vegetation and associated photosynthetic activity reduction as well as lowered palatability may all contribute to changes in species composition, cover, and productivity. Increased roads would channel water that was originally spread across the landscape leading to modification of upland hydrology. These desertification impacts would be significant if not adequately mitigated in areas with moderate to steep slopes.

5.11.2 Noxious Weeds

Noxious and invasive weeds species are present throughout the landscape, with heavier occurrences in areas that have been previously disturbed. Soil disturbing activities have created opportunities for noxious and invasive species to gain a foothold and spread. Linear projects such as roads, transmission lines, and pipelines provide some of the greatest opportunity for weeds to migrate along. With greater understanding of the harm noxious and invasive weeds species can have, new techniques to minimize

the spread, and careful diligence in controlling those weeds that do appear, the cumulative effect from this project would be relatively low.

5.11.3 Wetlands

Cumulative impacts to wetlands are not expected from the proposed project or alternatives when added to other past, present, or reasonably foreseeable future actions (**Table 5.0-1**) in the general project vicinity. This is due to protections provided to wetlands by the CWA, EO 11990, and other regulations that strive to meet the national goal of "no net loss" of the nation's wetlands. Any project that does not avoid wetland impacts altogether would be required to get a permit from the USCOE and either restore the wetlands or create a replacement as compensation.

5.12 Cumulative Impacts for Visual Resources

The CIA for visual resources for all alternatives is the Rawlins Resource Area. Existing and reasonably foreseeable projects that would be expected to produce incremental and cumulative impacts within the CIA are summarized in **Table 5.0-1**. These projects would contribute incremental changes to the current level of effects to visual resources in the CIA from historic and ongoing management activities.

Historic uses are evident in the rural landscapes throughout the CIA, and include grazing, road development, recreational activities, and private land actions. This area has become a regional resource for many year-round recreational activities. Evidence of human activity in CIA landscapes from past, present, and reasonably foreseeable actions include roads paved with asphalt or surfaced with gravel, numerous two-track roads, oil and natural gas exploration and extraction projects, overhead electric transmission lines, pipelines, coal gasification projects, uranium exploration and extraction activities, and wind energy development, especially along the I-80 corridor. Additional activities on private lands in the CIA include state and federal highways, urban areas, industrial activities, oil and gas development, commercial development, private residences, and other land uses typical of a regional economy based on the development of natural resources. Wind energy development is a relatively recent activity in the CIA.

The listed projects include energy development and resource exploration and extraction projects that generally involve the construction and operation of facilities that disturb substantial areas of undeveloped lands. Many of the landscapes in the visual resources CIA generally are characterized by moderate to high scenic integrity, in that they appear to be natural landscapes with minor to no human modifications. The landscapes would be impacted by individual projects by altering relatively large areas of natural-appearing landscapes to landscapes with a substantial industrial component; thereby reducing scenic integrity of these areas to a low level. The Application Area boundaries of several cumulative projects are in close proximity to highways and communities, as shown on **Figure 5.0-1**. Portions of altered landscapes would be visible by relatively large numbers of viewers from federal and state highways, and communities within the boundaries of the CIA. Cumulative projects also would be within viewsheds of sensitive viewing areas that include the CDNST and other recreation areas. The visibility of the cumulative projects as viewed from these locations is dependent on the ability of intervening terrain to screen project components from view, and the proximity of the cumulative projects to each other, which would increase the perceived level of change.

The CIA contains large areas of Wind Power Class 4 to Class 6, with high potential for the development of wind energy. Considerable wind energy development has occurred on public and private lands within the CIA. Wind energy development projects are visible for longer distances than other cumulative projects in the CIA. A proposed wind energy project on lands adjacent to the southeast boundary of the Sierra Madre would, in combination with the proposed project, affect the viewsheds of historic and scenic trails and the North Platte River. Other cumulative wind energy projects listed in **Table 5.0-1** are located in close proximity to each other in the vicinity of U.S. 30 and SH 13. Motorists and residents at various

locations on the highways view expansive vistas that include large areas occupied by one or more wind energy projects, which potentially are visible up to 20 miles from the facilities.

Anticipated economic and population growth would increase the level of use for some management activities on public lands in the CIA, including ongoing outdoor recreation activities. Residential and commercial construction is anticipated to continue on private lands, and would increase the evidence of human activity throughout the CIA. Growth also would increase the number of residents and recreationists who have a concern for scenic resources.

Based on the past, current, and anticipated actions discussed above, the cumulative effects of activities in the CIA would increase the potential for adverse impacts to inventoried visual resources for the RFO (Otak, Inc. 2011). The size and number of WTGs associated with the project under any action alternative, combined with other similar facilities, and other resource, wind energy, and transmission development in the CIA, would have adverse impacts to inventoried visual resources. The incremental contribution of the proposed project to cumulative effects to inventoried visual resources is substantial because the project would have a high level of visibility relative to other cumulative projects, based on project's close proximity to I-80 and communities along the highway. The incremental effect of the proposed project under any of the action alternatives in addition to existing and foreseeable disturbance in the CIA would be a substantial contribution to the ongoing alteration of large areas of the CIA from natural and rural landscapes to rural landscapes with a noticeable industrial component.

Most BLM lands affected by cumulative projects are managed with VRM Class III and IV objectives as described in the VRM Plan Amendment preferred alternative in Volume I. The proposed project would contribute a noticeable incremental increase in cumulative changes from large scale facilities but would meet VRM Class IV objectives, which accommodates major changes in the landscape. VRM Class III objectives would be met for most cumulative projects with the successful implementation of mitigation; however, mitigation strategies for wind energy development and the accompanying high-voltage transmission lines are limited in the ability to reduce the appearance of large scale facilities spread over large areas.

5.13 Cumulative Impacts for Water Resources

The CIA used for assessing potential cumulative impacts to water resources is defined as all 6th order, HUC-12 Sub-watersheds (Berelson et al. 2001) that have a portion of the Application Area included within their boundary (**Table 3.13-1** and **Figure 3.13-1**). There are a total of 21 sub-watersheds assessed. The total area encompassed by these sub-watersheds is approximately 640,000 acres or 1,000 miles^2.

Within this analysis area, past and present land disturbance has been largely quantified through GIS analysis as part of the wildlife analyses. Analysis of greater sage-grouse required land disturbance quantification within 11 miles of the Application Area, which includes all of the water resources analysis area with the exception of the northern-most tip near Seminoe Reservoir (furthest downstream), consisting of approximately 1,200 acres. The remainder of the past and present disturbance in the analysis area is detailed in **Table 5.13-1**.

Past and present disturbance is greatest in the sub-watersheds that contain the towns of Rawlins and Sinclair. Disturbance from roads can be seen in all sub-watersheds to some extent. Sub-watersheds with a gas plant, recreation areas, and oil and gas development show minor disturbance, which also is noted. Only the sub-watersheds with the towns exhibit disturbance greater than 1 percent. The operation of Alternative 1R would not increase present disturbance above 1 percent in any of those sub-watersheds. The four sub-watersheds with the town development present are the only sub-watersheds with more than 1 percent disturbance.

The RFFA projects identified within the water resources CIA are the Gateway West Transmission Line, Gateway South Transmission Line, TransWest Express Transmission Line, Middlewood Wind Energy, and numerous mine permits. The majority of these related projects in the area lie north and northeast of the project, generally downstream on the North Platte River. The Middlewood Wind Energy project and one small 40 acre mine permit area lie to the southeast of the Sierra Madre site. A small portion of the mine permit area is partially within the Upper Colorado River drainage.

The potential for water quality impacts from these projects are similar in nature to this project due to land disturbance. Total Application Areas are presented in **Table 5.13-2** to quantify the potential for cumulative impacts. Because these projects are few, the permit areas do not overlap this project, and because the disturbance within the permit areas is assumed to be similar to this project, it can be concluded that the cumulative impact to water quality and quantity from land disturbance would not affect any current users of the water, nor alter channel geometry.

Table 5.13-1 Past and Present Disturbance within the Water Resources Analysis Area

Sub-watershed Name	Past and Present Disturbance							Project Operation Alternatives				Grand Total with Project Operation Alternatives			
	City (acres)	Gas Plant/ Refinery (acres)	Recreation (acres)	Roads (acres)	Well Pads (acres)	Total Disturbance (acres)	Total Disturbance (percent)	Alt 1R (percent)	Alt 2 (percent)	Alt 3 (percent)	Alt 4 (percent)	Alt 1R (percent)	Alt 2 (percent)	Alt 3 (percent)	Alt 4 (percent)
North Platte Basin															
North Platte River-First Cottonwood Draw				157		157	0.3	0.1	0.1	0.1	0.1	0.5	0.5	0.5	0.4
Little Jack Creek				109		109	0.3	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.3
Upper Sage Creek-North Platte River [1]				184	3	186	0.5	0.2	0.1	0.1	0.2	0.7	0.6	0.6	0.6
Rasmussen Creek [1]				28		28	0.1	0.7	0.7	0.7	0.8	0.9	0.8	0.8	1.0
Lower Sage Creek-Upper North Platte River [1]				20	3	22	0.1	0.3	0.4	0.5	0.5	0.5	0.5	0.6	0.6
Miller Creek [1]				92		92	0.3	0.5	0.4	0.4	0.5	0.8	0.8	0.7	0.9
Upper Little Sage Creek [1]				183	17	199	0.6	0.0	0.0	0.0	0.0	0.6	0.7	0.7	0.7
Lower Little Sage Creek [1]				34	10	44	0.3	0.2	0.2	0.2	0.2	0.4	0.5	0.5	0.4
North Platte River-Coal Mine Draw				60		60	0.2	0.1	0.2	0.2	0.3	0.3	0.4	0.4	0.4
North Platte River-Lost Springs Draw			116	245		359	0.8	0.0	0.0	0.0	0.0	0.8	0.8	0.8	0.8
Iron Springs Draw				25		25	0.1	0.4	0.9	1.0	0.9	0.5	1.0	1.1	1.1
Hugus Draw				5		5	0.0	0.9	1.0	1.1	1.0	0.9	1.1	1.1	1.1
Grenville Dome	42	62		156		259	1.2	1.1	1.2	1.3	1.2	2.3	2.4	2.4	2.3
Pass Creek-Stage Station Springs				193	10	203	0.6	0.0	0.0	0.0	0.0	0.6	0.6	0.6	0.6
Middle Sugar Creek	2,961			323	16	3,115	12.5	0.1	0.3	0.3	0.1	12.7	12.8	12.8	12.7
Lower Sugar Creek	3,063	398		404	3	3,357	7.8	0.3	0.3	0.3	0.3	8.1	8.1	8.1	8.1

Table 5.13-1 Past and Present Disturbance within the Water Resources Analysis Area

Sub-watershed Name	Past and Present Disturbance							Project Operation Alternatives				Grand Total with Project Operation Alternatives			
	City (acres)	Gas Plant/ Refinery (acres)	Recreation (acres)	Roads (acres)	Well Pads (acres)	Total Disturbance (acres)	Total Disturbance (percent)	Alt 1R (percent)	Alt 2 (percent)	Alt 3 (percent)	Alt 4 (percent)	Alt 1R (percent)	Alt 2 (percent)	Alt 3 (percent)	Alt 4 (percent)
101800021304 (Sugar Creek)[2]	209			2		210	1.9	1.1	1.1	1.2	1.0	3.0	3.0	3.1	2.9
North Platte Basin Subtotal	**6,274**	**460**	**116**	**2,221**	**61**	**8,433**	**1.6**	**0.3**	**0.3**	**0.3**	**0.3**	**1.9**	**2.0**	**2.0**	**2.0**
White-Yampa Basin															
North Fork Savery Creek				126		126	0.4	0.0	0.0	0.0	0.0	0.4	0.4	0.4	0.4
Little Savery Creek				116	3	119	0.4	0.0	0.0	0.0	0.0	0.4	0.4	0.4	0.4
Muddy Creek-Littlefield Creek[3]				134		134	0.4	0.0	0.0	0.0	0.0	0.4	0.4	0.4	0.4
McKinney Creek[3]				93		93	0.3	0.3	0.3	0.0	0.2	0.6	0.6	0.3	0.5
White-Yampa Basin Subtotal				**469**	**3**	**472**	**0.4**	**0.1**	**0.1**	**0.0**	**0.0**	**0.4**	**0.4**	**0.4**	**0.4**
Grand Totals[4]	**6,274**	**460**	**116**	**2,690**	**64**	**8,904**	**1.4**	**0.2**	**0.3**	**0.3**	**0.3**	**1.6**	**1.7**	**1.7**	**1.7**

[1] Sub-watersheds included in Sage Creek watershed improvement project.

[2] Some 12-digit sub-watersheds (HUs) were assigned the HUC-12 number when no GNIS name was identified on the DRGs. The name in parentheses indicates the HUC-10 name.

[3] Sub-watersheds included in Upper Muddy Creek watershed improvement project.

[4] Discrepancies in total acreage due to rounding.

Table 5.13-2 Sub-watersheds with Reasonably Foreseeable Actions and Associated Application Area within Analysis Area

Sub-watershed Name	CCSM		Other Projects Considered for Cumulative Impacts							
	Application Area Total (acres)	Percent of Sub-watershed	Mine Permits (acres)	Gateway West T-line (acres)[1]	Gateway South T-Line (acres)[1]	TransWest Express T-Line (acres)[1]	Middlewood Wind Energy (acres)	Cumulative Total (acres)	Percent of Sub-watershed	Percent Change Due to Other Projects
North Platte Basin										
North Platte River-First Cottonwood Draw	6,162	13.1					4,099	10,261	21.9	8.7
Little Jack Creek	8	0.0	36				11,604	11,648	32.6	32.5
Upper Sage Creek-North Platte River	28,140	68.7					6,965	35,105	85.8	17.0
Rasmussen Creek	23,140	98.5					87	23,227	98.9	0.4
Lower Sage Creek-Upper North Platte River	8,224	41.0					500	8,724	43.4	2.5
North Platte River-Lost Springs Draw	3,347	7.1	240	190	99			3,875	8.2	1.1
Grenville Dome	13,669	62.0		352				14,021	63.6	1.6
Middle Sugar Creek	3,615	14.5		142	276	146		4,179	16.8	2.3
Lower Sugar Creek	1,733	4.0			350			2,083	4.9	0.8
101800021304 (Sugar Creek)2	7,069	64.0		195		208		7,473	67.7	3.7

Table 5.13-2 Sub-watersheds with Reasonably Foreseeable Actions and Associated Application Area within Analysis Area

Sub-watershed Name	CCSM		Other Projects Considered for Cumulative Impacts							
	Application Area Total (acres)	Percent of Sub-watershed	Mine Permits (acres)	Gateway West T-line (acres)[1]	Gateway South T-Line (acres)[1]	TransWest Express T-Line (acres)[1]	Middlewood Wind Energy (acres)	Cumulative Total (acres)	Percent of Sub-watershed	Percent Change Due to Other Projects
White-Yampa Basin										
North Fork Savery Creek	3,380	11.0	4					3,384	11.0	0.0
Totals3	222,690	34.8	280	879	724	355	23,255	248,182	38.8	4.0

[1] Acreage calculated from miles of proposed transmission line within Subwatershed times an assumed ROW of 350 feet.

[2] Some 12-digit sub-watersheds (HUs) were assigned the HUC-12 number when no GNIS name was identified on the DRGs. The name in parentheses indicates the HUC-10 name.

[3] Total sums all sub-watersheds in analysis area, including those not shown here. Discrepancies in total acreage due to rounding.

5.14 Cumulative Impacts for Wildlife and Fisheries Resources

5.14.1 Cumulative Impact Assessment Methodology

The CIA for wildlife and fisheries encompasses the entire RFO, an area of approximately 11.2 million acres in south-central and southeastern Wyoming.

As with all other resources, the cumulative analysis for wildlife and fisheries resources focuses on past, present, and reasonably foreseeable actions presented in **Table 5.0-1** and the proposed project assuming that: 1) human use of the CIA would increase with the implementation of the proposed project, 2) wildlife habitats currently are at their respective carrying capacities in and adjacent to the Application Area, and 3) the overall region has been previously affected by at least some level of historic and current development activities and will be affected by reasonably foreseeable actions.

5.14.2 Projects and Activities Considered

Projects that have either been permitted or are in the permitting process within close proximity are described in **Table 5.0-1**.

5.14.3 Cumulative Impacts for Wildlife Resources

Cumulative impacts to wildlife resources would primarily be related to habitat loss, habitat fragmentation, and animal displacement. Long-term surface disturbances incrementally add to wildlife habitat losses, habitat fragmentation, and may result in animal displacement. In areas where energy development (including oil, gas, wind, and coal gasification) has occurred, habitat loss may have disrupted seasonal use patterns or migration routes. Historic, current, and future developments in the vicinity of the Application Area may reduce the carrying capacity for some species through a reduction in available cover, forage, and breeding areas. Most of the existing and future surface disturbance in the CIA is associated with energy development, including construction of well pads, pipelines, wind turbines, transmission lines, and road networks. However, other activities such as housing development, livestock grazing, and private land actions also contribute to cumulative impacts on wildlife and their habitats. Among big game species, elk and mule deer are especially susceptible to these impacts because of their sensitivity to habitat loss and human disturbance associated with energy development. The big game habitat within each respective CIA is displayed on **Figures 5.14-1** through **5.14-3**. Other wildlife species, such as raptors and greater sage-grouse, also would be susceptible to these cumulative impacts since encroaching human activities in the region have resulted and/or would result, in habitat loss, animal displacement, and potential fragmentation. Many of the local wildlife populations (e.g., small game, reptiles and amphibians) that occur in the CIA likely would continue to occupy their respective ranges and breed successfully, although the population numbers may decrease relative to the amount of cumulative habitat loss and disturbance from incremental development.

Past and present projects identified for the CIA, have resulted in the direct disturbance of approximately 8,904 acres (**Table 5.13-1**). The cumulative impact of Alternative 1R would result in approximately 10,448 acres of long-term surface disturbance within the CIA, of which 15 percent would be attributable to the Alternative 1R. Similarly, with the identified past and present surface disturbance with either Alternatives 2, 3, or 4 would result in a cumulative long-term surface disturbance of 10,746, 10,684, and 10,775 acres, respectively. These alternatives would contribute to 17 percent of the cumulative impact. A portion of the cumulative disturbance surface area has been, or would be, reclaimed or has recovered. The reclaimed areas and areas associated with habitat conversion would be capable of supporting wildlife use; however, species composition and densities likely would change.

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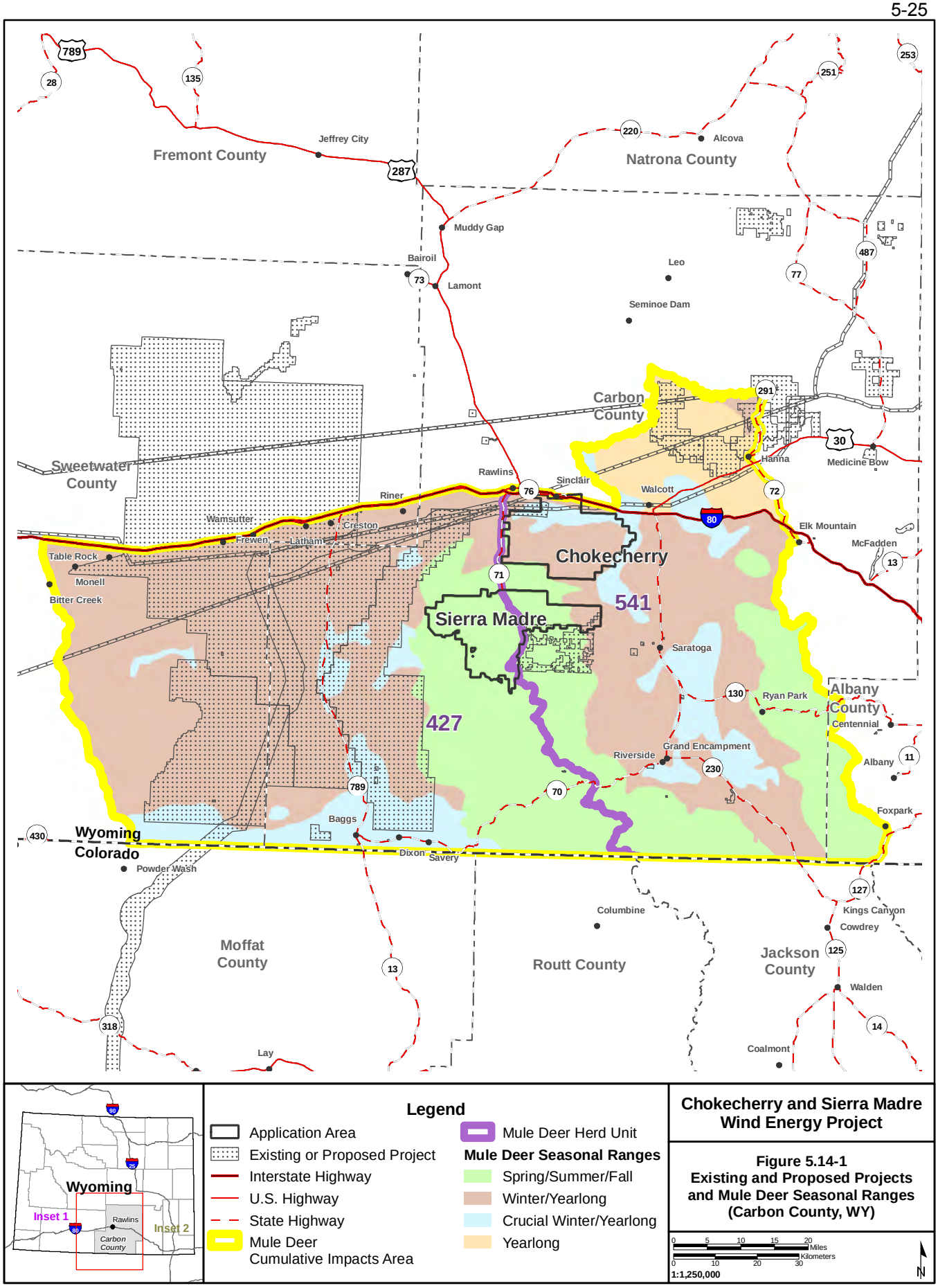

Chokecherry and Sierra Madre Wind Energy Project

Figure 5.14-1
Existing and Proposed Projects and Mule Deer Seasonal Ranges (Carbon County, WY)

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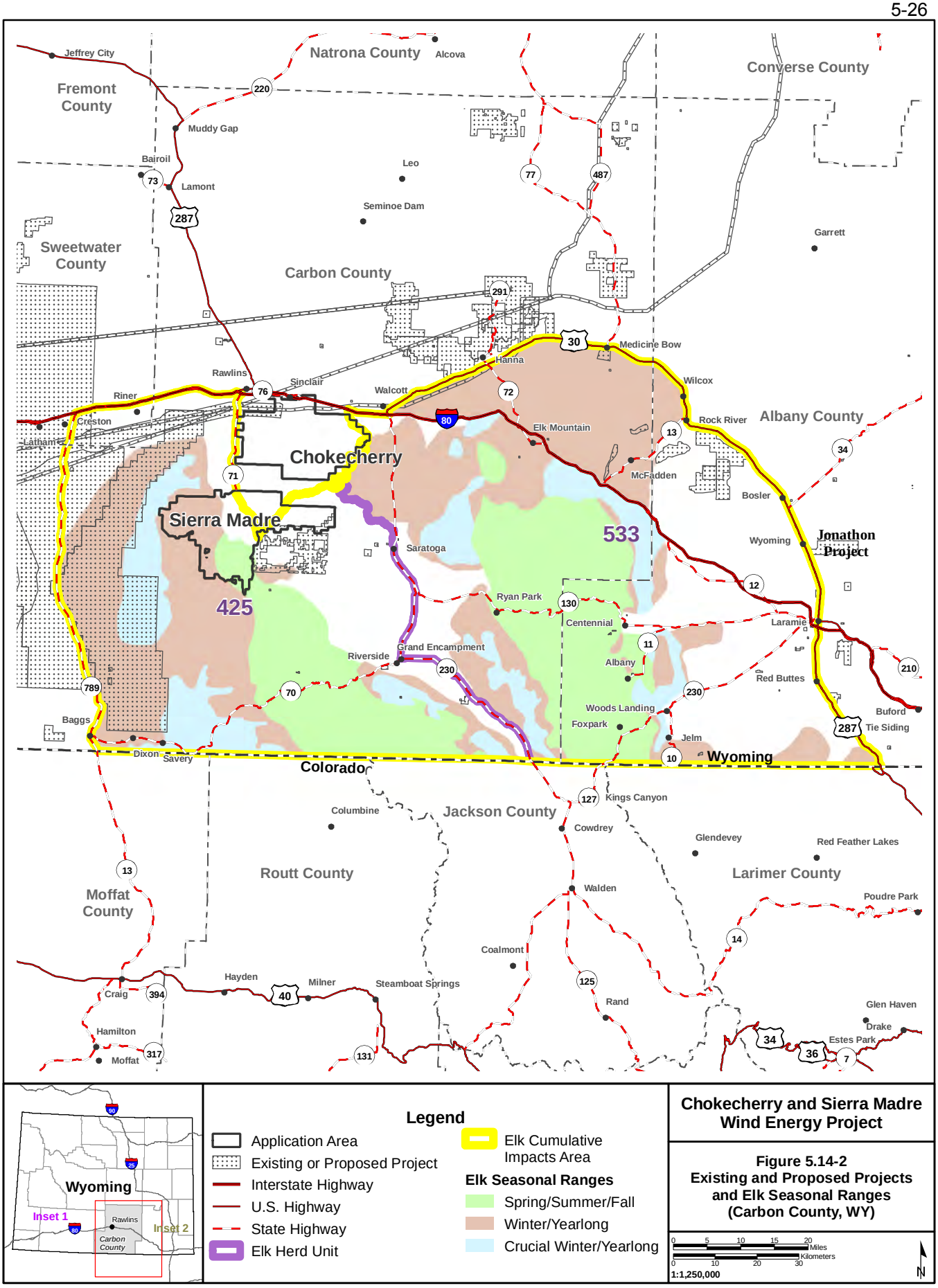


Legend

- Application Area
- Existing or Proposed Project
- Interstate Highway
- U.S. Highway
- State Highway
- Elk Herd Unit
- Elk Cumulative Impacts Area

Elk Seasonal Ranges

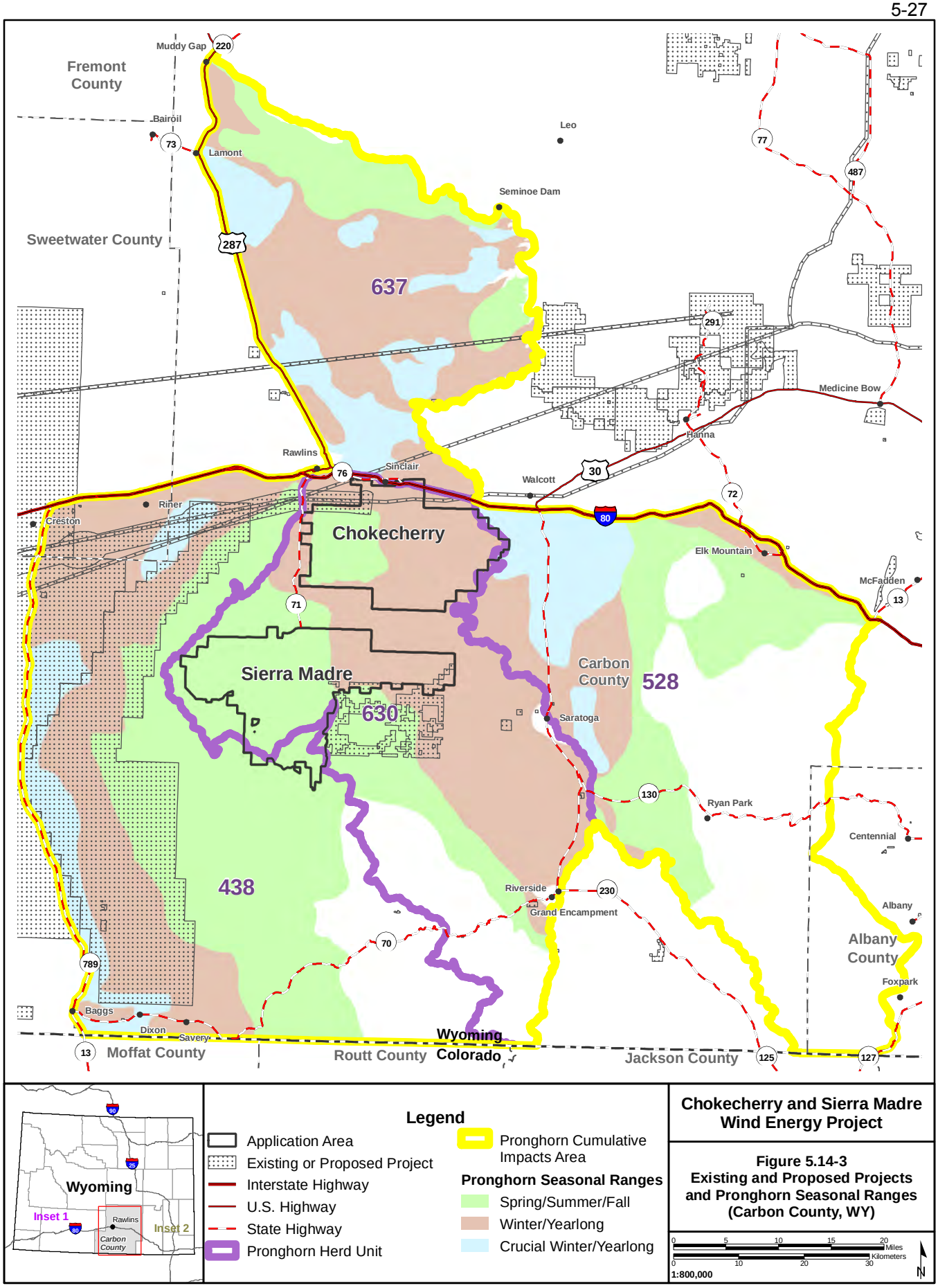
- Spring/Summer/Fall
- Winter/Yearlong
- Crucial Winter/Yearlong

Chokecherry and Sierra Madre Wind Energy Project

Figure 5.14-2
Existing and Proposed Projects and Elk Seasonal Ranges (Carbon County, WY)

0 5 10 15 20 Miles
0 10 20 30 Kilometers
1:1,250,000
N

X:\0Projects\12907_001_Wyoming_Wind\Figures\EIS\DEIS\Volume2\Figure_5_14-3_PronghornCumulative_20110628.mxd



Chokecherry and Sierra Madre Wind Energy Project

Figure 5.14-3
Existing and Proposed Projects and Pronghorn Seasonal Ranges (Carbon County, WY)

While surface disturbance generally corresponds to associated wildlife habitat loss, accurate calculations of cumulative wildlife habitat loss cannot be determined because the direct impacts of habitat disturbance are species-specific and dependent upon: 1) the status and condition of the population(s) or individual animals being affected; 2) seasonal timing of the disturbances; 3) value or quality as habitat of the disturbed sites; 4) value or quality of adjacent habitats for the affected species; 5) the type and duration of surface disturbance; and 6) other variables that are difficult to quantify (e.g., habitat avoidance due to increased noise and human presence). Nonetheless, surface disturbance remains a useful indicator of direct habitat loss and is commonly used as standard metric in CIA.

It is anticipated that indirect impacts to habitat for most species associated with human presence and noise would be greatest during construction and incrementally decrease to some degree in the CIA during the life of the proposed project; however, there would be an overall increase in indirect loss of habitat for some species from the present. Indirect cumulative impacts from wind energy and other development within the CIA would include:

- Animal displacement. Displaced individuals could be forced into already occupied and/or less suitable habitats possibly resulting in reduced quantity and quality of habitat. This increased crowding and/or use of less suitable habitat could result in deteriorated physical condition from increased energy expenditure and general distress as important habitat quality and quantity is reduced and animals are displaced. Loss of habitat/forage consequently could result in increased competition between and among species for available resources.
- Decreased reproduction success and survival. A decrease in physical condition and an increase in stress may lead to decreased survival and reproductive success.
- Increased traffic levels. An increase in traffic levels (associated with construction and operation) on roadways has the potential to increase the risk of vehicle/wildlife collisions and increased human utilization of resources would expose wildlife to potential human harassment (and poaching), either inadvertent or purposeful.

Based on these direct and indirect cumulative impacts, ongoing and future energy development and livestock grazing in the CIA would cumulatively and incrementally reduce the ability of wildlife habitats in the CIA to support wildlife at their current levels for the lifetime of this wind energy facility (potentially 50 years). Cumulative impacts would continue until such time that reclamation is deemed successful (approximately 10 to 100 years depending on the vegetation cover type) and the project is decommissioned.

5.14.3.1 Big Game

Most big game species are migratory and require large tracts of land to meet their seasonal habitat requirements. Accordingly, the potential impacts of development may not be exceptionally high in one seasonal range (e.g., winter or summer), but when seasonal ranges are considered together, the cumulative effects could become biologically significant to the affected populations. Therefore, the CIA for big game is based on herd units rather than the entire RFO. When assessing cumulative impacts to big game, the construction of roads and other infrastructure represents the primary source of impact(s). The construction of roads and other infrastructure reduce the amount of habitat available for animals through direct habitat loss, indirect habitat loss (i.e., behavioral avoidance), and fragmentation. The preponderance of evidence suggests these roadway impacts can have population-level effects on both terrestrial and aquatic communities (Trombulak and Frissell 2000; Fahrig and Rytwinski 2009; Benitez-Lopez et al. 2010). However, the thresholds at which roads or other development features create movement barriers or population-level effects to big game are rarely known (Frair et al. 2008) and can vary from species to species.

5.14.3.2 Mule Deer

The CIA for mule deer encompasses herd units 427 (Baggs) and 541 (Platte River) (**Figure 5.14-1**). Studies conducted in the Atlantic Rim Project Area show that a portion of the mule deer that winter in and adjacent to the Atlantic Rim Project Area migrate 20 to 40 miles to summer ranges in the Sierra

Madre area (Sawyer 2007; Sawyer et al. 2009a,b). Other studies have documented mule deer and elk from the Powder Wash and Desolation Flats area migrating east/northeast to summer ranges in the Sierra Madre area (Porter 1999) Gas development can displace mule deer to less-preferred habitat and create indirect habitat loss considerably larger than the direct habitat loss (Sawyer et al. 2006). New road construction increases the potential for wildlife-vehicle collisions, poaching, and general disturbance resulting from increased human activity. Increased traffic levels on WY 789 associated with gas field development have increased mule deer-vehicle collisions and prompted WGFD and WYDOT to construct a wildlife underpass approximately 7 miles north of Baggs. Accordingly, the Sierra Madre area will result in additional impacts to the spring/summer/fall range of the Baggs deer herd – a herd whose winter and yearlong ranges have been, or will be, impacted by other projects. In contrast, the past, present and reasonably foreseeable projects identified in the Platte River herd unit were restricted to some mining activity north of I-80, near Hanna (**Figure 5.0-1**). Although these mining projects are within the boundaries of the Platte River herd unit, I-80 is a barrier to big game movement. Given mule deer movements are restricted to either side of the interstate, there were no other projects identified that are likely to contribute to cumulative impacts of the Platte River deer herd. Of the herd units in the CIA, potential impacts are highest in the Baggs herd unit.

5.14.3.3 Elk

The CIA for elk encompasses herd unit 533 (Snowy Range). Past, present and reasonably foreseeable projects identified in the Snowy Range herd unit included the Atlantic Rim and Continental Divide/Wamsutter gas development project along the western border, and several wind power projects (e.g., Foote Creek Rim, McFadden Ridge) along the eastern border (**Figure 5.14-2**). However, only the Atlantic Rim project occurs within the seasonal ranges of the Snowy Range elk herd. Elk avoidance of roads is well-documented (Cole et al. 1997; Rowland et al. 2000) and disturbance in parturition areas can have demographic consequences (Phillips and Alldredge 2000). New road construction increases the potential for wildlife-vehicle collisions, poaching, and general disturbance resulting from increased human activity. Development in the western portion of the Sierra Madre area will further impact the spring/summer/fall and winter/yearlong range of this elk herd.

5.14.3.4 Pronghorn

The CIA for pronghorn encompasses herd units 438 (Baggs), 630 (Iron Springs), 528 (Elk Mountain), and 637 (South Ferris). Past, present and reasonably foreseeable projects identified in the Baggs herd unit included the Atlantic Rim and Continental Divide/Wamsutter gas development projects that cover most of the crucial and winter/yearlong range within the herd unit (**Figure 5.14-3**). Pronghorn tend to increase vigilance and reduce their feeding time in areas with heavy traffic (>200 vehicles/week) (Berger et al. 1983). This response (i.e., vigilance and reduced feeding) to roads increases with traffic levels (Gavin and Komers 2006). New road construction increases the potential for wildlife-vehicle collisions, poaching, and general disturbance resulting from increased human activity. Development within the southernmost portion of the Sierra Madre area will further impact the spring/summer/fall range of the Baggs pronghorn herd. In contrast to the Baggs herd unit, no past, present or reasonably foreseeable projects were identified in the Iron Springs, Elk Mountain, or South Ferris herd units. Of the herd units in the CIA, potential impacts are highest in the Baggs herd unit.

5.14.3.5 Cumulative Impacts for Bats

Because very little bat roosting or foraging habitat would be directly impacted by removal of vegetation in the Application Area, habitat impacts to both migratory and non-migratory bats, including the BLM

sensitive species of bats in the Project region, are expected to be low and no significant cumulative impacts are likely. Similarly, because fatality rates of non-migratory bats are expected to be relatively low, no cumulative impacts associated with turbine fatalities are expected for non-migratory bat species. Fatality impacts to long-distance migratory tree bats are rather unique, in that the impacted populations are likely not local, but breed north of the Project region, such as in the Pacific Northwest or forested areas of northern Wyoming, Idaho, Montana, and western Canada. Cumulative impacts to long-distance migratory tree bats would primarily be associated with wind energy development along their entire migration corridor, from Canada to Mexico.

Over 20 states have enacted laws requiring a portion of the electricity supply to come from renewable energy (AWEA 2006) and a similar federal law is being considered. Generating 20 percent of U.S. electricity supplies from wind energy by 2030 is technically feasible (USDOE 2008). As of June 2009 (AWEA 2009b), the 17 western U.S. states had 19,951 MW of installed capacity, which represents 68 percent of all installed wind energy in the U.S. There are an additional 800 MW of existing wind energy in western Canada (Canadian Wind Energy Association [CWEA] 2009). Using an average of 2.1 bat fatalities/MW/year for existing wind energy facilities in western North America (Johnson and Stephens 2011) would imply that as many as 43,577 bat fatalities could occur per year in this region, a large percentage being migratory tree bats. The existing wind energy development and the projected increase in wind energy development throughout western North America as well as other forms of development that result in direct fatalities would cumulatively impact migratory tree bat populations, especially hoary and silver-haired bats. However, there is inadequate information on the populations of these species to determine if the fatalities resulting from this project would contribute significantly to a change in population sizes.

5.14.3.6 Cumulative Impacts for Birds

The potential for population level impacts caused by avian collision mortality associated with 6,700 MW of existing and proposed wind-energy development in the Columbia Plateau Ecoregion of eastern Oregon and Washington was estimated based on results of 12 existing mortality studies in the ecoregion (Johnson and Erickson 2010). Estimated breeding population sizes were available for most birds in the ecoregion based on Breeding Bird Survey data. Predicted fatality rates for avian groups as well as species of concern were compared to published annual fatality rates. Because the additional wind-energy associated mortality was found to comprise only a small fraction of natural fatality rates, population level impacts would not be expected for the ecoregion as a whole, but local impacts to some species could occur (Johnson and Erickson 2010). In the only study to quantitatively assess potential population level impacts, Hunt (2002) conducted a 4-year radio telemetry study of golden eagles at the APWRA and found that the resident golden eagle population appeared to be self-sustaining despite high levels of fatalities, but the effect of these fatalities on eagle populations wintering within and adjacent to the APWRA was unknown. All 58 territories occupied by golden eagle pairs in the APWRA in 2000 remained active in 2005 (Hunt and Hunt 2006). Other activities considered for the cumulative impacts analysis such as oil and gas development, increased vehicle presence, direct habitat loss, and power lines are expected to result in some direct impacts to raptors and other birds. There are no other existing or proposed wind energy facilities within the home range of breeding raptors and other birds using the Application Area. There is a chance that most birds using the Application Area will come into contact with other wind facilities, increased traffic associated with energy development, and other risk factors during migration. Nevertheless, collision mortality of raptors as well as other birds associated with 3,000 MW of wind energy development is not expected to result in cumulative impacts through population reductions. The Wildlife Society prepared a landmark publication on wind energy and wildlife and concluded that fatalities of passerines from turbine strikes generally are not significant at the population level (Arnett et al. 2007). Also, the NAS (2008) recently reviewed wind energy impacts on birds, and came to the following conclusion: “At the current level of wind-energy development (approximately 11,600 MW of installed capacity in the United States at the end of 2006, including the older California turbines), the committee sees no evidence that fatalities caused by wind turbines result in measurable

demographic changes to bird populations in the United States, with the possible exception of raptor fatalities in the Altamont Pass area."

Although direct impacts are not considered cumulatively significant, indirect impacts to sagebrush obligate birds, including several BLM sensitive species were considered significant in the Application Area. Most of the other existing and proposed developments such as oil and gas development and power lines will lead to additional loss of habitat and further indirect impacts through displacement and habitat fragmentation. Therefore, cumulative impacts to sagebrush obligate species are considered significant.

5.14.4 Cumulative Impacts for Fisheries

Cumulative impacts to fisheries resources include erosion and sedimentation from surface disturbance, water depletions from the Platte and White-Yampa River basins from the projects considered (**Table 5.0-1**) and the potential for leaks or spills of contaminants during construction and maintenance within the North Platte and White-Yampa basins. The CIA for fisheries includes the 21 sub-watersheds assessed for the North Platte and White-Yampa basins as well as downstream extending into central Nebraska within the Platte River, and into northwest Colorado within the Colorado River.

Past, present, and RFFAs in the CIA could result in some level of erosion and sedimentation, which in turn may impact aquatic habitats in localized areas. An increase of fine inorganic sediment in rivers and streams may impact fish spawning, fish rearing, and feeding behavior (USFWS 2002a,b,c,d). Past and present surface disturbance including oil and gas development and livestock grazing within each of the 21 sub-watersheds was summarized in **Table 5.13-1**. Total past and present surface disturbance exceeds 1 percent in only four sub-watershed including Grenville, Sugar Creek, Middle Sugar Creek, and Lower Sugar Creek, which are all within the North Platte basin. With the addition of Alternative 1R, the total disturbance within each of these sub-watersheds would increase by 1.1, 0.2, 0.3, and 1.1 percent, respectively. The first two sub-watersheds identified do not contain any named waterbodies, while the waterbodies within the later two sub-watersheds do not have any fisheries data associated with them. Therefore, based on the lack of information it is difficult to determine the magnitude of cumulative impacts.

The past and present total surface disturbance within the sub-watersheds that contain important trout fisheries including Upper Sage Creek-North Platte River; North Platte River-Coal Mine Draw; and McKinney Creek, are estimated to be 0.5, 0.2, and 0.3 percent of total sub-watershed, respectively. With the addition of Alternative 1R, the percent of total surface disturbance within each of these sub-watersheds would slightly increase to 0.6, 0.3, and 0.7 percent of the total sub-watershed, respectively. It is likely that increased erosion and subsequent sediment yield will occur locally within these sub-watersheds resulting from Alternative 1R, increasing cumulative impacts. However, without the final layout for construction cumulative impacts can be generalized to the conceptual area of development but it is impossible to determine the magnitude of cumulative impacts for specific sub-watersheds.

As for foreseeable future actions identified within the CIA, several transmission lines, numerous mine permits, and other projects may be implemented in the future. The majority of these related projects in the area lie north and northeast of the Project, generally downstream on the North Platte River. One small 40-acre mine permit area lies to the southeast of the Sierra Madre site. Section 5.13, Cumulative Impacts for Water Resources, describes that the potential for water quality impacts from these projects are similar in nature to this project based on land disturbance. Areas within these sub-watersheds, particularly the North Platte River-Lost Springs Draw sub-watershed, will likely experience an increase in erosion and subsequent sediment yield will occur locally within these sub-watersheds resulting in a addition contribution to cumulative impacts to fisheries in these areas (see **Table 5.13-2**).

Water depletions also may impact fisheries resources, including aquatic habitats within the North Platte and White –Yampa basins. It is anticipated that water needs for construction and maintenance of the proposed project would be obtained primarily with water from the North Platte Basin through a Temporary Use Agreement associated with existing agricultural water rights. Existing authorized water usage would directly and indirectly consume water from the North Platte Basin which would ultimately cause reductions in flow downstream within the Platte River. These potential cumulative impacts are discussed further in relation to special status species in Section 5.15, Cumulative Impacts for Special Status Species.

Activities within or adjacent to the 100-year floodplains of the rivers or within drainages leading to these rivers may increase the potential for a release of contaminants into these drainages. Leaks or spills of contaminants may lead to habitat degradation and mortality of fish. Development activities in proximity to these aquatic resources within the CIA require special construction practices and spill prevention measures for projects that have the potential to impact the fisheries.

5.15 Cumulative Impacts for Special Status Species

5.15.1 Cumulative Impact Assessment Methodology

Special Status Species would be cumulatively impacted by RFFAs and the resulting direct impacts generally would be the same as discussed in Section 5.14, Cumulative Impacts for Wildlife and Fisheries Resources, for wildlife; however, on BLM-managed lands (and private lands in many cases), surveys typically are required in potential or known habitats of threatened, endangered, or otherwise special status species. These surveys would help determine the presence of any special status wildlife species or extent of habitat, and protective measures generally would be taken to avoid or minimize direct disturbance in these important areas. Given the status of the greater sage-grouse population, the Colorado River endangered fish, and downstream Platte River species, cumulative impacts for the greater sage-grouse, Colorado pikeminnow, razorback sucker, humpback chub, bonytail chub, whooping crane, interior least tern, piping plover, pallid sturgeon, and western prairie fringed orchid may be more pronounced than for other special status species. The CIA areas for special status species differ with respect to species. This analysis examines the wildlife and aquatic habitat within respective CIA areas that may be disturbed from all past, present, and RFFAs. Notwithstanding, in assessing cumulative impacts, it was not possible to specifically determine where future impacts would occur within the CIA areas. Projects and activities considered in this cumulative assessment are the same as those described in Section 5.14, Cumulative Impacts for Wildlife and Fisheries Resources, and presented in **Table 5.0-1** and shown on **Figure 5.0-1**.

5.15.1.1 Greater Sage-grouse

The project does not include surface disturbance within greater sage-grouse core breeding areas, however, it was determined that the methods contained within BLM IM WY-2010-012 for identifying cumulative impacts/disturbance was appropriate for determining cumulative impacts for this project. Based on Instruction Memorandum (IM) WY-2010-012, in combination with BLM's guidance document (*Chokecherry/Sierra Madre Wind Project Greater Sage-grouse Habitat Evaluation*) and a follow-up meeting with the BLM (BLM RFO, April 13 and 14, 2010), the following parameters were used to calculate greater sage-grouse habitat disturbance and road/energy development density within an established CIA effects study area for the CCSM Wind Project EIS. The CIA area was defined as an 11-mile radius around the project boundary.

All of the area within designated greater sage-grouse core breeding areas was considered greater sage-grouse habitat. In addition, areas identified as being greater sage-grouse habitat outside core breeding areas based on BLM data were included in the analysis. Of the 1,913 miles^2 (1,224,127 acres) within the analysis area, there are 1,032 miles^2 (660,648 acres) of greater sage-grouse core habitat (54 percent) and 311 miles^2 (199,243 acres) of non-core habitat (16 percent); the remaining 569 miles^2 (364,236 acres) (30 percent) are not considered greater sage-grouse habitat.

Once all greater sage-grouse habitat was mapped within the 11-mile radius, existing and proposed disturbances resulting in direct habitat loss were overlaid on this map and the amount of greater sage-grouse habitat loss, separated by core and non-core areas, was calculated. Disturbances considered for this analysis included 1) highways and improved roads (defined as crowned and ditched roads); 2) well pads; 3) wind turbines; 4) cities, rest/recreation areas; 5) designated energy corridors; 6) gas plants, compressor stations and substations; and 7) gravel pits and mines. Features not included in the direct impact analysis because they were determined not to impact greater sage-grouse or had little ground disturbance associated with them included 1) individual cabins or small subdivisions of <10 homes; 2) agricultural lands; 3) unimproved roads (two-track and four-wheel drive roads); 4) reservoirs and campgrounds; 5) oil and gas water disposal/injection wells; 6) plugged and abandoned wells; 7) meteorological towers, radio towers, communication towers; and 8) power lines.

Next, existing and proposed energy production and transmission structures were overlaid on the same analysis area, and the number of energy production and transmission structures per 640 acres was calculated for both core and non-core areas. Energy and transmission structures used in this analysis included the following: 1) wind turbines; 2) gravel pits and mines; 3) gas plants; 4) compressor stations and substations; 5) oil and gas wells; 6) highways and improved roads; 7) oil and gas fields; 8) designated ROW corridors; 9) cities, rest/recreation areas; 10) pipelines; 11) utility corridors; and 12) fiber optic lines.

To examine potential cumulative indirect impacts, within the same analysis area, acres of greater sage-grouse core and non-core breeding areas within 1 mile of existing and proposed infrastructure that has the potential for either displacement or fragmentation of greater sage-grouse habitat was calculated. The features examined included: 1) highways/improved roads; 2) oil and gas wells; 3) powerlines; 4) wind turbines; 5) cities, rest/recreation areas; and 6) gas plants, compressor stations/substations.

5.15.2 Cumulative Impacts for Federally Listed Species

Federally listed species would be cumulatively impacted by the projects identified in **Table 5.0-1** and result in direct impact similar to those discussed in Section 5.14, Cumulative Impacts for Wildlife and Fisheries Resources. However, surveys will be required in potential or known habitats of threatened, endangered, or otherwise special status species. These surveys would help determine the presence of any or minimize direct disturbance in these important areas.

5.15.2.1 Wyoming Species

<u>Black-footed ferret</u>

The CIA area for black-footed ferrets is limited to areas with white-tailed prairie dog colonies. All action alternatives encompass areas where there potentially is suitable habitat for white-tailed prairie dog colonies and therefore a reduction in prairie dog habitat may lead to a decrease in habitat, including prey for black-footed ferrets. All action alternatives contain a portion of the non-block cleared potential black-footed ferret area defined as the Bolten Ranch Complex. This project, as well as others identified in **Table 5.0-1**, may directly impact black-footed ferret habitat, thus surveys for white-tailed prairie dog towns will occur before construction of the proposed project. If prairie dog towns are identified within the construction area meet the definition of potential black-footed ferret habitat, black-footed ferret surveys will be completed using the USFWS (1989) survey guidelines in non-block cleared areas. These surveys will be conducted to minimize impacts directly to black-footed ferrets, however habitat modifications may occur. Therefore there would be potential impacts to black-footed ferrets and consultation with the USFWS will occur, with a *May Affect* determination in the Biological Assessment. If black-footed ferrets are detected, additional discussions with the USFWS will occur and the project will be modified so as to avoid impacts to the species. Thus, direct cumulative effects upon this species would be avoided.

Colorado Butterfly Plant and Ute Ladies'-Tresses

The CIA area assessed for Colorado butterfly plant and Ute ladies'-tresses consists of the entire Application Area. Indirect concerns across the area include the possibility of a general reduction or loss of pollinators, invasion of weeds from development into occupied habitats, and increased risk of habitat disturbance resulting from human presence.

BLM policy avoids disturbance activities within identified special status plant habitats, thus direct cumulative impacts to these species should be avoided. Furthermore, site-specific surveys will be conducted to identify any unknown populations at risk from development. Standard mitigation and BMPs will allow for avoidance of impacts if such a population(s) should be found.

5.15.2.2 Platte River System

The amount of water required for construction and maintenance and possible sources of water were identified by PCW (PCW 2010a,b). No new depletions would result to the Platte River under any of the action alternatives as all of the potential sources of water represent a change of existing use. This change in use will require a Temporary Use Agreement from the WSEO, which will protect existing water rights and will specify measures that must be implemented to prevent new depletions. Nevertheless, this change in use would be considered a new water related activity under the Platte River Program and thus the existing depletions would result in a *May Affect, Likely to Adversely Affect* determination, and the BLM would need to initiate the ESA consultation process. However, because the water is a change in use the Wyoming Depletions Plan will cover this use (i.e., act as the Reasonable and Prudent Alternative) and the USFWS would use the streamlined ESA consultation as described in the plan and nothing more is required. Therefore, the actions associated with any of the action alternatives would likely not affect the target flows for these species. During the consultation process, the cumulative impacts associated with projects listed in **Table 5.0-1** would be considered and any impacts attributed to this project would be mitigated to the extent possible.

5.15.2.3 Colorado River System

The potential water depletion associated with any of the action alternatives from the Colorado River System would total 50 acre-feet during construction over the 4-year construction phase, according to information provided by PCW (PCW 2010a,b). This use would be considered a depletion and would result in a *May Affect, Likely to Adversely Affect* determination, and the BLM would need to initiate the ESA consultation process. The Atlantic Rim, Creston/Blue Gap, Continental Divide/Wamsutter II, and South Baggs Application Areas fall partially within the Little Snake River Basin of the Colorado River System and would be considered during the consultation process and any impacts attributed to this project would be mitigated to the extent possible.

5.15.3 Cumulative Impacts for BLM Sensitive Species

Cumulative impacts for BLM sensitive mammals, birds, reptiles and amphibian species were considered under their respective classifications in Section 5.14, Cumulative Impacts for Wildlife and Fisheries Resources. Site specific surveys will be completed for BLM sensitive species, with the intent of avoiding currently occupied habitat. However, this does not ensure that habitat will not be impacted. This project as well as others will result in the loss of potential habitat for BLM sensitive species, with fragmentation of habitat for some species possible. Although that loss and extent of fragmentation may not be quantifiable without site-specific surveys to determine the presence of any special status wildlife species and the extent of their habitat.

<u>Greater Sage-grouse</u>

Footprints of existing disturbances total 5,194 acres of greater sage-grouse core breeding areas in the CIA. Cumulative impacts to greater sage-grouse core breeding areas within the proposed disturbances associated with the project are identical among Alternatives 1R, 2, 3, and 4, as no surface disturbance

within greater sage-grouse core breeding areas would occur. Together, existing and proposed disturbances for all four alternatives represent 0.79 percent of all greater sage-grouse core breeding areas in the CIA (**Table 5.15-1**). Existing disturbances in non-core greater sage-grouse habitats total 2,618 acres in the CIA. Alternative 2 would have the largest impact to greater sage-grouse non-core habitat, adding 1,426 acres of disturbance, followed by Alternative 3 (1,381 acres), Alternative 4 (1,365 acres) and Alternative 1R (1,254 acres) (**Table 5.15-1**). The total disturbance impacts to all greater sage-grouse habitats in the CIA are very similar for all four alternatives, as the total disturbance to greater sage-grouse habitats would be 1.05 percent for Alternative 1 and 1.07 percent each for Alternatives 2, 3, and 4 (**Table 5.15-1**).

There are currently 267 structures in greater sage-grouse core habitat within the CIA. Because no wind turbines or other structures are planned to be placed in core areas as part of the wind energy facility, impacts to greater sage-grouse core breeding areas among Alternatives 1R, 2, 3, and 4 are identical (i.e., zero acres impacted). In terms of the number of proposed and existing structures in greater sage-grouse non-core breeding areas, impacts would be slightly higher for Alternative 1R, which would have 1,273 structures, compared to 1,243 for Alternative 2; 1,234 for Alternative 3; and 1,044 for Alternative 4 (**Table 5.15-2**). The number of existing and proposed structures per 640 acres is 0.67for Alternative 1R, 0.65 each for Alternatives 2 and 3, and 0.55 for Alternative 4 (**Table 5.15-2**).

For assessing indirect impacts to greater sage-grouse, a 1-mile buffer around existing and proposed facilities was used. As a result, indirect impacts to greater sage-grouse core breeding areas are relatively similar for all four alternatives, ranging from 497,202 acres within 1 mile of proposed and existing facilities for Alternative 1R to 498,368 acres for Alternative 4 (**Table 5.15-3**). The proportion of greater sage-grouse core habitat within 1 mile of existing and proposed facilities in the CIA, which likely result in some displacement or habitat fragmentation, also is similar among all four alternatives, ranging from 75.3 percent for Alternative 1R to 75.4 percent for Alternative 4. For greater sage-grouse non-core breeding areas in the CIA, the area within 1 mile of existing and proposed facilities is highest for Alternative 4 (256,489 acres), followed by Alternative 2 (249,212 acres), Alternative 3 (243,390 acres) and Alternative 1R (240,540 acres). For all greater sage-grouse habitats combined (core and non-core), the proportion of greater sage-grouse habitat within 1 mile of facilities is 85.8 percent for Alternative 1R, 86.8 percent for Alternative 2, 85.6 percent for Alternative 3, and 87.8 percent for Alternative 4 (**Figures 5.15-1** through **5.15-4**). Given that the total area of greater sage-grouse habitat indirectly impacted by proposed and existing facilities is approximately 85 percent of the existing habitat for all four alternatives, cumulative impacts to greater sage-grouse are considered significant for all four alternatives.

Sensitive Fish Species

The CIA for the BLM sensitive fish species includes the Upper Muddy Creek Watershed. The cumulative impacts to BLM sensitive fish species include the impacts of this project, those associated with the Atlantic Rim, current livestock operations, and possible oil and gas development on state land within the Upper Muddy Creek/Grizzly WHMA. Of primary concern to aquatic species would be water depletions resulting in changed water conditions and habitat degradation. Past and present water depletions within the Upper Muddy Creek/Grizzly WHMA consist of primarily of evaporation from reservoirs and impoundments associated with livestock operations. Currently, there is an ongoing BLM effort to inventory all the reservoirs and springs within this area. However, because this inventory is not complete it is not possible to determine the total depletions due to evaporation. The proposed action for the Atlantic Rim project EIS identified a significant impact on the habitat of the roundtail chub within the Upper Muddy Creek watershed based on the impacts of new roads and other facilities on the habitat features. It also is possible that habitat fragmentation may occur, denying the roundtail chub access to required habitats. Many best management practices including detailed mitigation measures were proposed to mitigate these impacts.

Under alternatives 1R and 2 there is potential for surface disturbance within the Upper Muddy Creek/Grizzly WHMA, however the magnitude of the potential impacts resulting from possible construction within the Upper Muddy Creek WHMA cannot be determined without the final layout. If construction occurs within the Upper Muddy Creek/Grizzly WHMA the potential impacts from this project would likely increase sedimentation within the Muddy Creek watershed, contributing to the cumulative impacts on the BLM sensitive fish species from all projects considered in the CIA. Alternatives 3 and 4 would not result in any development within the Upper Muddy Creek/Grizzly WHMA, thus these alternatives would not contribute to any cumulative impacts on these fish species.

Sensitive Plant Species

The area of influence assessed for BLM sensitive plant species consist of the area depicted in **Figure 5.15-1**. Indirect concerns across the area include the possibility of a general reduction or loss of pollinators, invasion of weeds from development into occupied habitats, and increased risk of habitat disturbance resulting from human presence.

BLM policy avoids disturbance activities within identified special status plant habitats, thus direct cumulative effects upon these species should be avoided. Furthermore, site-specific surveys will be conducted to identify any unknown populations at risk from development. Standard mitigation and BMPs will allow for avoidance of impacts if such a population(s) should be found.

Table 5.15-1 Existing and Proposed Long-term Disturbance Calculations for Greater Sage-grouse Cumulative Impacts

Feature	Existing Disturbance			Long-Term Disturbance											
				Alternative 1R			Alternative 2			Alternative 3			Alternative 4		
	Core	Non-Core	Total[1]	Core	Non-Core	Total[1]	Core	Non-Core	Total[1]	Core	Non-Core	Total[1]	Core	Non-Core	Total[1]
Highways, improved roads (crown and ditched)	2,705	772	3,477	1	774	775	1	962	963	1	939	939	1	952	953
Well pads	92	10	102	0	0	0	0	0	0	0	0	0	0	0	0
Wind turbines	0	0	0	1	230	230	0	223	223	0	222	222	0	173	174
Cities, rest/recreation areas, etc.	2,512	1,902	4,415	0	0	0	0	0	0	0	0	0	0	0	0
Linear energy facilities(including facilities within designated utility corridors)	0	0	0	0	48	48	0	60	60	0	53	53	0	58	58
Gas plants, compressor stations, substations	0	0.5	0.5	0	206	206	0	185	185	0	170	170	0	185	185
Gravel pits, mines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Combined Footprint	**5,194**	**2,618**	**7,812**	**2**	**1,254**	**1,255**	**1**	**1,426**	**1,427**	**1**	**1,381**	**1,381**	**1**	**1,365**	**1,366**
Existing Disturbance + Proposed Disturbance						**9,071**			**9,244**			**9,197**			**9,178**
Proposed Facilities Disturbance to Greater Sage-grouse Habitat (percent)[2]						**1.05**			**1.07**			**1.07**			**1.07**

[1] For disturbance calculations, disturbances in non-core and core habitat do not always sum to the total. This is due to overlapping disturbances not being counted twice.

[2] Calculated by using the total greater sage-grouse habitat acreage of 859,891 acres.

Table 5.15-2 Number of Energy Production and Transmission Structures within Greater Sage-grouse Cumulative Impacts Analysis Area

Feature	Feature Density Calculation	Existing Disturbance			Long-Term Disturbance											
					Alternative 1R			Alternative 2			Alternative 3			Alternative 4		
Included in Energy Production and Transmission Structures Analysis[1]		**Core**	**Non-Core**	**Total[2]**	**Core**	**Non-Core**	**Total[2]**	**Core**	**Non-Core**	**Total[2]**	**Core**	**Non-Core**	**Total[2]**	**Core**	**Non-Core**	**Total[2]**
Oil and gas wells	Each well pad location counts as 1.	252	63	315	0	0	0	0	0	0	0	0	0	0	0	0
Power lines	Each power line counts as 1.	6	5	8	0	5	5	0	4	4	0	2	2	0	4	4
Pipelines	Each pipeline counts as 1.	9	14	15	0	0	0	0	0	0	0	0	0	0	0	0
Compressor station or substation	Each compressor station or substation counts as 1.	0	1	1	0	5	5	0	5	5	0	4	4	0	5	5
Wind turbines	Each wind turbine counts as 1.	0	0	0	0	923	923	0	894	894	0	888	888	0	695	695
Gas Plant/Refinery		0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Total Number of Facilities				**340**			**933**			**903**			**894**			**704**
Existing Facilities + Proposed Facilities				**340**			**1,273**			**1,243**			**1,234**			**1,044**
Proposed Facilities per 640 acres[3]							**0.95**			**0.93**			**0.92**			**0.78**

[1] Not included in the Energy Production and Transmission Structures Analysis:

- Communication sites;
- Local mines;
- Met towers
- Other disturbances (e.g., roads, O&M, buildings, etc.)

[2] For facility disturbance, facilities in non-core and core habitat do not always sum to the total. This is due to overlapping disturbance in core and non-core habitat not being counted twice.

[3] Calculated by using the total greater sage-grouse habitat acreage of 859,891 acres.

Table 5.15-3 Acres within 1 Mile of Existing and Proposed Facilities within Greater Sage-grouse Cumulative Impacts Analysis Area

Feature	Existing Fragmentation			Long-Term Fragmentation											
				Alternative 1R			Alternative 2			Alternative 3			Alternative 4		
	Core	Non-Core	Total[1]	Core	Non-Core	Total[1]	Core	Non-Core	Total[1]	Core	Non-Core	Total[1]	Core	Non-Core	Total[1]
Highways, improved roads (crown and ditched)	475,950	96,927	572,877	13,881	132,947	146,828	13,404	138,736	152,140	9,181	133,230	142,411	15,092	149,414	164,507
Well pads	40,788	5,393	46,181	0	0	0	0	0	0	0	0	0	0	0	0
Wind turbines	0	0	0	13,477	117,871	131,349	13,270	129,097	142,367	9,064	124,159	133,223	14,009	138,370	152,379
Cities, rest/recreation areas, etc.	11,175	11,852	23,027	0	0	0	0	0	0	0	0	0	0	0	0
Linear energy facilities(including facilities within designated utility corridors)	36,209	20,666	56,875	0	26,935	26,935	447	32,483	32,930	447	29,627	30,074	14,008	141,967	155,975
Gas plants, compressor stations, substations	0	2,878	2,878	0	10,839	10,839	242	10,535	10,777	242	8,268	8,511	242	10,535	10,777
Gravel pits, mines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Combined Footprint	**483,096**	**106,379**	**589,475**	**14,105**	**134,161**	**148,266**	**13,859**	**142,833**	**156,693**	**9,599**	**137,012**	**146,610**	**15,272**	**150,110**	**165,382**
Existing Fragmentation + Proposed Fragmentation				**497,202**	**240,540**	**737,741**	**496,956**	**249,212**	**746,168**	**492,695**	**243,390**	**736,085**	**498,368**	**256,489**	**754,857**

[1] For disturbance calculations, disturbances on non-core and core habitat do not always sum up to the total. This is due to overlapping disturbances not being counted twice.

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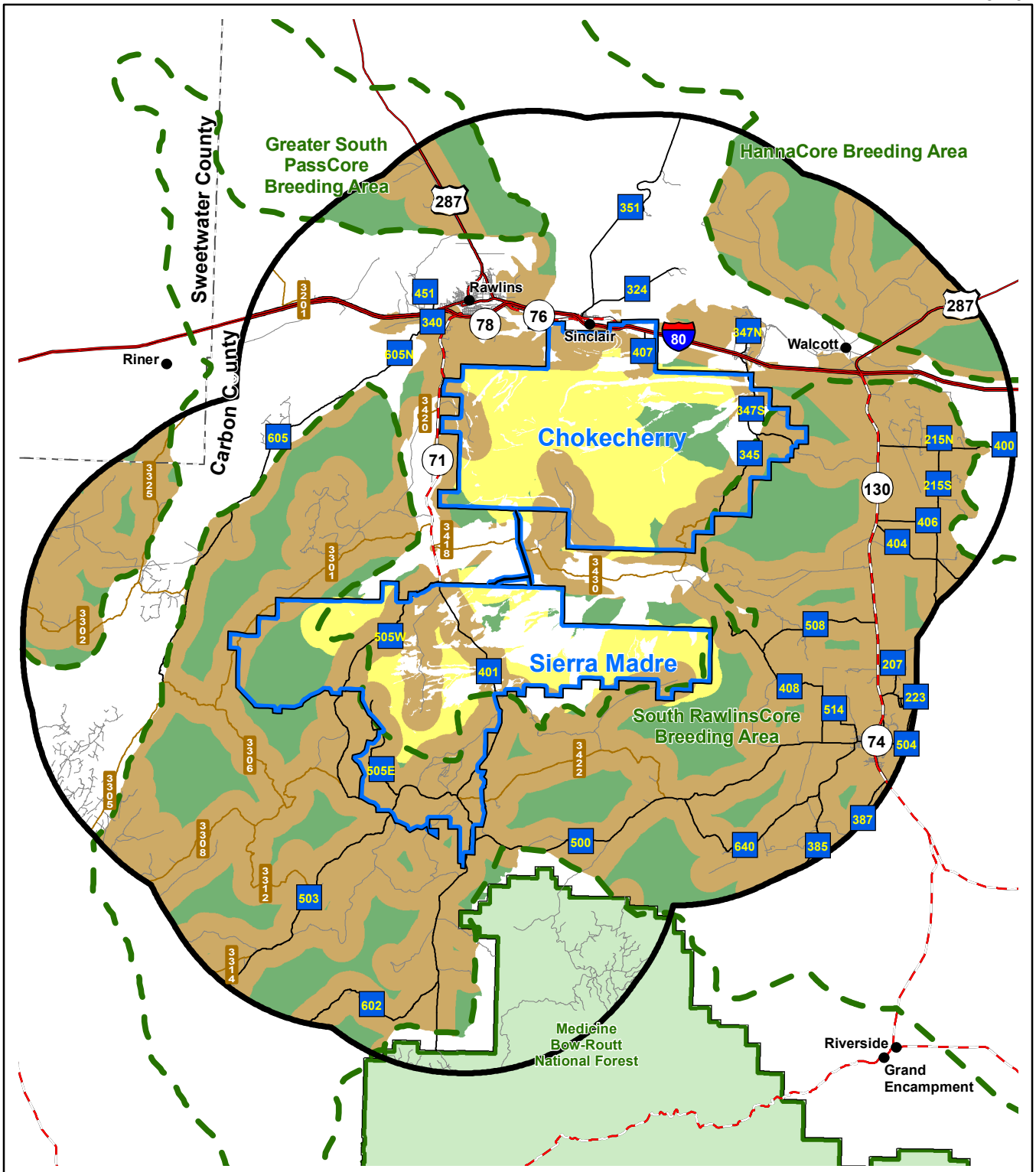

Legend

- Project Area
- Sage Grouse Cumulative Impacts Study Area
- Sage Grouse Core Breeding Area
- Existing Sage Grouse Habitat Fragmentation
- Proposed Additional Sage Grouse Habitat Fragmentation
- Unfragmented Sage Grouse Habitat

Chokecherry and Sierra Madre Wind Energy Project

Figure 5.15-1

Greater Sage-Grouse Habitat Fragmentation Alternative 1R

0 1 2 3 4 5 10 Miles
0 1 2 3 4 5 10 15 Kilometers
1:500,000
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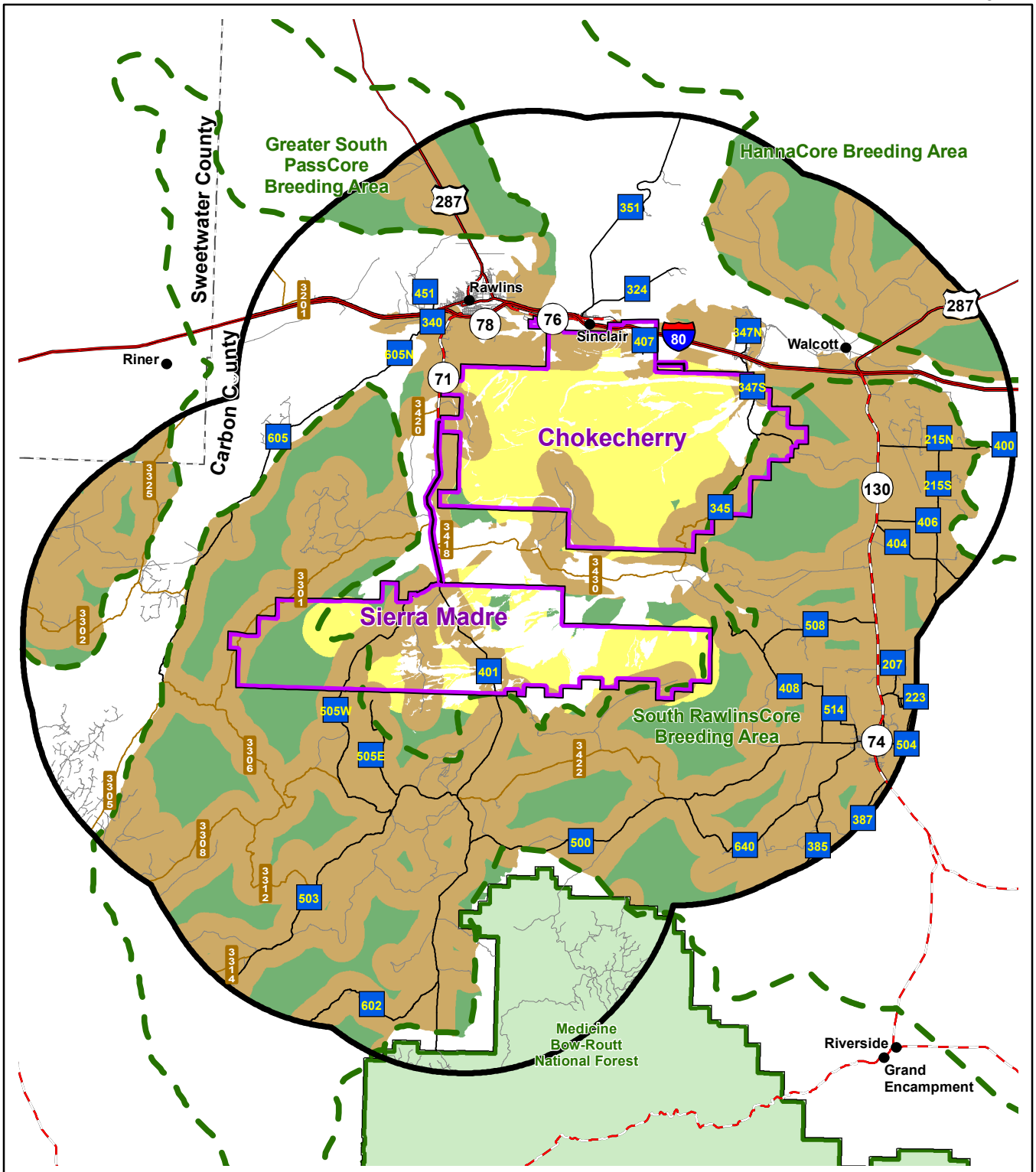

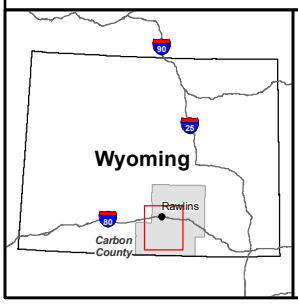

Legend

- Project Area
- Sage Grouse Cumulative Impacts Study Area
- Sage Grouse Core Breeding Area
- Existing Sage Grouse Habitat Fragmentation
- Proposed Additional Sage Grouse Habitat Fragmentation
- Unfragmented Sage Grouse Habitat

Chokecherry and Sierra Madre Wind Energy Project

Figure 5.15-2

Greater Sage-Grouse Habitat Fragmentation Alternative 2

0 1 2 3 4 5 10 Miles
0 1 2 3 4 5 10 15 Kilometers
1:500,000
N

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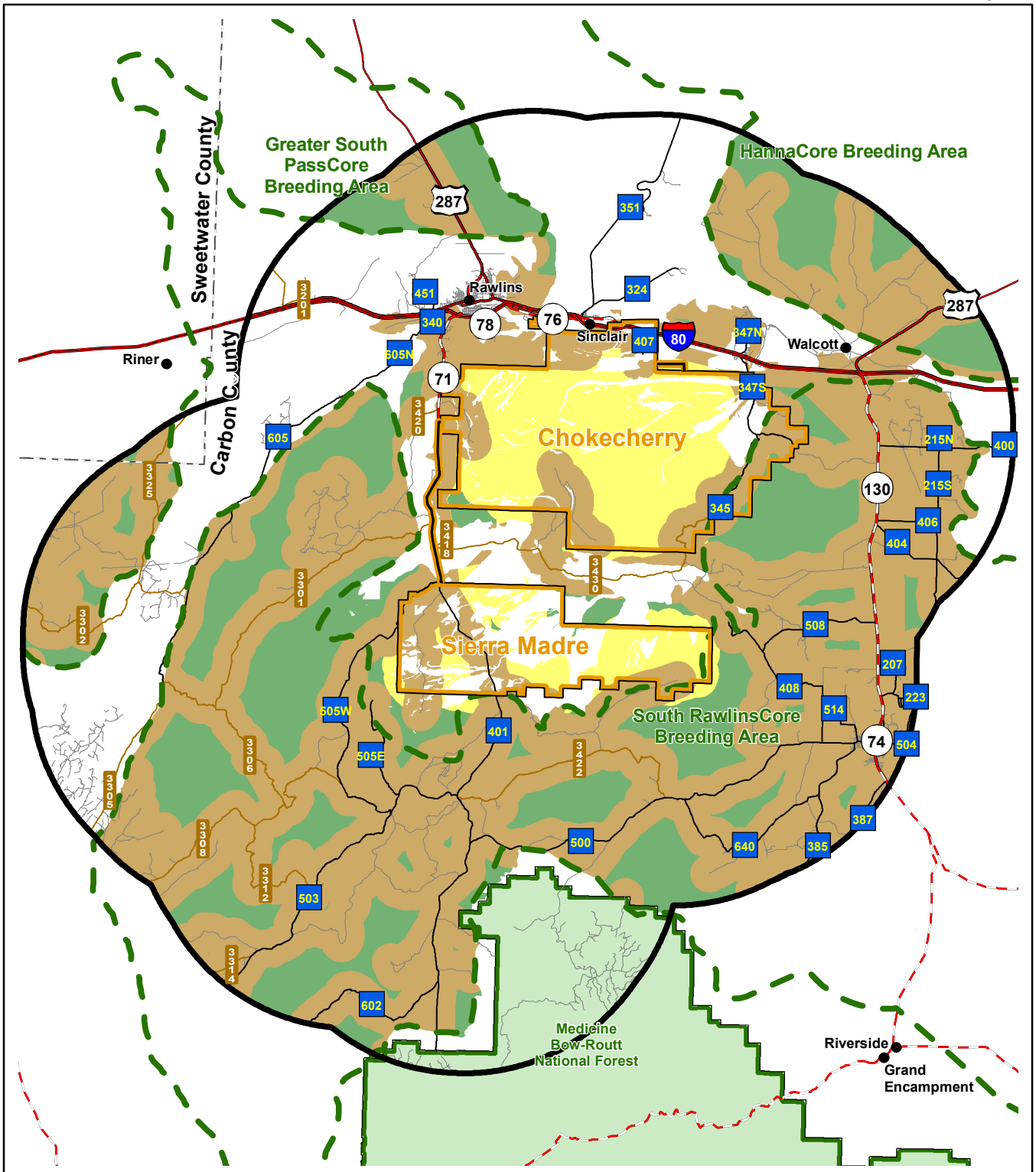

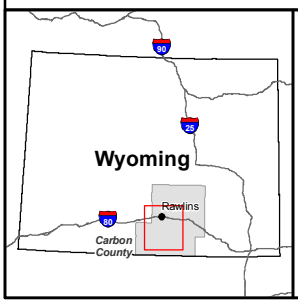

Legend

- Project Area
- Sage Grouse Cumulative Impacts Study Area
- Sage Grouse Core Breeding Area
- Existing Sage Grouse Habitat Fragmentation
- Proposed Additional Sage Grouse Habitat Fragmentation
- Unfragmented Sage Grouse Habitat

Chokecherry and Sierra Madre Wind Energy Project

Figure 5.15-3

Greater Sage-Grouse Habitat Fragmentation Alternative 3

0 1 2 3 4 5 10 Miles
0 1 2 3 4 5 10 15 Kilometers
1:500,000
N

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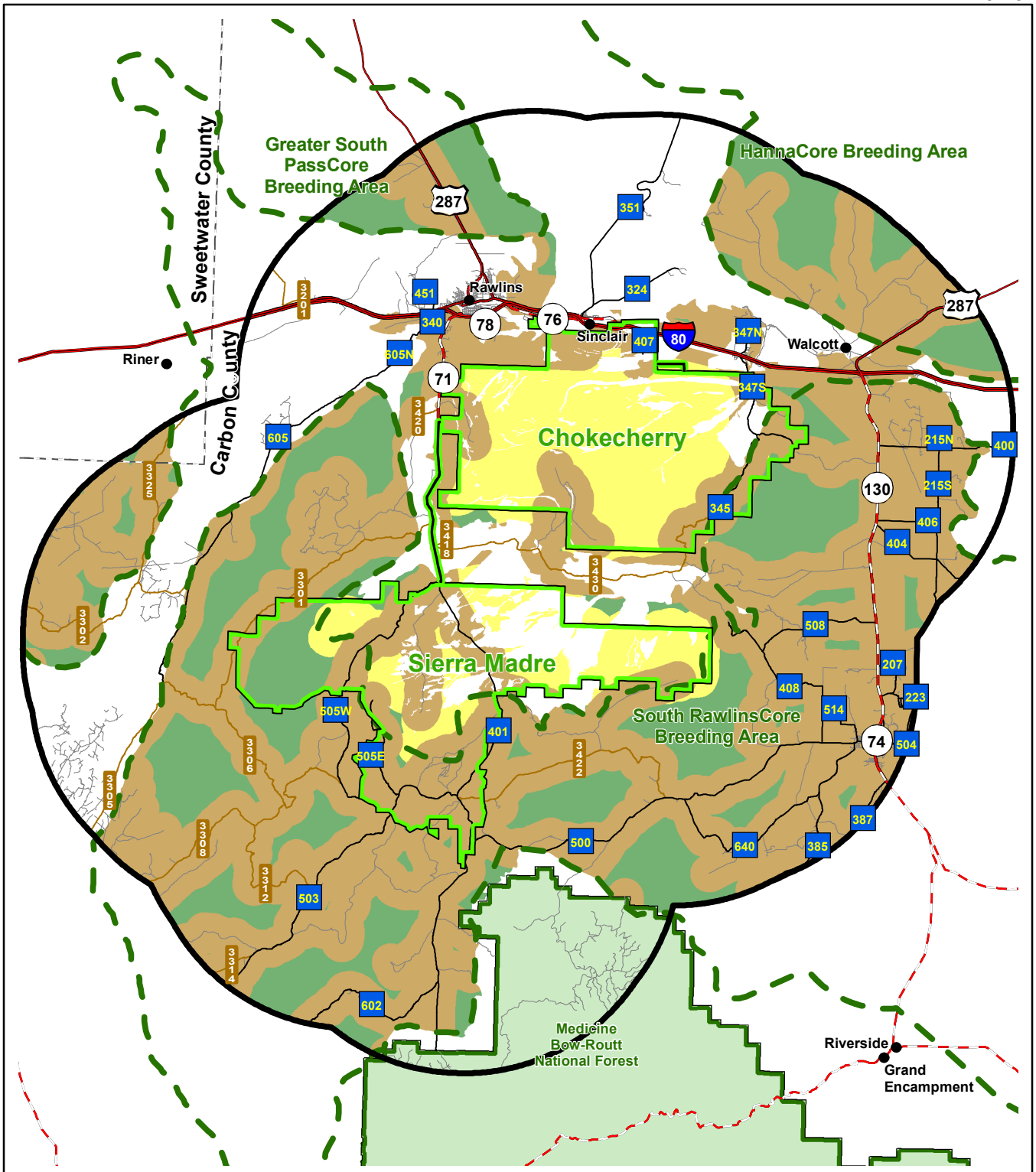

Legend

- Project Area
- Sage Grouse Cumulative Impacts Study Area
- Sage Grouse Core Breeding Area
- Existing Sage Grouse Habitat Fragmentation
- Proposed Additional Sage Grouse Habitat Fragmentation
- Unfragmented Sage Grouse Habitat

Chokecherry and Sierra Madre Wind Energy Project

Figure 5.15-4

Greater Sage-Grouse Habitat Fragmentation Alternative 4

0 1 2 3 4 5 10 Miles
0 1 2 3 4 5 10 15 Kilometers
1:500,000
N

5.16 Cumulative Impacts for Noise

The CIA for noise impacts is the Application Area with a 1,400-foot buffer. This CIA was chosen due to the limited range of noise impacts. Noise emanating from within the area of analysis consists of normal rural background noise such as wildlife, agriculture (grazing), wind, and occasional traffic. Since none of the identified projects overlap the Application Area, the Proposed Alternative would be the only project contributing to noise in the Application Area, therefore, the only noise impacts are those identified in the Proposed Alternative.