3.0 Affected Environment

3.1 Air Quality and Climate

3.1.1 Overview

Air quality within the CCPA has the potential to be affected by such activities as emissions from the construction and operation of oil and gas well sites, facilities, access roads, and other elements of management activities. Regional air quality also is affected by natural events such as windstorms and wildfires. These natural events generally are short lived, lasting from several hours to several days or weeks. The effects during these events may impact human health and the environment, and generally are considered part of the natural and physical environment. This section describes the current air quality and climate trends of the region and the applicable regulations that would apply to the Project.

3.1.2 Regulatory Framework

The CAA of 1970 (42 USC 7401 et seq.), as amended in 1977 and 1990, is the primary federal statute that regulates air pollution. Provisions of the CAA potentially relevant to the Project include:

- National Ambient Air Quality Standards (NAAQS)
- New Source Review
- Federal Operating Permits Program
- New Source Performance Standards
- National Emission Standards for Hazardous Air Pollutants
- Conformity Requirements
- Greenhouse Gas (GHG) Tailoring Rule and Reporting Rule

In addition to federal regulations, the CAA provides states with the authority to regulate air quality within state boundaries. The State of Wyoming has enacted additional Wyoming Ambient Air Quality Standards (WAAQS) and air quality regulations that have permitting requirements for sources operating within the state.

3.1.2.1 National and State Ambient Air Quality Standards

The federal CAA requires all states to control air pollution emission sources so that NAAQS are met and maintained.

The NAAQS establishes maximum acceptable concentrations for criteria pollutants including nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), particulate matter with an aerodynamic diameter of 10 microns or less (PM_{10}), particulate matter with an aerodynamic diameter of 2.5 microns or less ($PM_{2.5}$), ozone, and lead. The NAAQS are established by the USEPA and as outlined in 40 CFR 50. In addition to the federal criteria pollutants, WAAQS also establish maximum acceptable concentrations of hydrogen sulfide (H_2S), fluoride, and suspended sulfates. Given the extremely low levels of lead, H_2S, floride, and SO_2 emissions from potential Project sources, lead, H_2S, floride, and suspended sulfate standards are not addressed further in this analysis.

NAAQS and WAAQS represent the maximum allowable atmospheric concentrations that may occur to protect public health and welfare and include a reasonable margin of safety to protect the more sensitive individuals in the population. The objective for all areas is to meet the NAAQS, which are promulgated by the USEPA and apply nationwide. An area that does not meet the NAAQS is designated as a nonattainment area on a pollutant-by-pollutant basis. As of spring 2016, the areas potentially impacted

by the Project currently are in attainment for all criteria pollutants. Applicable NAAQS and WAAQS are presented in **Table 3.1-1**.

Table 3.1-1 Applicable Ambient Air Quality Standards

Pollutant[1] (Units)	Averaging Period	Ambient Air Quality Standards	
		National[2]	Wyoming[3]
Ozone	8-hour[4]	0.070 parts per million (ppm)	0.070 ppm
NO_2	1-hour[5]	100 parts per billion (ppb) or 188 µg/m^3	100 ppb or 189 µg/m^3
	Annual[6]	53 ppb or 100 µg/m^3	53 ppb or 100 µg/m^3
CO	1-hour[7]	35 ppm or 40,000 µg/m^3	35 ppm or 40,000 µg/m^3
	8-hour[7]	9 ppm or 10,000 µg/m^3	9 ppm or 10,000 µg/m^3
SO_2	1-hour[8]	75 ppb or 196.5 µg/m^3	75 ppb or 196.5 µg/m^3
	3-hour[9]	0.5 ppm or 1,300 µg/m^3	0.5 ppm or 1,300 µg/m^3
PM_{10} (micrograms per cubic meter [µg/m^3])	24-hour[9]	150	150
	Annual[6]	--[10]	50
$PM_{2.5}$ (µg/m^3)	24-hour[11]	35	35
	Annual[12]	12	12

[1] Due to the lack of an identified regional issue for lead, H_2S, floride, and suspended sulfate these standards will not be analyzed as part of this study.
[2] Source: USEPA 2015a.
[3] Source: WDEQ 2014e.
[4] The 3-year average of the fourth-highest daily maximum 8-hour average measured at each monitor within an area over each year must not exceed this standard. This standard was updated from previous standard of 0.075 ppm on October 1, 2015 (USEPA 2015c,d).
[5] The 3-year average of the 98th percentile of the daily maximum 1-hour average is not to exceed this standard.
[6] Not to be exceeded.
[7] Not to be exceeded more than once per year.
[8] The 3-year average of the 99th percentile of the daily maximum 1-hour average must not exceed this standard.
[9] Not to be exceeded more than once per year on average over 3 years.
[10] The annual PM_{10} NAAQS of 50 µg/m^3 was revoked by USEPA on September 21, 2006; see FR Volume 71, Number 200, October 17, 2006.
[11] Three year average of the 98th percentile of the 24-hour concentrations at each population-oriented monitor within an area must not exceed this standard.
[12] Three-year average of annual mean must not exceed this standard.

New Ozone Standard

On October 1, 2015, USEPA reduced the NAAQS for ozone from 0.075 ppm to 0.070 ppm based on extensive scientific evidence regarding ozone effects on public health and welfare (USEPA 2015c). As of spring 2016, attainment designations were based on the previous 0.075 ppm standard, but the lower standard could change some attainment area designations, especially those where attainment is based on ozone monitoring values above 0.070 ppm. According to USEPA (2015d), designating areas is typically is a 2-year process, and in some cases it may take 3 years. Final designations will utilize future air quality data (i.e., 2014-2016 data), and USEPA plans to issue new guidance to facilitate the designation process in the near future. The statutory deadline for final area designations by USEPA is October 1, 2018 (USEPA 2017). Thus, the attainment designation of some counties may change in the near future due to the new ruling.

3.1.2.2 New Source Review

The New Source Review requires stationary sources of air pollution to obtain permits before construction. A source may have to meet one or more of the following permitting requirements:

- Prevention of Significant Deterioration (PSD) permits: required for new major sources or major sources making a major modification in an attainment area.
- Nonattainment New Source Review permits: required for new major sources or major sources making a major modification in a nonattainment area.
- Minor source permits.

New Source Review is pollutant-specific; therefore, it is important to note that a single stationary source may have requirements under all three programs for different pollutants. The Project is not expected to trigger major source permitting requirements under the PSD or Nonattainment New Source Review programs for any pollutant; however, it likely would require minor new source permits. Wyoming New Source Review policy is found in Chapter 6, Section 2 of the Wyoming Air Quality Standards and Regulations (WDEQ 2014e).

Prevention of Significant Deterioration Review

PSD regulations, which restrict the degree of ambient air quality deterioration allowed in areas that meet the NAAQS, apply to proposed new or modified major stationary sources located in an attainment area that have the potential to emit criteria pollutants in excess of predetermined de minimis values (40 CFR Part 51). As defined in 40 CFR 51, a source is a major stationary source if it:

- Can be classified in one of the 28 named source categories listed in Section 169 of the CAA, and it emits or has the potential to emit 100 tons per year (tpy) or more of any pollutant regulated by the CAA; or
- Is any other stationary source that emits or has the potential to emit 250 tpy or more of any pollutants regulated by the CAA (USEPA 1990).

Allowable deterioration to air quality can be expressed as the incremental increase to ambient concentrations of criteria pollutants, also referred to as a “PSD increment.” The PSD increments for criteria pollutants are based on the PSD classification of the area. Class I area status is assigned to federally protected wilderness areas and allows the lowest amount of permissible deterioration. Class I areas allow the lowest amount of air quality increment consumption, while Class II designations allow higher increment consumption. There are no designated Class III or heavy industrial use areas in the Project area.

A project’s PSD increment consumption typically is determined through the use of an air quality model. Atmospheric concentrations of NO_2, SO_2, PM_{10}, and $PM_{2.5}$ predicted by the air quality model are compared with allowable PSD increments. The allowable PSD increments for Class I and Class II areas are provided in **Table 3.1-2**. The CCPA is shown in **Figure 3.1-1** relative to designated Class I and Class II areas, as well as undesignated areas (which are evaluated relative to Class II increments) within the CAMx 4-kilometer (km) modeling domain. If conducted for a NEPA analysis, a comparison of project impacts to PSD increments does not represent an official regulatory PSD increment consumption analysis because:

- Increment consumption is not evaluated for regulatory purposes under NEPA; and
- An official increment consumption analysis requires a special set of emissions data not typically available as part of a NEPA analysis.

Table 3.1-2 USEPA Allowable PSD Increments for Class I and Class II Areas

PSD Class	Pollutant	Allowable Increment (µg/m^3)		
		Annual Arithmetic Mean	24-hour Maximum	3-hour Maximum
Class I	NO_2	2.5	-	-
	SO_2	2	5	25
	PM_{10}	4	8	-
	$PM_{2.5}$	1	2	-
Class II	NO_2	25	-	-
	SO_2	20	91	512
	PM_{10}	17	30	-
	$PM_{2.5}$	4	9	-

Source: USEPA 1991.

Nonattainment New Source Review

Nonattainment New Source Review is required for new major sources or major modifications of existing sources in nonattainment areas. As of fall 2016, the areas potentially impacted by the Project currently are in attainment for all criteria pollutants; therefore, Nonattainment New Source Review does not apply.

Minor New Source Review

The minor New Source Review permitting program regulates pollutants from sources that do not require PSD or Nonattainment New Source Review permits. The purpose of minor New Source Review permits is to prevent the construction of sources that would interfere with attainment or maintenance of a NAAQS or violate the control strategy in nonattainment areas. Also, minor New Source Review permits often contain permit conditions to limit the sources' emissions to avoid the need for PSD analysis or Nonattainment New Source Review. The Wyoming minor source permitting program does not include de minimis emission levels below which facilities or projects are exempted from permitting.

3.1.2.3 Federal Operating Permits Program

A Title V operating permit is required for all major stationary sources under the Federal Operating Permits Program outlined in 40 CFR Part 70 of the CAA. Whether a source meets the definition of "major" depends on the type and amount of air pollutants it emits and, to some degree, on the overall air quality in its vicinity. Generally, major sources are industrial facilities and large commercial operations, which include stationary facilities that emit 100 tpy or more of a regulated air pollutant including compounds such as oxides of nitrogen (NO_X), CO, SO_2, PM_{10}, $PM_{2.5}$, and volatile organics. Major sources of toxic air pollutants (i.e., any source that emits more than 10 tpy of an individual toxic air pollutant or more than 25 tpy of any combination of toxic air pollutants) also are covered under the Federal Operating Permits Program.

The proposed Project is not expected to be a major source with respect to the Federal Operating Permits Program; therefore, a Title V operating permit would not be required.

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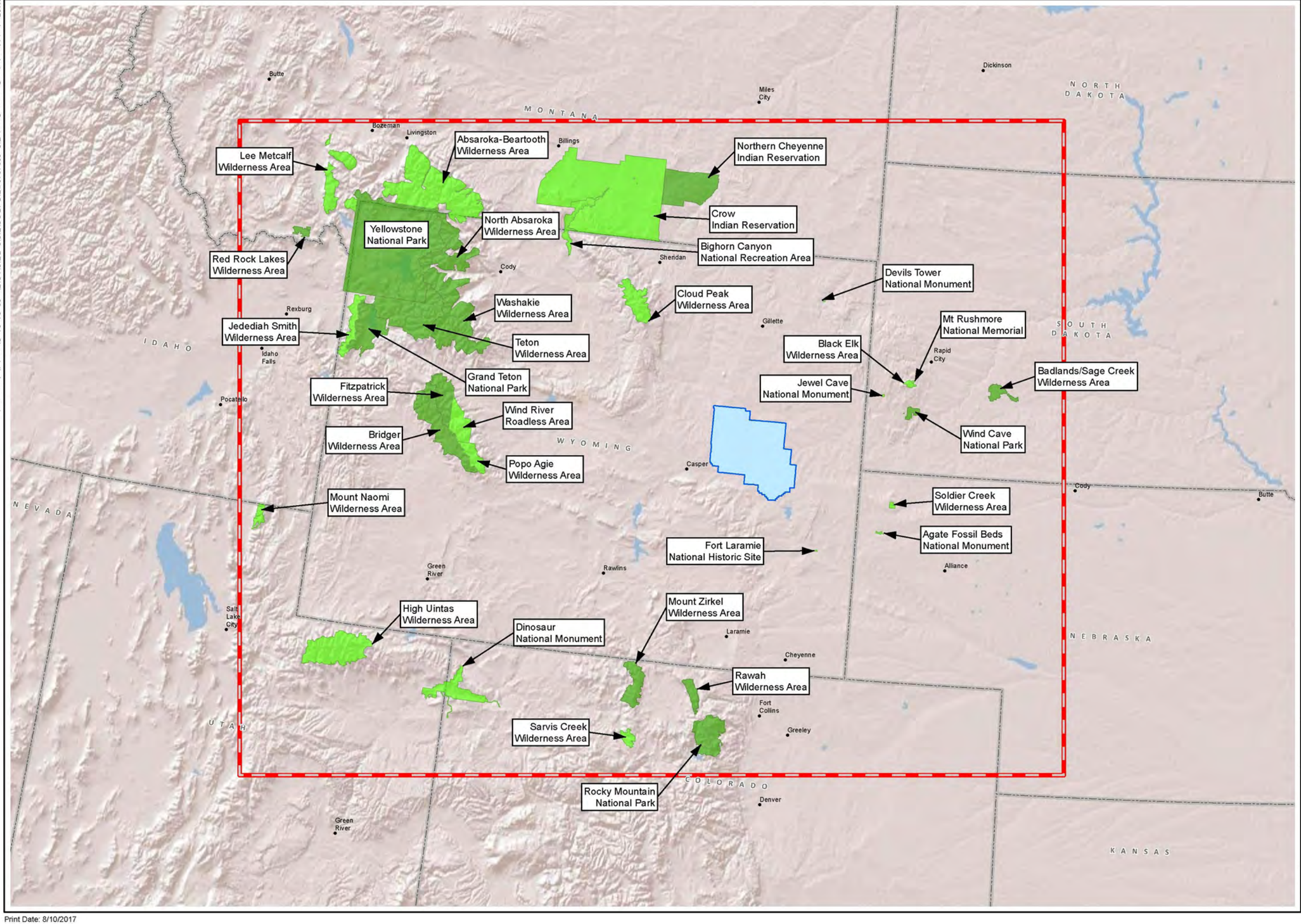

Project Boundary
CAMx 4-km Domain
Class I Area
Class II Area

Source: NPS 2013.

CONVERSE COUNTY OIL AND GAS EIS

Figure 3.1-1
Class I and II Areas
in the 4-km CAMx Domain

0 20 40 60 80 Miles
0 20 40 60 80 Kilometers
1:4,000,000

N

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3.1.2.4 Wyoming Air Quality Standards and Regulations

The Project would be required to comply with applicable Wyoming Air Quality Standards and Regulations, including those pertaining to New Source Review outlined in Section 3.1.2.2 and those that specify fugitive dust control requirements. Specifically, Wyoming Air Quality Standards and Regulations Chapter 3, Section 2(f)(i)(A) requires that sources operating within the State of Wyoming control fugitive dust emissions. Approved control measures for minimizing fugitive dust from construction/demolition activities (i.e., clearing or leveling of land, earthmoving, excavation, or movement of trucks or construction equipment over access haul roads or cleared land) may include watering and/or chemical stabilization.

3.1.2.5 New Source Performance Standards

The regulation of new sources was an important step taken by the CAA. New Source Performance Standards apply to all new, modified, or reconstructed sources within a given category, regardless of geographic location or the existing ambient air quality. The standards define emission limitations that would be applicable to a particular source group. The New Source Performance Standards potentially applicable to the Project include the following subparts of 40 CFR Part 60:

- Subpart A – General Provisions
- Subpart Kb – Standards of Performance for Volatile Organic Storage Vessels
- Subpart IIII – Standards of Performance for Stationary Compression Ignition Internal Combustion Engines
- Subpart JJJJ – Standards of Performance for Stationary Spark-Ignition Internal Combustion Engines
- Subpart OOOO – Standards of Performance for Crude Oil and Natural Gas Production, Transmission, and Distribution

3.1.2.6 National Emission Standards for Hazardous Air Pollutants

Under the National Emission Standards for Hazardous Air Pollutants, the USEPA promulgated Maximum Achievable Control Technology (MACT) standards pursuant to Section 112 of the 1990 CAA Amendments, and these rules are provided in 40 CFR 63. The MACT standards potentially applicable to the Project include:

- Subpart A – General Provisions
- Subpart HH – Oil and Natural Gas Production Facilities
- Subpart HHH – Natural Gas Transmission and Storage Facilities

3.1.2.7 Conformity for General Federal Actions

Established under the CAA (Section 176(c)(4)), the General Conformity Rule plays an important role in helping states and tribes improve air quality in those areas that do not meet the NAAQS (i.e., nonattainment areas). Under the General Conformity Rule, federal agencies must work with state, tribal, and local governments in a nonattainment or maintenance area to ensure that federal actions conform to the air quality plans established in the applicable state or tribal implementation plan.

The CCPA is in an area that is in attainment for all pollutants; therefore, the Project would not be subject to General Conformity requirements.

3.1.2.8 Greenhouse Gas Reporting and Tailoring Rules

GHGs include carbon dioxide (CO_2), methane (CH_4), nitrous oxide, and several halogenated compounds. While GHGs are naturally occurring in the atmosphere, anthropomorphic (human-caused) activity is adding to the levels of GHGs. Their status as a pollutant is not related to toxicity, but to the long-term impacts they may have on climate due to increased levels in the earth's atmosphere. GHGs do not have applicable ambient standards or emission limits under the major environmental regulatory programs described above because they are non-toxic and non-hazardous at normal ambient concentrations.

On October 30, 2009, the USEPA issued the reporting rule for major sources of GHG emissions (40 CFR Part 98). The rule requires a wide range of sources and source groups to record and report selected GHG emissions. Various oil and gas operations are required to monitor and report GHG emissions under this regulation.

On June 3, 2010, the USEPA issued the *Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule*. The rule provides criteria to determine which stationary sources become subject to permitting requirements for GHG emissions under the PSD and Title V programs of the CAA. The rule is based on calculation of carbon dioxide equivalents (CO_2e), which factors into the global warming potential of each GHG and normalizes this to an equivalent of CO_2 emissions. Under the rule, facilities are required to obtain PSD permits if they are new facilities with GHG emissions of at least 100,000 tpy CO_2e or existing facilities with at least 100,000 tpy CO_2e that are making changes resulting in increased GHG emissions by at least 75,000 tpy CO_2e. Facilities seeking to obtain a PSD permit for other regulated pollutants also must address GHG emissions increases of 75,000 tpy CO_2e or more. New and existing sources with GHG emissions above 100,000 tpy CO_2e also must obtain operating permits.

On June 23, 2014, the Supreme Court ruled that the USEPA lacked the authority to require PSD and Title V Permits based on the CO_2e emissions thresholds for sources that would not otherwise require such a permit. This ruling will prompt regulatory changes that will impact future permitting actions; interim guidance is available to provide direction with regard to current permitting actions (USEPA 2014b), and a proposed rule has been provided for public comment (USEPA 2016a).

The USEPA rules do not require any controls or establish any standards related to GHG emissions for minor sources.

3.1.3 Criteria and Hazardous Air Pollutants

Many air quality regulations consider both existing (i.e., background) air quality conditions, recent trends, and the impact of a development on those conditions. An understanding of the current conditions and trends also provides a baseline for comparison of potential future impacts. Recent trends in air quality (e.g., frequency and length of periods of elevated concentrations) are important to consider when evaluating potential future changes, independent of an individual project.

The following discussion describes current conditions and trends for criteria air pollutants as well as Hazardous Air Pollutants (HAPs), and it concludes with a discussion of the current attainment status in the vicinity of the CCPA.

3.1.3.1 Criteria Air Pollutants

To determine existing air quality conditions within the CCPA, recent measurements of criteria pollutants were analyzed using data obtained from the USEPA Air Quality System (USEPA 2014c) for six WDEQ monitoring stations as identified in **Table 3.1-3**. The locations of these monitoring stations are shown relative to the CCPA in **Figure 3.1-2**.

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Thunder Basin National Grassland
Thunder Basin
Fortification Creek
Cloud Peak Wilderness
Buffalo
Campbell County
Newcastle
Wind Cave National Park
Wind Cave National Park
Casper-Sinclair
Casper Gaseous
Casper SLAMS
Converse County Mobile #2
Sheridan
Gillette
Casper
Rapid City
MONTANA
WYOMING
SOUTH DAKOTA
NEBRASKA

Project Boundary

Monitoring Network

- WDEQ
- IMPROVE
- NADP
- CASTNet

Source: USEPA 2014c.

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Figure 3.1-2
Air Quality
Monitoring Stations

0 7.5 15 30 Miles
0 7.5 15 30 Kilometers
1:1,500,000

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Table 3.1-3 Criteria Pollutant Monitoring Stations

Station Name	Station ID	Wyoming County	Pollutants Analyzed	Latitude (degrees)	Longitude (degrees)	Distance to Center of CCPA (km)
Thunder Basin[1]	56-005-0123	Campbell	NO_2, $PM_{2.5}$, ozone	44.652	-105.29	173
Campbell County	56-005-0456	Campbell	NO_2, PM_{10}, ozone	44.147	-105.53	116
Casper-Sinclair	56-025-2601	Natrona	NO_2, SO_2, ozone	42.861	-106.236	66
Casper SLAMS	56-025-0001	Natrona	PM_{10}, $PM_{2.5}$	42.851	-106.325	73
Converse County Mobile #2	56-009-0801	Converse	NO_2, ozone	42.767	-105.304	40
Casper Gaseous	56-025-0100	Natrona	NO_2, ozone	42.822	-106.365	78

[1] The $PM_{2.5}$ data at this monitor likely did not use Federal Reference Method/Federal Equivalent Method. It is considered by Air Quality System to be "valid data that does reasonably match the FRM with or without correction, but not to be used in NAAQS decisions" (USEPA 2014d).

Existing conditions and air quality trends are discussed in more detail for each criteria pollutant in the following subsections. The monitoring data obtained from the Air Quality System are not necessarily in the statistical form required for comparison to the NAAQS or WAAQS (e.g., Air Quality System gives the 98^{th} or 99^{th} percentile for each year rather than the 3-year average required for NAAQS or WAAQS). Therefore, the analyses presented below are not directly comparable to the NAAQS or WAAQS but show recent air quality and indicate whether background values in the vicinity of the CCPA are near NAAQS or WAAQS thresholds. Air quality data provided in the statistical form of the NAAQS or WAAQS are referred to as design concentrations.

Ozone

Ozone monitors chosen for the analysis include data collected at five monitoring stations. **Figure 3.1-3** shows the fourth highest 8-hour average ozone concentration for each reporting year at each station. The Thunder Basin and Campbell County stations reported occasional values above the 0.070 ppm standard over the past 10 years. The 3-year average of the fourth-highest daily maximum 8-hour concentration (the form of the standard) for Thunder Basin during 2006, 2007, and 2008 is exactly 0.070 ppm, but the concentrations appear to be lower during subsequent years. As discussed in Section 3.1.2.1, current attainment designations are based on the previous 0.075 ppm standard, and the exceedance occurred while this previous standard was in effect. According to USEPA (2015d), designating areas is typically a 2-year process (and in some cases 3). Final designations would utilize future air quality data (i.e., 2014 to 2016 data), and the USEPA plans to issue new guidance to facilitate the designation process in the near future. There does not appear to be any discernable trends over the past decade.

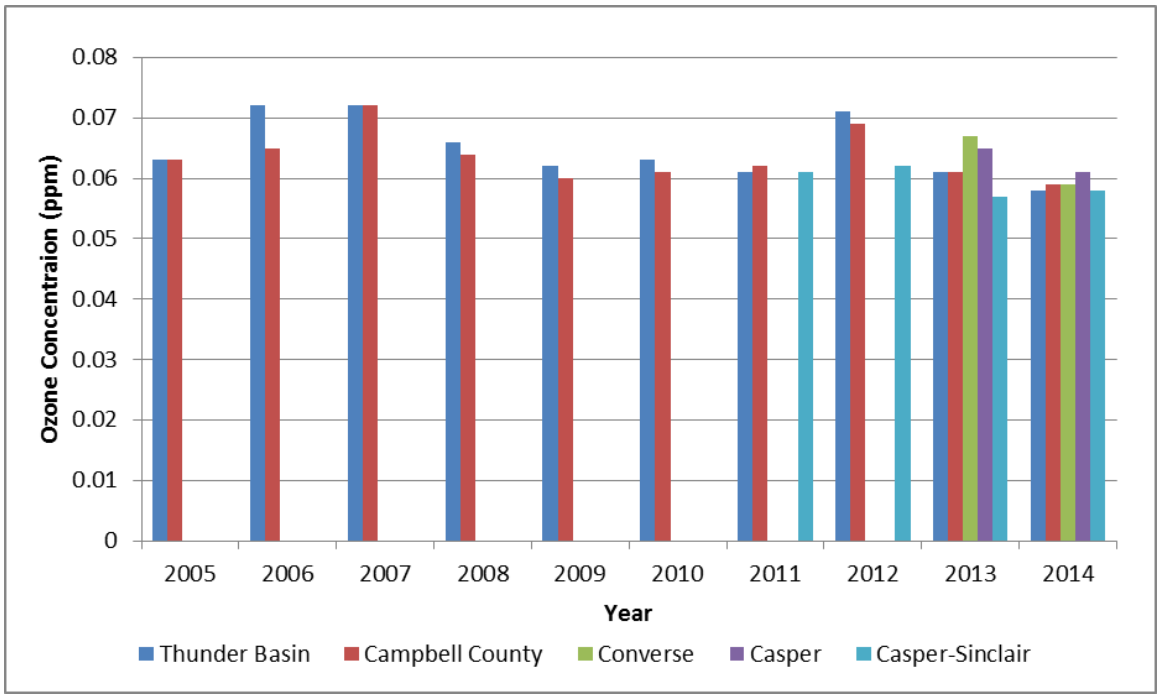

Figure 3.1-3 Fourth Highest 8-hour Average Ozone Levels

NO_2

Figure 3.1-4 shows the maximum 98th percentile 1-hour NO_2 concentration in a given year at five monitoring stations in the vicinity of the CCPA. All sites analyzed have concentrations well below the 1-hour and annual NO_2 standard (**Table 3.1-1**). There are no discernable trends in NO_2 concentrations.

CO

No air quality monitoring stations within the region routinely monitor CO and it is not expected to be an air quality concern in the region.

SO_2

The Casper-Sinclair station began collecting data in July 2011, and during the period from July through December 2011 only 55 percent of the collected data was valid. However, high data capture was achieved in 2012, 2013, and 2014.

Figure 3.1-5 shows the 1-hour annual maximum SO_2 concentrations for 2011 through 2014 and indicates upward trend in SO_2 concentrations. These maximum monitored concentrations are well below the NAAQS and WAAQS thresholds of 75 ppb and 500 ppb (**Table 3.1-1**).

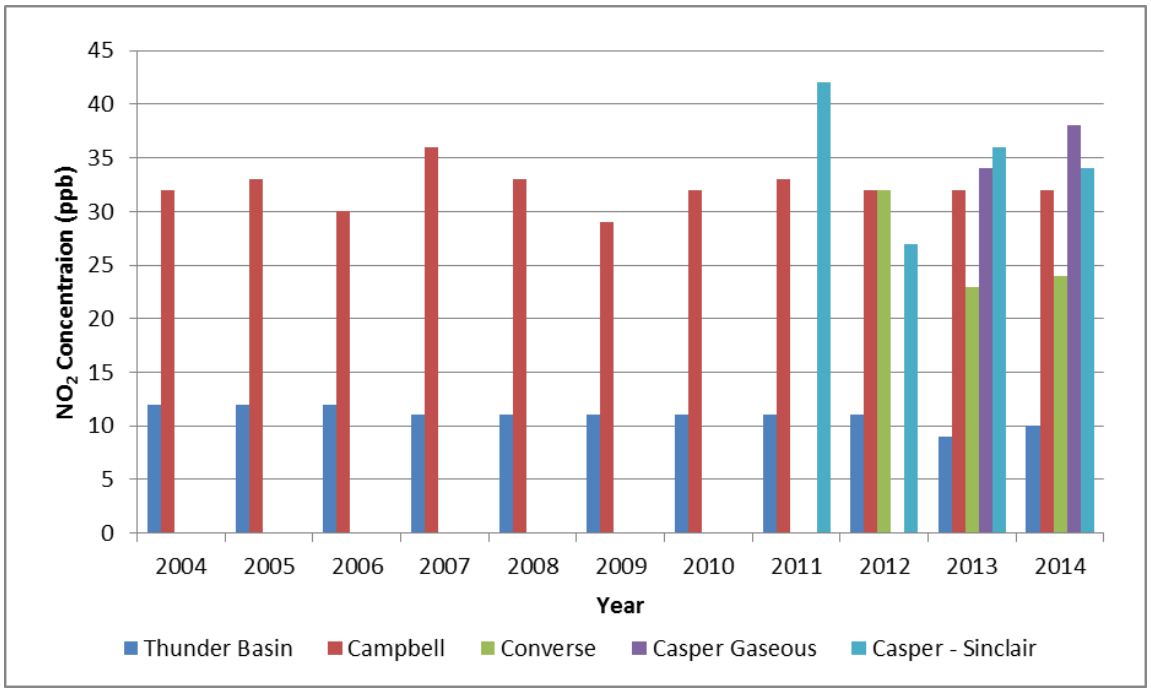

Figure 3.1-4 98th Percentile of the Daily Max 1-hour NO_2 Values

1

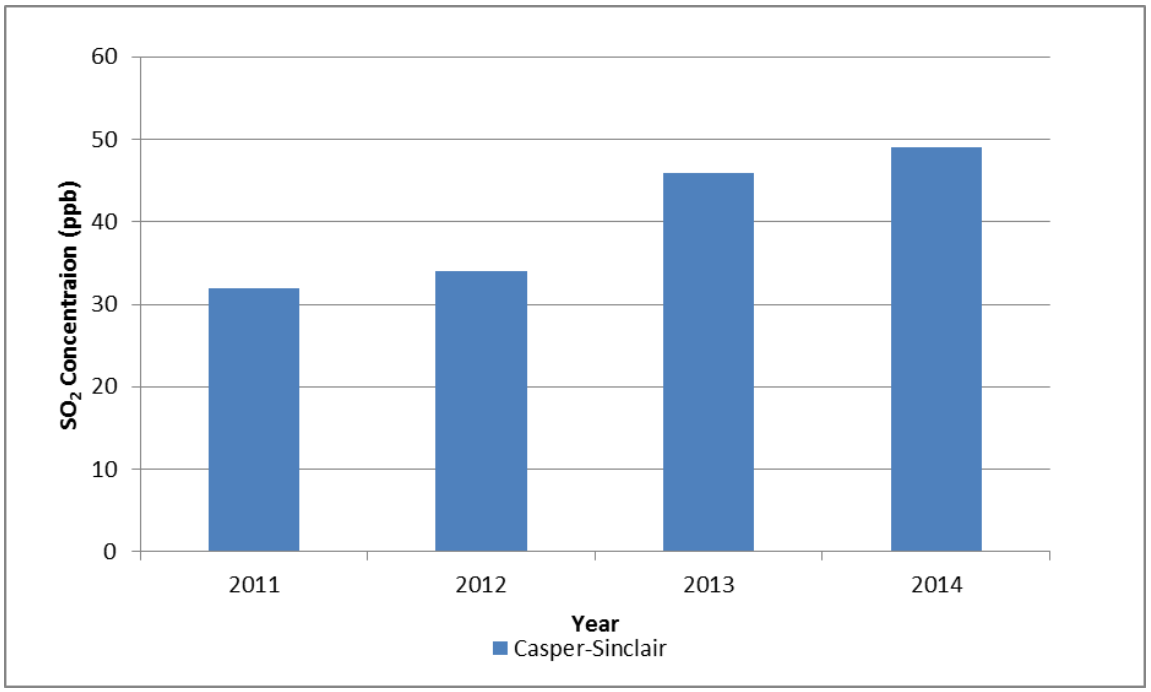

Figure 3.1-5 Maximum Daily 1-hour SO_2 Values at Casper-Sinclair Station

2

3 PM_{10}

4 While there are several PM_{10} monitoring stations in the vicinity of the CCPA, most of these stations are
5 industrial in nature and are not intended for regional background purposes. Three stations were chosen

for this analysis. **Figure 3.1-6** shows the maximum 24-hour average PM_{10} concentrations for each year since 2003, which are all below the 150 µg/m^3 NAAQS and WAAQS threshold (**Table 3.1-1**). **Figure 3.1-7** shows annual mean concentrations of PM_{10}, which are all below the 50 µg/m^3 threshold. No trends are discernible.

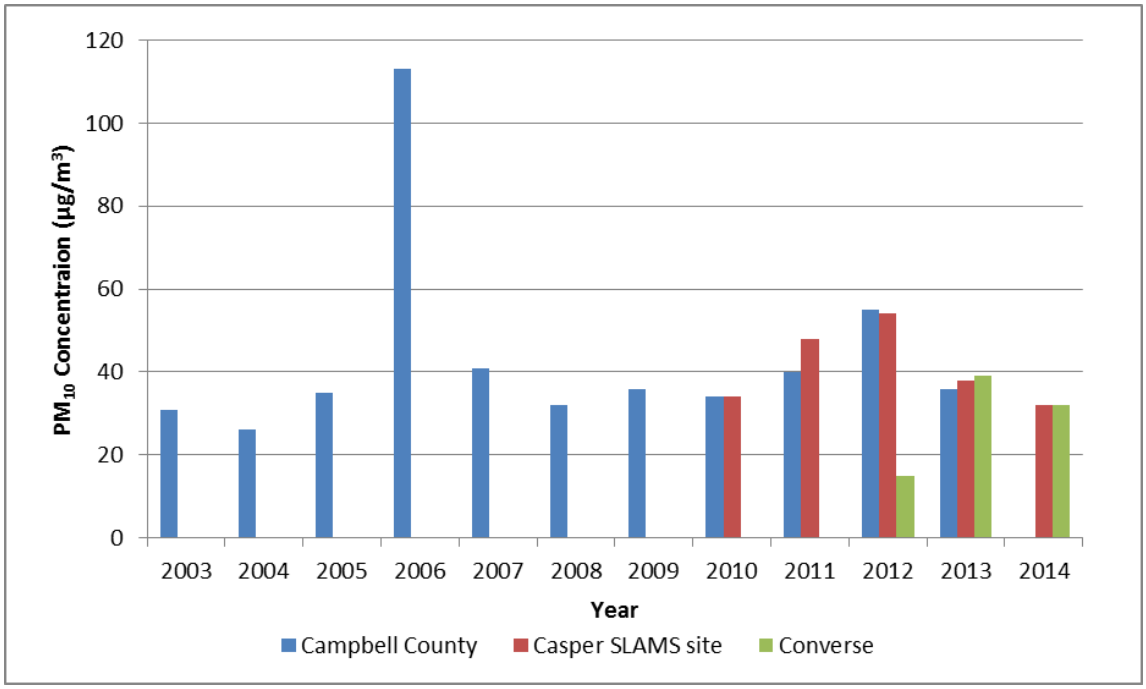

Figure 3.1-6 Second Maximum 24-hour PM_{10} Values

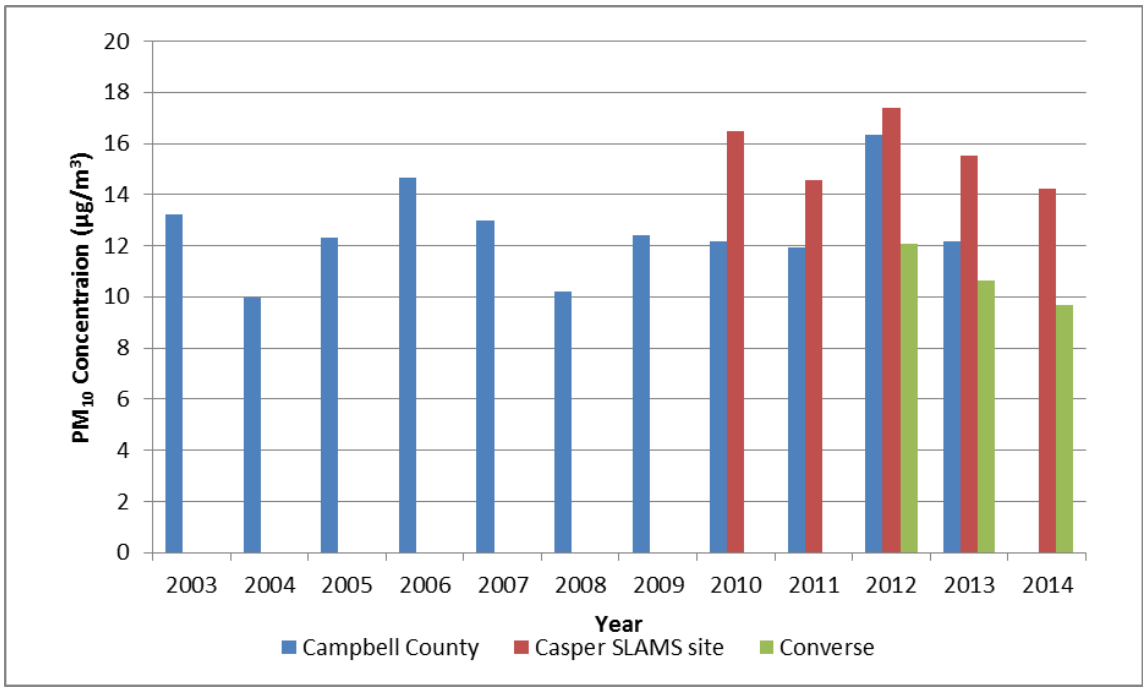

Figure 3.1-7 Annual PM_{10} Arithmetic Average Concentrations

$PM_{2.5}$

Figure 3.1-8 shows the 98th percentile 24-hour concentration for each year at the Thunder Basin and Casper SLAMS monitoring stations. All values are below the 35 µg/m^3 NAAQS and WAAQS threshold (**Table 3.1-1**). **Figure 3.1-9** shows the annual average $PM_{2.5}$ concentration for each year of the record. All of these values are well below the 12 µg/m^3 standard. There are no discernable trends in the $PM_{2.5}$ concentrations.

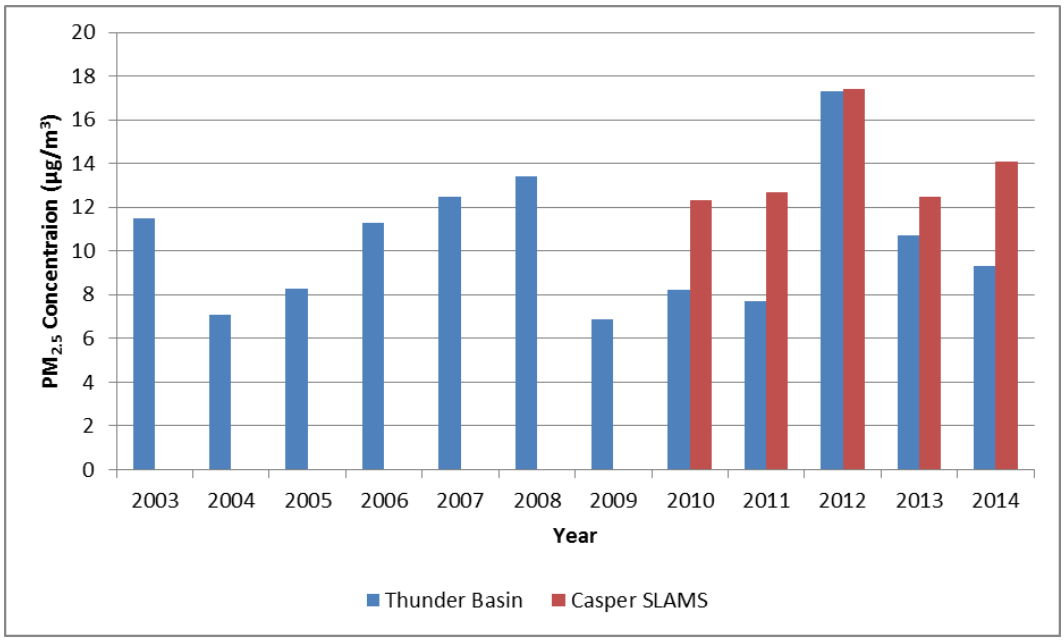

Figure 3.1-8 98th Percentile 24-hour $PM_{2.5}$ Values

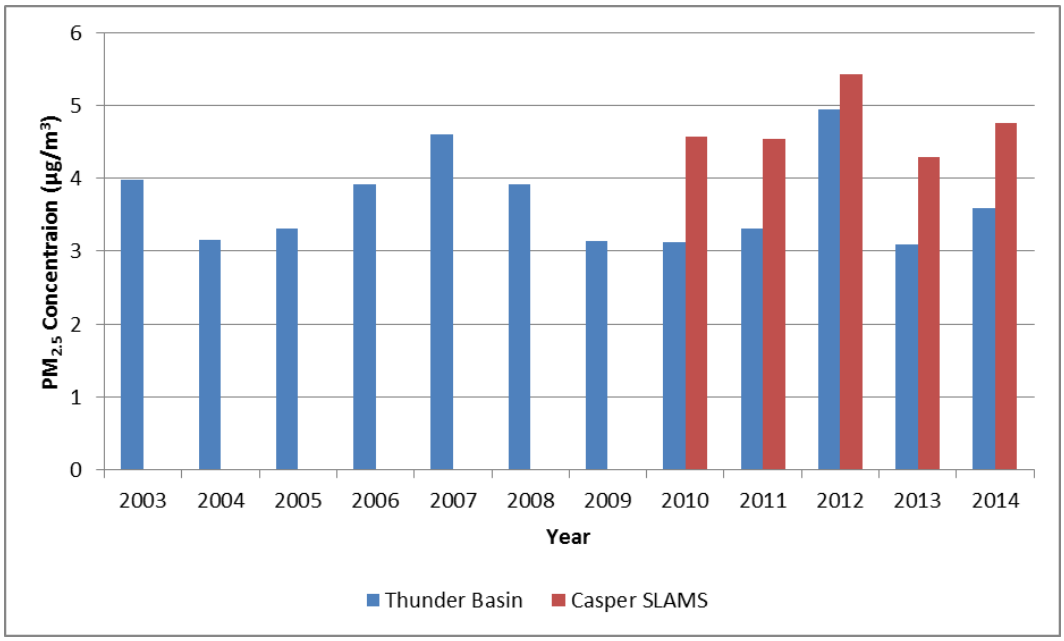

Figure 3.1-9 Annual Average $PM_{2.5}$ Concentrations

3.1.3.2 Hazardous Air Pollutants

In addition to criteria pollutants, HAPs can cause serious health effects or adverse environmental or ecological effects. While there are many types of HAPs, those commonly emitted from similar projects include benzene, toluene, ethyl-benzenes, xylene, n-hexane, and formaldehyde. Although these HAPs are associated with anthropogenic (human-caused) emissions sources, concentrations of HAPs are not measured in the region and there is no data available to assess the current concentrations or trends.

3.1.3.3 Air Quality Attainment Status

USEPA has designated the area surrounding the CCPA as in attainment for all criteria pollutants. The data shown in Section 3.1.3.1 are consistent with attainment designations. The closest nonattainment area is for PM_{10} in Sheridan, Wyoming, which is greater than 200 miles north of the CCPA. The nearest nonattainment areas for ozone include Upper Green River Basin, Wyoming (approximately 330 miles from the CCPA) and the Fort Collins-Denver-Boulder-Greeley-Loveland, Colorado area (greater than 220 miles from the CCPA).

3.1.4 Air Quality Related Values

Air quality related values (AQRVs) are a metric used to assess impacts to other resources sensitive to air quality, including vegetation, soils, water, fish, wildlife, and visibility. Federal Land Managers (FLMs) such as the NPS, BLM, and USFS track and manage AQRVs. The New Source Review permitting program (described in Section 3.1.2.2) includes an analysis of impacts to AQRVs as a component of all PSD permit applications. Impacts to AQRVs can include changes in visibility or atmospheric deposition of pollutants to soil and bodies of water. For example, to assess atmospheric deposition impacts to sensitive waterbodies, the change in the acid neutralizing capacity (ANC) of sensitive lakes is evaluated as an AQRV assessment.

Under the PSD program, areas are classified as three categories: Class I, Class II, and Class III. Special protection via the Class I designation is given to those areas Congress has designated as special national or regional areas of natural, scenic, recreational, or historic value. PSD Class I designation allows the lowest amount of permissible deterioration. Class II designations allow a higher level of increment consumption relative to Class I areas, and Class III applies to heavy industrial use areas. There are no designated Class III areas in the U.S. Any areas not classified as Class I or Class II are treated as Class II for evaluation purposes.

PSD Class I and other sensitive Class II areas are located within the vicinity of the CCPA (**Figure 3.1-1**). The closest PSD Class I area is Wind Cave National Park, which is approximately 100 miles northwest of the CCPA.

FLMs review the issuance of any PSD permits required under the New Source Review program to evaluate any impacts that exceed established thresholds for AQRVs. Similarly, the potential impacts on AQRVs would be assessed and disclosed for this Project as part of the NEPA process regardless of the applicability of the New Source Review rule. The monitoring stations within the vicinity of the CCPA that collect data useful for assessment of AQRVs are listed in **Table 3.1-4** and shown in **Figure 3.1-2**.

Table 3.1-4 AQRV Monitoring Station Information

Network/Station Name	Station ID	County	Values Analyzed	Latitude (degrees)	Longitude (degrees)	Distance to Center of CCPA (km)
IMPROVE						
Thunder Basin National Grassland	THBA1	Campbell, Wyoming	Speciated $PM_{2.5}$, Visibility	44.663	-105.287	175
Cloud Peak Wilderness Area	CLPE1	Johnson, Wyoming	Speciated $PM_{2.5}$, Visibility	44.334	-106.956	175
Wind Cave National Park	WICA1	Custer, South Dakota	Speciated $PM_{2.5}$, Visibility	43.558	-103.484	179
National Atmospheric Deposition Program						
Wind Cave National Park	WNC429	Custer, South Dakota	Wet deposition	43.558	-103.484	179
Newcastle	WY99	Weston, Wyoming	Wet deposition	43.873	-104.192	142
CASTNet						
Newcastle	NEC602	Weston, Wyoming	Dry deposition	43.873	-104.192	142

Source: IMPROVE 2014a,b,c; National Atmospheric Deposition Program 2015a,b; USEPA 2015b.

3.1.4.1 Visibility

Regional haze is visibility impairment caused by the cumulative air pollutant emissions from numerous sources over a wide geographic area. Visibility impairment is caused by particles and gases in the atmosphere that scatter, distort, or absorb light. The primary cause of regional haze in many parts of the country is light scattering resulting from fine particles (i.e., $PM_{2.5}$) in the atmosphere. Additionally, coarse particles between 2.5 and 10 microns in diameter can contribute to light extinction. Coarse particles and $PM_{2.5}$ can be naturally occurring or the result of human activity. The natural levels of these species result in some level of visibility impairment, in the absence of any human influences and vary with season, daily meteorology, and geography (Malm 1999).

The USEPA and other agencies have been monitoring visibility in national parks and wilderness areas since 1988. Observations have shown that visibility is impaired relative to natural background conditions. In 1999, the USEPA issued a Regional Haze Rule to protect visibility in over 150 national parks and wilderness areas. The Regional Haze Rule requires states to establish Reasonable Progress Goals for improving visibility, with the overall goal of attaining natural background visibility conditions by 2064.

Visibility impacts are expressed in deciviews (dv), a numeric value describing perceived changes in visibility. Deciview values are calculated from either measured or estimated light extinction values in units of inverse megameters. A small dv value indicates a pristine atmosphere.

Visibility near the CCPA was assessed using the three closest visibility monitoring stations operated by the IMPROVE program as listed on **Table 3.1-4**. Visibility (in dv) for the 20 percent best days, 20 percent worst days, and annual average visibility are shown in **Figure 3.1-10** for these three IMPROVE stations over the period from 2003 to 2013. Thunder Basin National Grassland does not have data for 2003 and from 2006 through 2011.

FLMs have estimated natural background visibility conditions for Wind Cave National Park; a federally designated Class I area. Natural background visibility conditions are not available for Thunder Basin

National Grassland and Cloud Peak Wilderness Area because they are not federally designated Class I areas. The three IMPROVE monitoring stations are all located in similar geographic regions away from large population centers; therefore, it is expected that Thunder Basin National Grassland and Cloud Peak Wilderness Area have similar natural background visibility conditions as Wind Cave National Park. For Wind Cave National Park, the estimated natural background visibility conditions for the 20 percent best and 20 percent worst days are 2.1 dv and 7.2 dv, respectively.

As shown in **Figure 3.1-10**, the most recent 20 percent best days generally have visibility values less than 6 dv, while the 20 percent worst days typically have visibility values greater than 8 dv. When comparing the visibility measured at Wind Cave National Park over the period 2002 to 2013 to the estimated natural background conditions, both the 20 percent worst and 20 percent best days are higher than natural background conditions.

3.1.4.2 Deposition

The effects of atmospheric deposition of nitrogen and sulfur compounds on terrestrial and aquatic ecosystems are well documented and have been shown to cause leaching of nutrients from soils, acidification of surface waters, injury to high elevation vegetation, and changes in nutrient cycling and species composition. The effects of acidification are not as wide spread in the western U.S. relative to the eastern U.S. because sulfur deposition tends to be lower in the western U.S. In areas of lower deposition, nitrogen enrichment effects are often observed prior to the onset of acidification effects. However, high elevation aquatic ecosystems in the west, including those in Wyoming, can still be sensitive to acidification, to which both nitrogen and sulfur deposition contribute.

The Federal Land Manager's Air Quality Guidance (FLAG) (2010) recommends that applicable sources assess impacts of nitrogen and sulfur deposition at Class I areas. To address this guidance, nitrogen and sulfur deposition impacts attributable to this Project were assessed at Class I areas and sensitive Class II areas. Project-specific and cumulative modeled results were compared to critical load thresholds to assess total deposition impacts. The National Park Service (NPS) has developed critical load values for its Class I areas, as shown in **Table 3.1-5**. In addition, **Table 3.1-5** presents the critical loads for potential ecoregions within the other Class I areas and sensitive Class II areas.

Background total nitrogen and sulfur deposition data are collected at the National Atmospheric Deposition Program National Trends Network (wet deposition) and CASTNet (dry deposition) monitoring locations near Wind Cave National Park in South Dakota and Newcastle, Wyoming. The most recent available background nitrogen and sulfur deposition data for monitoring year 2013 are shown in **Table 3.1-6**. The average annual wet deposition values from these stations for nitrate, sulfate, and ammonium are shown in **Figure 3.1-11** for the period from 2003 through 2013.

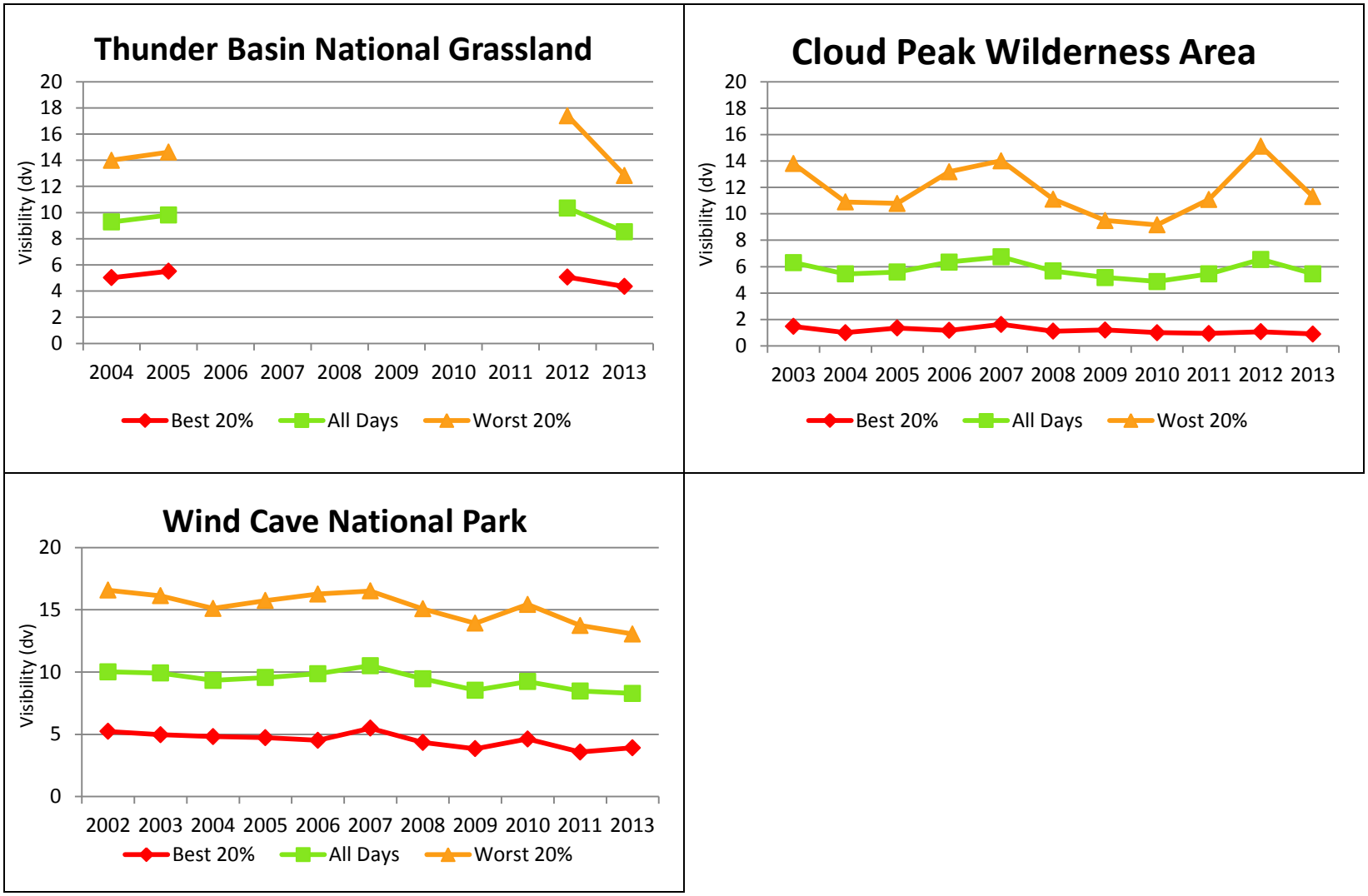

Figure 3.1-10 Visibility for the 20 percent Best Days, 20 percent Worst Days, and All Days

Table 3.1-5 Critical Load Values for NPS Class I areas and Ecoregions near CCPA

NPS Unit	Ecoregion	Critical Load (kilograms per hectare per year)										
		Maximum Total Nitrogen Deposition	Forest		Herbaceous Plants		Lichen		Mycorrhizal Fungi		Nitrate Leaching	
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Grand Teton National Park	Northwestern Forested Mountains	7.8	4	17	4	10	2.5	7.1	5	10	4	17
Rocky Mountain National Park	Northwestern Forested Mountains	12	4	17	4	10	2.5	7.1	5	10	4	17
Wind Cave National Park	Northwestern Forested Mountains	5.3	4	17	4	10	2.5	7.1	5	10	4	17
Yellowstone National Park	Northwestern Forested Mountains	6.8	4	17	4	10	2.5	7.1	5	10	4	17
	North American Deserts	2.7	NA	NA	3	8.4	3	3	NA	NA	NA	NA
	Northwestern Forested Mountains	6.8	4	17	4	10	2.5	7.1	5	10	4	17
	Great Plains	5.1	NA	NA	5	25	NA	NA	12	12	10	25
	Temperate Sierras	4.2	NA	NA	NA	NA	4	7	NA	NA	NA	NA

NA = Not available.

Source: NPS 2014.

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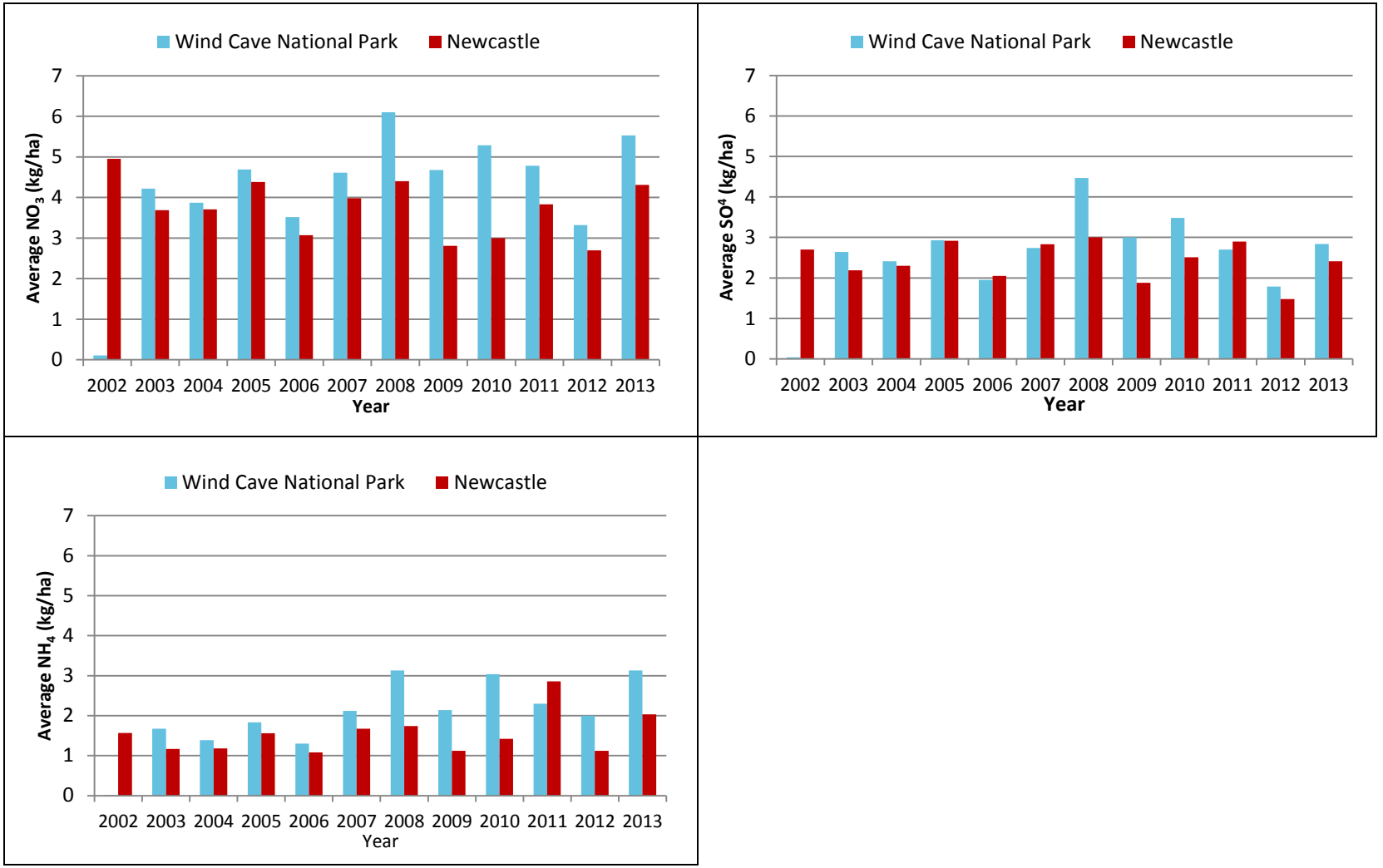

Figure 3.1-11 Annual Average Wet Deposition of Nitrate, Sulfate, and Ammonium for National Atmospheric Deposition Program Stations

1

Table 3.1-6 Background Nitrogen and Sulfur Deposition Values for 2013

Station Location	Deposition (kilograms per hectare per year)			
	Nitrogen		Sulfur	
	Wet[1]	Dry[2]	Wet[1]	Dry[2]
Wind Cave National Park, South Dakota	5.53	0.906	2.84	0.195
Newcastle, Wyoming	4.31	-	2.41	-

[1] National Atmospheric Deposition Program 2015a, 2015b.

[2] USEPA 2015b.

The most recent ANC values available (as of November 2014) and the number of samples used in the calculation of the lowest 10th percentile ANC values are provided in **Table 3.1-7**. **Figure 3.1-12** shows the location of the lakes relative to the 4-km CAMx domain. Of the 14 lakes analyzed, only Upper Frozen Lake is considered to be extremely sensitive to atmospheric deposition by the USFS because the background ANC is less than 25 microequivalent/liters (µeq/L).

Table 3.1-7 Background ANC Values for Acid Sensitive Lakes

Wilderness Area	Lake	Latitude (Deg-Min-Sec)	Longitude (Deg-Min-Sec)	10th Percentile Lowest ANC Value Reported (µeq/l)	Number of Samples
Bridger	Black Joe	42º44'22"	109º10'16"	70.6	72
Bridger	Deep	42º43'10"	109º10'15"	61.1	62
Bridger	Hobbs	43º02'08"	109º40'20"	69.8	76
Bridger	Lazy Boy	43º19'57"	109º43'47"	27.8	1
Bridger	Upper Frozen	42º41'13"	109º09'39"	13.2	3
Cloud Peak	Florence Lake	44º20'53"	107º10'50"	70.0	40
Cloud Peak	Emerald Lake	44º27'26"	107º18'11"	34.4	42
Fitzpatrick	Ross	43º22'41"	109º39'30"	54.0	55
Mount Zirkel	Lake Elbert	40º38'3"	106º42'25"	52.0	61
Mount Zirkel	Seven Lakes	40º53'45"	106º40'55"	39.9	18
Mount Zirkel	Summit Lake	40º32'43"	106º40'55"	48.0	102
Popo Agie	Lower Saddlebag	42º37'24"	108º59'38"	55.5	54
Rawah	Island	40º37'38"	105º56'28"	71.9	25
Rawah	Rawah Lake #4	40º37'38"	105º56'28"	41.5	24

Source: USFS 2011.

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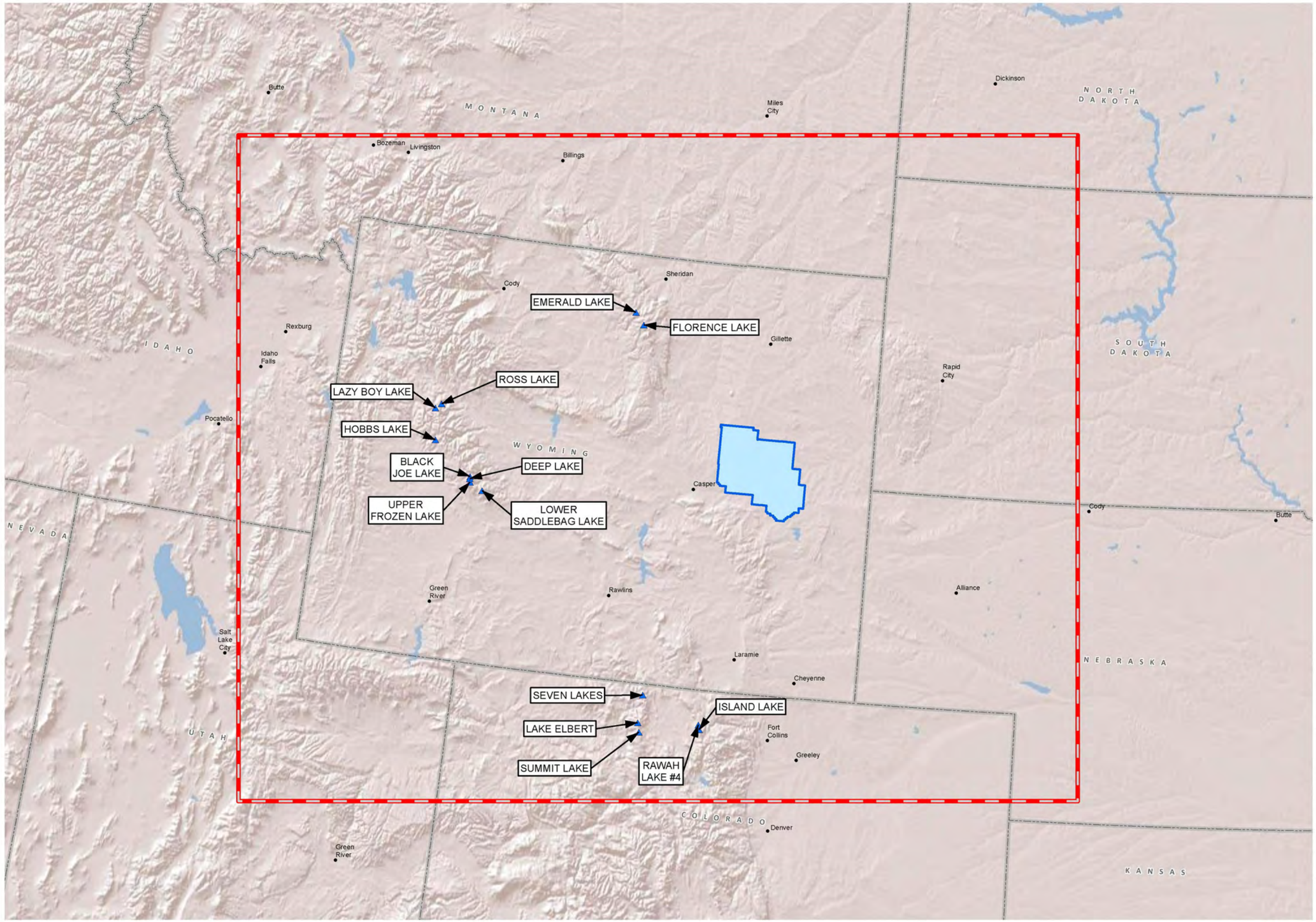

Project Boundary
CAMx 4-km Domain
Sensitive Lake

Source: USFS 2011.

CONVERSE COUNTY OIL AND GAS EIS

Figure 3.1-12
Sensitive Lakes
in the 4-km CAMx Domain

0 20 40 60 80 Miles
0 20 40 60 80 Kilometers
1:4,000,000

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3.1.5 Current Climate and Trends

Current climate data for the CCPA is analyzed in Section 3.1.5.1. While a climate data analysis is an indicator of current and near future meteorology in a particular region, it does not provide an indication of anticipated future changes in climate due to outside phenomenon (i.e., anthropogenic forcing or natural long-term climate cycles). Future changes are addressed as climate change in Section 3.1.5.2.

3.1.5.1 Regional Climate

The climate in the region is characterized as arid, with cold winters and moderate summers. The Cooperative weather station in Douglas, Wyoming (COOP ID 482685) provides representative current climate conditions in the CCPA. Common climatological measurements for this station were obtained from the WRCC. Monthly typical temperatures are provided on **Table 3.1-8** and precipitation and snow data are provided on **Table 3.1-9.** Wind data for this station was not available, so a wind rose showing typical wind conditions was developed using data from the National Weather Service Automated Surface Observing System station at Douglas, Wyoming (**Figure 3.1-13**). Primary wind flow is from the northwest and southeast.

Note that the timeframe for the temperature/precipitation record only extends as far back as 1996 as data were not available before then. Generally climate "normals" are determined from the most recent 30 years of a meteorology station data record. While both datasets contain enough information to assess current climate and weather behaviors (i.e., typical wind patterns, precipitation, etc.), this short timeframe must be considered when applying these values to potential future weather conditions. The earth has had episodes of extreme drought, cold, and warmth not captured in this brief record, and climate models indicate that climate is rapidly changing due to anthropogenic activity.

3.1.5.2 Climate Change and its Impacts

The following sections summarize the existing climatic conditions, anticipated regional climate trends, as well as the potential effects of climate on the Project. Effects of the Project on climate change are addressed in Section 4.1.

GHGs

As discussed in Section 3.1.2.8, GHGs do not have applicable ambient standards or emission limits under the major environmental regulatory programs. However, GHGs have the ability to trap heat from the sun within the earth's atmosphere and play an important role in determining the earth's climate. Several activities contribute to climate change, including emissions of GHGs from fossil fuel development and activities using combustion engines. Both of these activities are expected to occur as part of this Project.

The Intergovernmental Panel on Climate Change (IPCC) reports that since 1750, the largest contribution to total radiative forcing is caused by the increase in atmospheric concentration of CO_2 (IPCC 2013). In addition, "the atmospheric concentrations of CO_2, CH_4, and nitrous oxide have increased to levels unprecedented in at least the last 800,000 years. CO_2 concentrations have increased by 40 percent since pre-industrial times, primarily from fossil fuel emissions and secondarily from net land use change emissions" (IPCC 2013).

According to the National Climate Assessment (Melillo et al. 2014), U.S. average temperatures have increased by 1.3 degrees Fahrenheit (°F) to 1.9°F since record keeping began in 1895, and most of this increase has occurred since 1970.

Table 3.1-8 Monthly Typical Temperature for Douglas, Wyoming

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean Temperature (degrees Fahrenheit [°F])	24.8	26.5	35.0	43.3	53.1	63.1	70.6	68.7	57.4	45.1	33.4	24.2	45.5
Average Maximum Temperature. (°F)	39.0	40.5	48.2	57.3	67.5	78.3	86.7	85.2	73.5	60.2	47.3	37.5	60.2
Average Minimum Temperature (°F)	10.5	12.6	21.9	29.4	38.6	47.9	54.6	52.2	41.4	29.9	19.4	10.9	30.9

Note: Period of record: 1996 through 2010. Data were not collected for 1981-1996.

Source: WRCC 2014.

1

2

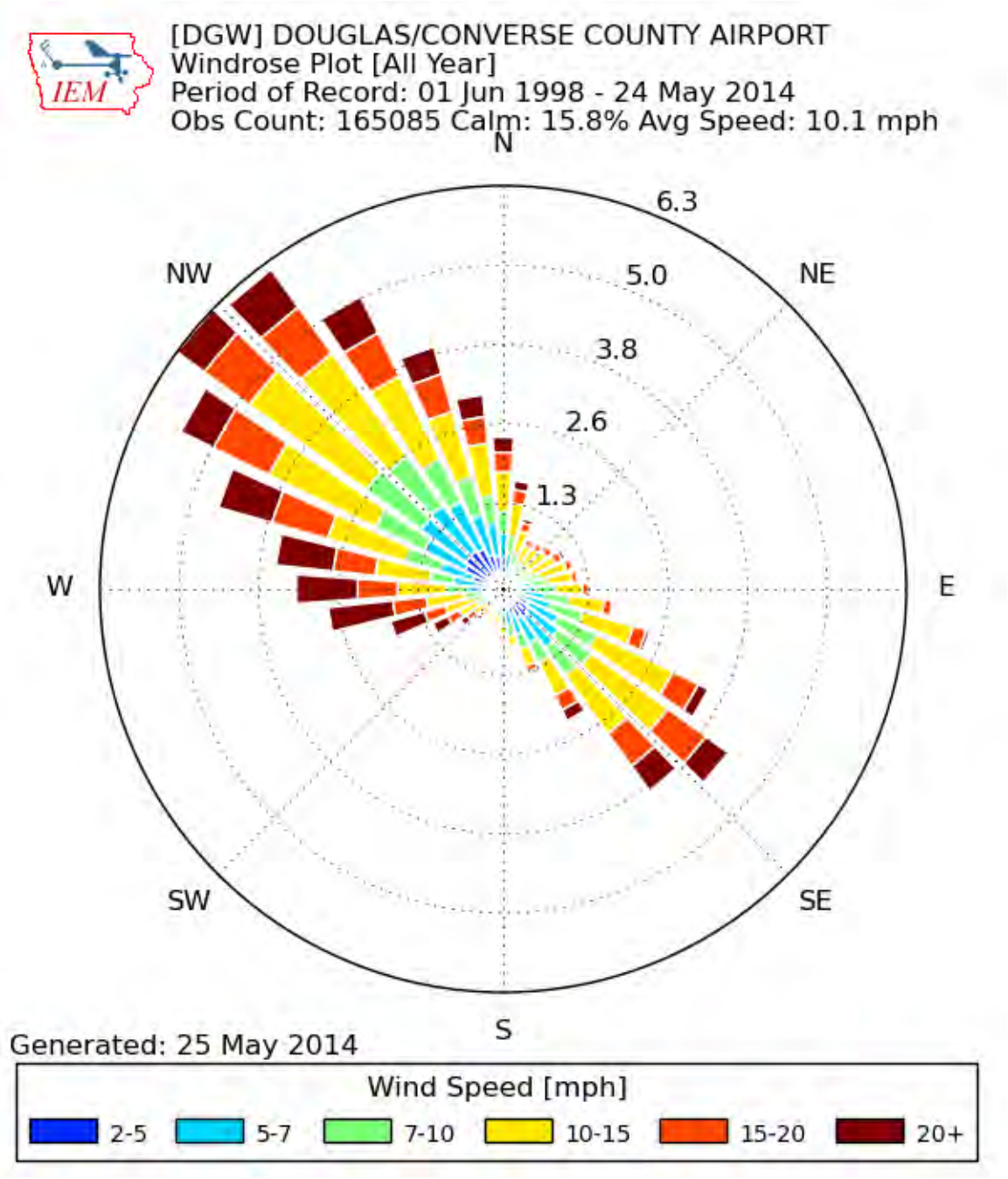
Table 3.1-9 Precipitation and Snow Statistics for Douglas, Wyoming

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Precipitation (inches)	0.5	0.6	0.9	1.8	2.4	1.8	1.3	1.1	1.2	1.3	0.6	0.5	13.9
Average Total Snowfall (inches)	6.6	7.9	8.7	8.8	1.7	0.2	0	0	0.6	3.2	6.1	7.6	51.3
Average Snow Depth (inches)	2	2	1	0	0	0	0	0	0	0	1	2	1

Note: Period of Record: 4/1/1909 to 3/31/2013. Percent of possible observations for period of record: 53.7 percent for snowfall and 15.3 percent for snow depth

Source: WRCC 2014.

3



Source: Iowa Environmental Mesonet 2014.

Figure 3.1-13 Wind Rose from Douglas, Wyoming

While the earth has experienced many episodes of warming/cooling in the past, the IPCC recently concluded that the recent warming of the climate system is very unique when compared to those past episodes. Additionally, most of the observed increases in globally average temperatures since the mid-20th Century are due to the observed increase in anthropogenic GHG concentrations (IPCC 2013).

Anthropogenic activities can influence climate; therefore, it is important to understand the potential impact of those activities. Many studies have been conducted to assess how the climate could change in the next century as a result of varying human activity.

Climate Change Scenarios and Impacts

In 2001, the IPCC projected that by the year 2100, global average surface temperatures could increase by 2.5°F to 10.4°F above 1990 levels. The National Academy of Sciences (2010) has confirmed these projections but also has indicated that there are uncertainties regarding how climate change may affect different regions. Computer model predictions indicate that increases in temperature would not be equally distributed but are likely to be accentuated at higher latitudes. Models indicate that average temperature changes are likely to be greater in the Northern hemisphere. Although large-scale spatial shifts in precipitation distribution may occur, these changes are more uncertain and difficult to predict.

To assess potential changes in climate response to varying amounts of GHG emissions, scientists run climate models with different assumptions regarding future GHG emissions. Some modeling scenarios assume that socioeconomic development will continue at current rates and GHG emissions will continue to increase rapidly into the foreseeable future. Other models assume that GHG emission will be curbed due to rapid technological advances and aggressive climate adaptation strategies.

In modeling scenarios that assume the world would only increase carbon emissions from approximately 10 to 12 Gigatonnes of carbon (GtC) by 2040 and then slowly decrease to approximately 3GtC by 2100, the Wyoming region is expected to experience a 5 to 6°F increase in surface air temperature by later this century. In models that assume emissions would continue to increase, temperature increases of 8°F or more are forecast for the western U.S. (Melillo et al. 2014; Walsh et al. 2014).

The National Climate Assessment (Shafer et al. 2014) suggests that impacts across Wyoming include at least a 5°F to 6°F temperature increase over the next century, and an increase in the maximum number of dry days and extreme events, such as exacerbated flooding and extended droughts.

The Northwestern Plains Rapid Ecoregional Assessment (SAIC 2012) performed a higher resolution future climate change analysis for the Northwestern Plains Ecoregion. This ecoregion encompasses the CCPA. This analysis utilized the a high CO_2 emission global climate model scenario in conjunction with a regional climate model to obtain more spatially refined climate change model projections than what can be obtained directly from a global climate model. This assessment projected a 1.9 to 2.3 degree temperature increase across most of the northeastern quadrant of Wyoming by the year 2060. Precipitation and snow water equivalent is expected to increase moderately in spring, decrease moderately in summer, and remain relatively unchanged annually by mid-century. However, no information was given with regard to the potential increased likelihood of extreme of events (e.g., flooding and droughts) as was discussed in the National Climate Assessment.

Effects on Air Quality

Warmer temperatures expected as a result of climate change can have an impact on air quality. While research has been conducted regarding how meteorological conditions affect air quality, the relationship is complex because pollutants chemically interact with each other and pollution is highly dependent on local conditions such as local topography, wind conditions, and the vertical structure of the lower atmosphere.

According to the National Climate Assessment (Melillo et al. 2014), there is high confidence that climate warming has the potential to decrease background surface ozone on a global scale. However, high CH_4 levels can offset this decrease, raising background surface ozone. It is estimated that by year 2100, background surface ozone would increase by approximately 8 ppb (which is 25 percent of current background levels) relative to scenarios with small CH_4 changes.

Increases in surface ozone have been documented during heat wave episodes (Peterson et al. 2014). Research also has shown ozone concentrations are strongly dependent on temperature (Weaver et al. 2009). As drought and duration of heat waves increase, ozone concentrations are likely to increase in the region.

Additional air pollution challenges include PM emissions from forest fires, which are likely to increase due to a longer fire season and higher temperatures that allow for drying out of vegetation (Peterson et al. 2014). Windblown dust from lack of vegetation also may occur. Such events will lead to more common exceptional air quality events and overall decreased air quality in the region. While such events may increase PM emissions by altering natural sources (i.e., forest fires and vegetation), PM is removed from the air through precipitation. Precipitation patterns also are expected to change; therefore, the confidence behind overall future PM impacts is still relatively low.

It also is important to note that many of the projected changes associated with climate change may not be measurably discernible within the reasonably foreseeable future. Existing climate prediction models also are global and regional in nature; therefore, they are not at the appropriate scale to identify exact climate changes at the scale of the CCPA. However, such regional predictions should provide clues to potential impacts, and such predictions should be taken into consideration. Evidence suggests that ozone concentrations may increase (all else being equal) due to climate change (Wise 2009), making compliance with the NAAQS less attainable.

Due to the potential negative effects of climate change, strategies are being formulated to decrease GHG emissions to help decrease climate change impacts. These strategies are being addressed at both the federal, state, and local levels. For example, through federal mandates, fuel efficiency of cars is increasing and energy upgrades of millions of homes across the country have taken place. Wyoming is taking some measures to address potential climate change impacts associated with GHG emissions. Since 2008, renewable energy generation from wind, solar, and geothermal sources in Wyoming increased by almost a factor of five. In addition, the city of Gillette, Wyoming has committed to reducing energy consumption by 20 percent in city buildings (White House Fact Sheet 2014).

It is difficult to assess whether additional mitigation strategies would be implemented, and to what extent current mitigation strategies ultimately would curb climate change. The extent of future mitigation strategies also is unknown. The climate system is sensitive to human activities that ultimately are related to demographic, social, ecological, and economic changes. These changes are often uncertain. The National Climate Assessment emphasizes that “uncertainties can make decision-making in the context of climate change especially challenging for several reasons, including the rapid pace of changes in physical and human systems, the lags between climate change and observed effects, the high economic and political stakes, the number and diversity of potentially affected stakeholders, the need to incorporate scientific information of varying confidence levels, and the values of stakeholders and decisions makers” (Moss et al. 2014).

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3.2 Cultural Resources, Historic Trails, and Native American Concerns

The term cultural resources generally refers to any and all resources 50 years old or older that are created or given special meaning without reference to their eligibility for the National Register of Historic Places (NRHP). The term encompasses archaeological sites, historical buildings, structures, objects, and districts, as well as specific areas of the landscape that are important to Native American tribes or other culturally recognizable groups. Sites are the locations of events, human occupations, or activities (NPS 2017). Buildings (e.g., courthouses, barns, houses) primarily are constructions used to shelter any form of human activity, while structures (e.g., trails, bridges, trolley cars, canals) are functional constructions made for other purposes. Objects (e.g., monuments, boundary markers) are items that are not classified as buildings or structures. Districts include multiple sites, buildings, and/or objects. Cultural resources also can include traditional cultural properties (TCPs) and properties of traditional religious and cultural importance. TCPs are locations having historical and continuing importance for the beliefs, customs, practices, and/or cultural identities of existing communities (Parker and King 1998) and are eligible for NRHP listing. Properties of traditional religious and cultural importance may or may not be eligible for listing. For the purposes of this analysis, historic trails and places/issues of concern to Native Americans are discussed separately from other kinds of cultural resources because they require different analysis areas.

Section 102 (42 USC 4332) of the NEPA mandates that federal agencies assess the direct and indirect environmental impacts of their proposed actions on the quality of the human environment, and Section 101 (42 USC 4331) charges federal agencies to “preserve important historic, cultural, and natural aspects of our national heritage.” Accordingly, federal agencies must consider the impacts of their proposed actions on cultural resources and cultural uses of the natural environment (e.g., traditional plant gathering). When a proposed action has the potential to impact cultural resources that are eligible for or listed in the NRHP (i.e., historic properties), federal agencies also must comply with the NHPA. Section 106 of the NHPA requires agencies to make a reasonable and good faith effort to identify historic properties that could be adversely affected by a federal agency’s proposed undertaking. While NEPA takes all cultural resources into consideration, regardless of their eligibility for the NRHP, the NHPA is concerned only with historic properties. Agencies must consider potential impacts on cultural resources and potential adverse effects on historic properties regardless of land ownership; however, resources located on private surface land belong to the private landowner, who is not obligated to authorize field inventory on their private land. The NHPA and other authorities also charge federal agencies with conducting meaningful, on-going consultation with Indian tribes and other interested parties regarding their concerns about adverse effects to historic properties. This consultation helps to provide additional information for NEPA so that agencies may consider the impacts to cultural resources that are important to those groups.

Section 106 of the NHPA applies to the three categories of cultural resources analyzed (i.e., cultural resources, historic trails, and resources of Native American concern) and helps define their analysis areas using the concept of area of potential effects (APE). Section 106 defines an APE as “the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if any such properties exist. The area of potential effect is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking” (36 CFR 800.16[d]).

For most prehistoric and historic properties for which integrity of setting, feeling, and association usually are not factors in determining their NRHP eligibility, the APE generally represents the resource itself plus a small buffer to account for potential additional site elements. For linear historic properties such as roads and trails and for any other historic properties for which setting, feeling, and association contribute to their NRHP eligibility, the APE generally is the physical resource itself plus its viewshed and other directly associated features and sites. A viewshed can be determined using Geographic Information System (GIS), with its size dependent on surrounding topography.

The three categories of cultural resources discussed in this document have overlapping yet different analysis areas; the minimum area is the CCPA but each category requires an additional analysis area beyond the CCPA. Accordingly, each specific analysis area is defined within its appropriate section.

To understand the kinds of cultural resources, historic trails, and resources of Native American concern that could be impacted by the Project, the first step was to conduct a literature review of existing information would conducted as set forth in BLM Manual 8110 (BLM 2004b). The literature was assembled from a review of previously recorded sites documented in State Historic Preservation Office (SHPO), BLM, USFS, and other databases (e.g., the Wyoming Cultural Records Office [WYCRO] database) as well as from current published and unpublished literature, chronologies, cultural and historical contexts, and information provided by the BLM, USFS, consulting Native American tribes, and special-interest groups (e.g., historic trails organizations).

3.2.1 Cultural Resources

Cultural resources are specific, definable locations of human activity and/or meaning, including objects, features, structures, sites, landscapes, and topographic elements whose locations are identifiable through field inventory, historical documentation, and/or oral tradition. The term includes prehistoric and historic archaeological sites and constructed resources (e.g., buildings and structures), as well as specific places on the landscape that have special meaning for groups of people traditionally associated with them. For the purposes of this document, the term cultural resources refers to all of these except historic trails and places of Native American concern, which are discussed separately.

Cultural resources identified archaeologically generally are called either sites or isolates. While sites indicate relatively substantial human activity, isolates suggest ephemeral or uninterpretable use. In 2005, the definitions of sites and isolates were changed in the SHPO reporting standards (Nissley 2005). As a result, some sites recorded before 2005 would be considered isolated resources if they were recorded today. However, for purposes of this analysis, any cultural resource having a Smithsonian number was treated as a site.

3.2.1.1 Analysis Area

The analysis area for cultural resources is the CCPA, which represents the area in which direct effects and most or all indirect effects to those resources would occur. Different information is provided by each type of cultural resource and each type is eligible under NHPA for different reasons; however, the types of intrusions that affect them generally are different from those that affect historic trails and resources of Native American concern. As such, the analysis area for cultural resources is smaller than those for historic trails and resources of Native American concern. Prehistoric and historic archaeological sites can provide information about past activities and lifeways, and they may be eligible under NHPA for their data potential. Information potential from an archaeological site generally is affected only by direct impacts and is not affected by visual intrusions. Historic sites and prehistoric sites that contain buildings and/or structures can provide information about construction techniques and architectural forms and styles, and they may be eligible under NHPA for their association with important events, people, and/or architecture. The integrity of these sites generally is dependent on the preservation of relatively small viewsheds (e.g., up to 1 mile or less). The aforementioned types of cultural resources located outside the boundary of the CCPA are unlikely to be indirectly affected by development within the CCPA.

3.2.1.2 Eligibility Criteria for Listing Cultural Resources in the NRHP

The NPS maintains the official list of the Nation's cultural resources that are worthy of preservation, based on an evaluation of three qualities: age, integrity, and significance. A resource generally must be at least 50 years old and must possess at least some integrity of location, design, setting, materials, workmanship, feeling, and/or association (36 CFR 60.4). A resource’s significance is evaluated by meeting one or more of the following criteria:

- Are associated with events that have made a significant contribution to the broad patterns of U.S. history (Criterion A); or
- Are associated with the lives of persons significant in U.S. history (Criterion B); or
- Embody the distinctive characteristics of a type, period, or method of construction, or represent the work of a master, or possess high artistic values, or represent a significant and distinguishable entity whose components may lack individual distinction (Criterion C); or
- Have yielded, or may be likely to yield, information important in prehistory or history (Criterion D).

3.2.1.3 Regulatory Framework

The primary federal laws related to the protection and management of cultural resources on federal lands include Section 101(d)(6), Section 106 (36 CFR part 800), and Section 110 of the NHPA of 1966 (16 USC 470), and the FLPMA (43 USC 35). Although the BLM is the lead federal agency for this EIS, the CCPA also contains surface and subsurface acreage under the purview of the USFS, the State of Wyoming, and private owners. Accordingly, the responsibilities and guidance of federal agencies, as well as the State and other appropriate entities, also are applicable. In addition to those noted above, the following federal, state, and/or county laws, ordinances, regulations, and standards apply to cultural resource protection within the analysis area:

- American Indian Religious Freedom Act of 1978 (42 USC 1996, 1996a)
- Antiquities Act of 1906 (16 USC 432, 433)
- Archeological and Historic Preservation Act of 1974 (16 USC 469)
- Archaeological Resources Protection Act of 1979 of 1979 (16 USC 470aa)
- EO 11593 of 1971, Protection and Enhancement of the Cultural Environment (36 FR 8921)
- EO 13007 Indian Sacred Sites (61 FR 104)
- EO 13175 Consultation and Coordination with Indian Tribal Governments (65 FR 218)
- EO 13287 Preserve America (68 FR 43)
- FLPMA (43 USC 35)
- Historic Sites Act of 1935 (16 USC 461)
- NEPA of 1969 as amended (42 USC 4321)
- NHPA of 1966 as amended (16 USC 470)
- Native American Graves Protection and Repatriation Act of 1990 (25 USC 3001)
- Recreation and Public Purposes Act of 1926 (43 USC 869)
- Approved RMP/ROD for the BLM CFO (BLM 2007b)
- USFS TBNG LRMP (USFS 2001)
- Programmatic Agreement among the BLM, Advisory Council on Historic Preservation (ACHP), and the National Conference of SHPOs Regarding the Manner in which BLM will meet its responsibilities under the NHPA State Protocol between the Wyoming BLM (BLM and SHPO 2014)
- Programmatic Agreement among the USFS, Wyoming Forests, Wyoming SHPO, and ACHP Regarding Compliance with the NHPA on the National Forests and Grasslands of Wyoming (USFS, SHPO, and ACHP 2008).

- Wyoming Antiquities Act of 1935
- Historic Preservation in the Cowboy State Wyoming Comprehensive Statewide Historic Preservation Plan 2016-2026 (Wyoming Department of State Parks and Cultural Resources 2016)
- Wyoming Environmental Quality Act of 1973
- Converse County Land Use Plan (Converse County 2015a)

In addition, the following BLM handbooks and manuals provide policies and guidance for the management of various types of cultural resources:

- H-1780-1, Improving and Sustaining BLM-Tribal Relations (BLM 2016f)
- MS-1780, Tribal Relations (BLM 2016e)
- MS-8100, The Foundations for Managing Cultural Resources (BLM 2004a)
- MS-8110, Identifying and Evaluating Cultural Resources (BLM 2004b)
- MS-8130, Planning for Uses of Cultural Resources (BLM 2004c)
- MS-8140, Protecting Cultural Resources (BLM 2004d)
- MS-8150, Permitting Uses of Cultural Resources (BLM 2004e)
- MS-8170, Interpreting Cultural Resources for the Public (BLM 2004f)

Federal historic preservation legislation mandates the documentation, evaluation, and consideration of cultural resources that potentially could be affected by federal undertakings, including private undertakings that operate under federal license or on federally managed lands. Specifically, Section 106 of NHPA requires that federal agencies consider the effects of their undertakings on historic properties. Effect is defined at 36 CFR Part 800.16(i) as "alteration to the characteristics of a historic property qualifying it for inclusion in or eligibility for the National Register." Section 106 also charges federal agencies with affording the ACHP a reasonable opportunity to comment on their undertakings. The federal Programmatic Agreements the Wyoming BLM and USFS have with ACHP and the National Conference of SHPOs (BLM and SHPO 2014; USFS, SHPO, and ACHP 2008) outline the manner in which the federal agencies should meet their responsibilities under NHPA. The State Protocol between the BLM and Wyoming SHPO defines how those bodies should interact and cooperate under NHPA, and provides direction for implementing NHPA. Additionally, BLM Manual 8140 provides direction for protecting cultural resources from natural and human-caused deterioration and for recovering cultural resource data to mitigate adverse effects of proposed undertakings in accordance with the State Protocol. Furthermore, although Section 106 of the NHPA does not specify how federal agencies should consider the effects of their undertakings on historic properties, the ACHP provides guidance for how to do so (ACHP 2013). In addition, the White House CEQ and the ACHP jointly published a handbook for integrating NEPA and NHPA (CEQ and ACHP 2013).

3.2.1.4 Cultural Overview

Prehistoric Period

The CCPA is situated in the Powder River Basin within the larger Northwestern Plains region. The Northwest Plains is an area of approximately 200,000 square miles that generally includes all of Wyoming, southern Montana, eastern Idaho, western South Dakota and Nebraska, the extreme southwestern corner of North Dakota, and the northern border of Colorado. Despite the presence of topographic and resource diversity, archaeological sites found in the region exhibit overall cultural homogeneity or similarity (Frison 1991; Kornfeld et al. 2010). The Powder River Basin is a wide,

moderately deep, and asymmetrical basin bounded by the Black Hills to the east; Casper Arch, Laramie Range, and Hartville Uplift to the south; and the Big Horn Mountains to the west.

Cultural chronologies of the Northwestern Plains have been provided largely by Mulloy (1958), Wedel (1961), Frison (1991), and Kornfeld et al. (2010). Based on a combination of projectile point forms, tool assemblages, feature types, faunal remains, stratigraphy, and radiocarbon dates, cultural periods defined in this region are the Pre-Clovis (pre-11,500 years before present [B.P.]), Paleoindian (11,500–8000 B.P.), Plains Archaic (8000–1450 B.P.), Late Prehistoric (1450–ca. 250 B.P./anno Domini [A.D.] 1700), and Protohistoric (ca. 250 B.P./A.D. 1700–1800). Each is summarized below.

Pre-Clovis Period

No pre-Clovis sites have previously been recorded within the region or the analysis area. However, there is a growing body of evidence from sites in Colorado (e.g., Dutton, Selby, and Lamb Springs), in other parts of North America (e.g., Cactus Hill in Virginia, Paisley Caves in Oregon, the Topper site in South Carolina, and Meadowcroft Rockshelter in Pennsylvania), and in South America (e.g., Cueva Fell and Monteverde in Chile, Pedra Furada in Brazil, and Piedra Museo in Argentina [Meltzer 2009; Stanford and Bradley 2012]) that people were on those continents prior to 11,500 B.P.

Paleoindian Period

Many Paleoindian sites and isolated projectile points have been identified in the Northwestern Plains region, dating to between about 11,500 and 8000 B.P. Traditions defined by specific projectile point forms and tool assemblages include Clovis (ca. 11,500–11,000), Folsom (11,000–10,200 B.P.), the Agate Basin Complex (10,500–10,000 B.P.), the Hell Gap Complex (10,000–9500 B.P.), the Alberta/Alberta-Cody Complex (9800–9000 B.P.), the Frederick and/or James Allen Cultural Complex (8400–8000), and the Lusk Complex (8400–7900 B.P.). Highly nomadic Paleoindian hunter-gatherers relied to a great extent on large Pleistocene megafauna, including mammoth, giant sloth, camels, bison, and horses (Frison 1991; Kornfeld et al. 2010). Most activities were of small magnitude and short duration; therefore, Paleoindians mostly left small archaeological assemblages representing short-term lithic reduction locales, camps, and animal kill and processing sites (Frison 1991). A small number of sites, such as Lindenmeier (a Folsom site in north-central Colorado) and Hell Gap (a site in southeastern Wyoming containing Clovis, Folsom, Agate Basin, and Hell Gap assemblages), provide much more extensive evidence for large-scale and/or repeated use. In general, Paleoindian tool assemblages are characterized by large lanceolate and stemmed projectile points, spurred end scrapers, gravers, borers, crescents, and mammoth bone tools (Frison 1991; Kornfeld et al. 2010; Wood 1998).

Clovis sites are widespread on the Northwestern Plains and in the Rocky Mountains. They are identified by the presence of large, fluted and unfluted lanceolate projectile points, planoconvex scrapers, retouch flakes, pressure retouch flakes, and core choppers (Frison 1991; Kornfeld et al. 2010). Clovis bifaces and blade technologies are distinctive and their efficiency of material use allowed for high mobility and successful exploitation of a wide range of ecological settings and subsistence practices. No Clovis sites have been recorded previously within the analysis area; however, the Casper site is a well-documented *Bison antiquus* kill site located west of the CCPA. Clovis sites include artifact scatters, open camps, animal kill locations, and caches.

At least some Folsom sites likely were contemporaneous with Clovis sites (Kornfeld et al. 2010). Folsom sites are identified by smaller but deeply fluted projectile points and a wide range of tool types (Frison 1991; Wood 1998). Many Folsom sites are bison kill sites and appear to demonstrate Paleoindian adaptations to changing environmental conditions between the Pleistocene and Holocene that coincided with the decline of Pleistocene megafauna in the Northwestern Plains region. Folsom sites, including the Brewster and Hell Gap sites, are known outside but not far from the analysis area, in eastern and southeastern Wyoming, respectively (Kornfeld et al. 2010).

Goshen Complex sites (ca. 10,400–10,200 B.P.) also may overlap with Clovis and Folsom sites. The first recorded Goshen site is located in southeastern Wyoming (Larson et al. 2009). Goshen sites are identified through the presence of lanceolate projectile points that have slightly concave bases and parallel pressure flaking patterns, with thinned rather than fluted bases, as well as bifaces and blade tools (Kornfeld et al. 2010). Goshen sites typically are bison bone beds (Frison 1991). Many Goshen projectile points have been found on the Northwestern Plains and in the Rocky Mountains (Kornfeld et al. 2010). Sites known outside the CCPA include the Hell Gap site in southeastern Wyoming and the Carter/Kerr-McGee site in the Powder River Basin (Kornfeld et al. 2010).

The Agate Basin Complex, Hell Gap Complex, and Alberta/Alberta-Cody Complex follow Clovis, Folsom, and Goshen. Each is typified by large, often stemmed projectile points designed for big game hunting (Frison 1991). The Hell Gap site in southeastern Wyoming contains all three complexes. Other notable sites include Sister's Hill, the Casper site, Jones-Miller, and Horner in north-central and northeastern Wyoming (Kornfeld et al. 2010).

Approximately 10,000 B.P., two distinct and concurrent Paleoindian traditions appeared. Known as Plains Paleoindian and Foothill/mountains Paleoindian, they were characterized by the use of some shared lithic technologies but likely represent specific adaptations to different geographic areas. While the Plains Paleoindian tradition was oriented toward a part-time bison hunting subsistence strategy, the Foothill/mountains complexes used more generalized hunting and gathering because of the more limited availability of large game in that ecozone. Foothill/mountains groups also appear to have placed a greater emphasis on plant foods, foreshadowing Plains Archaic adaptations (Frison 1991). Several unique projectile point types, including Lovell Constricted, Alder Complex, Haskett, Pryor Stemmed, and Deception Creek points, are associated only with the Foothill/mountains Paleoindian tradition (Kornfeld et al. 2010).

The Frederick and/or James Allen Cultural Complex and the Lusk Complex follow the Alberta/Alberta Cody Complex. Both are characterized by variation in tool forms, including large, unfluted lanceolate projectile points, scrapers, notched flakes, utilized flakes, retouched flakes, bifacial knives, end scrapers, spur perforators, and bone needles (Kornfeld et al. 2010). Assemblages sometimes also contain grinding slabs and informal manos. Projectile points of the Frederick Complex are lanceolate with parallel oblique flaking. Lusk projectile points are similar but tend to be narrower and thicker and usually are made from flakes, resulting in a triangular or plano-convex cross section (Kornfeld et al. 2010). These complexes suggest the use of a greater diversity of resources and more sophisticated hunting techniques, such as utilizing topographic features or snow drifts, which resulted in a larger number of animals killed at one time (Kornfeld et al. 2010; Wood 1998). Sites known from outside the analysis area include the Hell Gap site in southeastern Wyoming, the James Allen site in southern Wyoming, the Agate Basin site in east-central Wyoming, and the Betty Greene site near the Wyoming, Nebraska, and South Dakota border (Kornfeld et al. 2010).

Plains Archaic Period

Changes in global climate occurred between the Pleistocene and Holocene (7900 7200 B.P.) as the Pleistocene glaciers finally melted. Based in part on major climatic shifts from generally cooler and wetter conditions to warmer and drier ones, Archaic hunter-gatherers were less mobile and used a broader resource base than their Paleoindian predecessors. Exploiting both small and large game, including bison, as well as diverse plant resources, they used mostly smaller, more diversified side- and corner-notched projectile points and more formal ground stone tools, as well as some large corner-notched and un-notched points (Frison 1991; Kornfeld et al. 2010). Chronological relationships among the different projectile point styles is not well understood, and the periods of use of many types appear to substantially overlap (Kornfeld et al. 2010). Typical Archaic archaeological assemblages also include a variety of unifacial and bifacial stone tools and numerous grinding implements (Frison 1991). Features at Archaic sites often include hearths and architectural elements such as stone circles and alignments, indicating somewhat reduced mobility. By the later Archaic, ceramics also were in use. The Archaic

typically is divided into three sub-periods: Early Plains Archaic (8000–5000 B.P.), Middle Plains Archaic (5000–3000 B.P.), and Late Plains Archaic (3000–1450 B.P.).

The Early Plains Archaic roughly coincided with a dramatically drier climatic period, termed the Altithermal. During this time, people seem to have primarily occupied mountain and foothill areas; perhaps as a response to drought conditions at lower elevations. Habitation sites are found in rockshelters and caves, as well as in open areas near springs along mountain slopes (Frison 1991). Artifact assemblages demonstrate substantial technological changes in projectile point hafting and an emphasis on high quality lithic materials. For example, the Big Horn Mountains in north-central Wyoming contain evidence for concentrated quarrying (Frison 1991; Wood 1998). Other sites, such as the Hawken Site (a late fall/early winter arroyo trap bison kill locality in northeastern Wyoming) can be assigned to specific seasons and suggest that people regularly aggregated and dispersed at different times of the year (Kornfeld et al. 2010; Wood 1998). The Hawken site also contains the earliest side-notched point typology associated with a bison kill in the Northwestern Plains. Other notable Early Plains Archaic sites in the region include the Dunlap-McMurry burial in Natrona County east of the Town of Douglas, and the China Wall site in Albany County (Kornfeld et al. 2010).

The Middle Plains Archaic began approximately 5000 B.P. as moisture levels increased, creating environmental conditions similar to today (Kornfeld et al. 2010). At that time, human populations in the Northwestern Plains region increased due either to an influx of people or increased population growth within the region. The Middle Plains Archaic represented a continuing trend toward increased use of small game and plant resources; while evidence continues for small-scale bison hunting, most Middle Plains Archaic sites do not provide evidence for the kind of large-scale bison hunting seen in some Early Plains Archaic sites. One exception would be the Scoggin site in south-central Wyoming. Other site types include open and sheltered camps, many of which contain complex features such as stone-lined and stone-filled baking or roasting pits. Stone circle sites also are known, although they are less prevalent than in subsequent periods (Frison 1991). Middle Plains Archaic artifact assemblages include diverse projectile point types (Frison 1991) and flaked stone debitage, cores, unifacial flakes, worked flakes, and bifaces, as well as abundant manos and grinding slabs/mutates, atlatl points, bone tools, and occasional bone beads. The presence of rock-lined hearths at many sites indicates that baking plant foods became more common.

During the Late Plains Archaic, climatic conditions continued to be conducive to population growth, and sites dating to this period are more common and widespread than those of the Early and Middle Plains Archaic. A relatively intensive occupation of the Big Horn Mountains and Basin areas is suggested by many cave and rockshelter sites in those areas. Although the Late Plains Archaic is characterized by further changes in projectile point types, subsistence strategies, other tool types, and features such as stone circles, stone-lined and stone-filled hearths that first appear in the Middle Plains Archaic continue into this period (Frison 1991).

Other elements of artifact assemblages include a variety of flaked stone tools such as scrapers, drills, and perforators as well as bone awls, tabular bone beads, bone gaming pieces, and pendants. The diversified tool kits and larger variety of faunal and macrofloral remains recovered from Late Plains Archaic sites suggest a great variety of hunting and gathering activities. Notable sites in the region include the Muddy Creek site in Carbon County and the North Platte River and Patten Creek sites in Platte County (Kornfeld et al. 2010).

Two main cultural traditions are defined for the Late Plains Archaic based on projectile point forms. The Pelican Lake tradition, defined by wide, open, corner-notched projectile points, is widespread in the Northern and Northwestern Plains. The Yonkee tradition defined by extensive and sophisticated arroyo trap bison kill sites and associated projectile points, is less widespread and is found in the Powder River Basin of Montana and Wyoming (Kornfeld et al. 2010). In addition, a new side- or corner-notched projectile point type (termed Besant) appeared on the Northwestern Plains around 2000 B.P. They

appear to have been used with atlatls (spearthrowers) and are associated with highly sophisticated bison kill sites (termed bison corrals or pounds) comprised of logs and deep-set posts (Kornfeld et al. 2010). Besant projectile points demonstrate that people in Wyoming had connections to the Northwestern Plains and to cultures affiliated with the Great Basin who made similar corner-notched projectile points and basketry (Frison 1991; Kornfeld et al. 2010).

Furthermore, two ceramic traditions appear in the archaeological record in small numbers near the end of the Late Plains Archaic (Frison 1991). The Intermountain Pottery Tradition appears to have been indigenous to the Rocky Mountains and Northwestern Plains and may have been created by Numic-speaking Shoshonean groups (Kornfeld et al. 2010). These low-fired ceramics are utilitarian wares with thick sides and flat bottoms that have minimal decoration on minimally smoothed surfaces (Frison 1991). In contrast, Plains-derived Woodland ceramics are found in association with some Besant sites; predominantly along the Wyoming-Nebraska border and in northeastern Colorado (Kornfeld et al. 2010). Made using a paddle and anvil technique, their shape is described as conoidal, or sometimes globular with a signature cord-marked pattern on their exterior. They, too, were fired under low and inconsistent conditions, resulting in irregular surface colors that range from black to brown to red (Ellwood 2002). Both of these ceramic traditions are far more abundant during the subsequent Late Prehistoric period than during the Late Plains Archaic.

Late Prehistoric Period

Similar to the Late Plains Archaic, the Late Prehistoric saw people's continued reliance on a combination of wild game and plant resources, but with an even greater variety of fauna. Overall, the increasing use of ceramics (Frison 1991) and plant resources coincided with a gradual change from a nomadic way of life to a more settled one. This trend also is suggested by Late Prehistoric site and feature types, which include semi-permanent house pit depressions, large slab-lined food preparation pits, extensive middens, and storage features. Artifact assemblages include the newly invented bow and arrow, as well as cord-marked Woodland type ceramic vessels, small corner-notched arrow points, and more specialized and formal tool types. In addition, a large variety of projectile point forms continued from earlier periods or were introduced. For example, Besant projectile points introduced during the Late Plains Archaic continued in use during the Late Prehistoric. At the same time, small corner- and side-notched projectile points were made for use on arrows. For example, delicate Avonlea arrow points with u-shaped side notches located close to their bases are known from this period. Sites in which Avonlea projectile points are found contain large slab-lined hearths, flaked stone and bone tools, ground stone implements, and bone and shell decorative items (Kornfeld et al. 2010). Sites containing other small corner- and side-notched projectile points are easily distinguished from Avonlea sites by their lack of abundant debitage, weaponry, tools, decorative items, and faunal materials (Kornfeld et al. 2010). Side-notched points with basal notches, known as tri-notched arrow points, appeared near the end of the Late Prehistoric and continued to be used by the Crow and Shoshone during Protohistoric times (Frison 1991; Kornfeld et al. 2010). Examples of Shoshonean occupation during the Late Prehistoric period occur at the Bugas-Holding site in northern Wyoming. This site yielded several types of hearth features surrounded by a bone bed containing predominantly bighorn sheep and bison, as well as many tri-notched points, bone and stone tools, ornaments, and ceramics (Kornfeld et al. 2010).

Many Late Prehistoric sites demonstrate a continued reliance on hunting. For example, the Vore site in the Black Hills of Wyoming is a bison jump that contains as many as 22 components, each of which includes a variety of side-notched arrow points.

Protohistoric Period

The Protohistoric period begins with the initial contact between indigenous Native Americans and Euro-Americans through the permanent, widespread settlement of the latter. In addition to bringing new trade goods such as cloth and seed beads as well as metal technologies such as guns, pots, and knives, Euro-Americans brought new diseases that decimated many Native American populations. In addition to the resulting changes in population sizes, perhaps the most profound change for indigenous peoples

was the Euro-American re-introduction of the horse to North America (Frison 1991; Kornfeld et al. 2010). Many plains groups rapidly acquired large numbers of horses by the late 1600s. As a result, they could move farther faster and many tribes became known as highly skilled horse people and mounted bison hunters. For example, Shoshonean groups probably obtained large numbers of horses during the first quarter of the 17th Century, and the Crow obtained the horse shortly thereafter (Cowdrey et al. 2012). Many Euro-American trade goods, including glass and shell beads, small metal objects, and horse trappings, became prized items that often appear in burials from this time (Kornfeld et al. 2010).

Site types known from the Protohistoric period include open camps, open lithic scatters, stone circle sites, sheltered camps, sheltered lithic scatters, rock art, battlefields, trails, and culturally modified trees. Artifact assemblages may include hand-hammered iron points and metal lance points. Native people created the latter themselves by cold-hammering other iron objects obtained through trade or raiding (Frison 1991). At least one metal point has been identified within the analysis area.

History

The Wyoming SHPO has identified eight Historic Periods of Significance within the Powder River Basin: Early Historic (A.D. 1801–1842), Pre-Territorial (A.D. 1843–1867), Territorial (A.D. 1868–1889), Expansion (A.D. 1890–1919), Depression (A.D. 1920–1939), World War II Era (A.D. 1940–1946), Post-World War II (A.D. 1947–1955), and Modern (A.D. 1956–present). Major events or trends for each period are summarized below.

Early Historic Period

The Early Historic period was characterized by initial Euro-American exploration, establishment of the Rocky Mountain fur trade, and dispersed trading posts. Euro-Americans arrived relatively late in Wyoming, with the only evidence for an early Spanish presence or trade item coming in the form of a likely 17th Century Spanish rapier blade found near Tongue River in Dayton, Wyoming. The earliest confirmed European presence in Wyoming were French traders in the early 1800s (Larson et al. 2009; Homsher 1965). By the early 1830s, as many as 200 fur trappers were in eastern Wyoming, but that industry died down by the end of the decade. The first official government exploration of the region was made in 1842. These explorers, trappers, traders, and settlers followed previously established Native American trails along the North Platte River and across the landscape that became the Oregon, California, and Mormon Pioneer emigrant trails, the Pony Express route, and the first transcontinental telegraph line (Reckner 1988).

Pre-Territorial Period

The Pre-Territorial period saw the development and use of emigrant trails and wagon trails fueled by discoveries of gold and the passing of the Homestead Act of 1862. As Euro-Americans journeyed through the Powder River Basin and adjacent regions in increasingly large numbers, their interactions with Native Americans generally deteriorated. The 1840s through 1870s were characterized largely by conflict as Euro-Americans began to claim transportation routes and longstanding tribal lands for themselves (Larson 1978). Increasing traffic on emigrant trails and the perceived need to maintain U.S. territories, especially against Native Americans, led to the establishment of many military forts across the Rocky Mountain West. Those included Fort Caspar on the west side of modern-day Casper and Fort Fetterman, established in 1867, on a plateau above the North Platte River where the Bozeman Trail bisected the Oregon Trail. Many of the first settlements, including Reno Junction and Douglas, also were established along trails and railroad corridors. A combination of the creation of the reservation system through the 1851 Treaty of Fort Laramie, the California Gold Rush, and the Homestead Act of 1862 brought travelers and settlers to the Powder River Basin. Mining during the Montana gold boom specifically spurred the development of the Bozeman and Bridger Trails which were used for traveling to northern Wyoming (Miller 2011; Wyoming State Historic Preservation Office 2014).

Territorial Period

The completion of the Transcontinental Railroad in 1868 and the expansion of the Union Pacific Railroad in Wyoming between 1867 and 1890 facilitated Euro-American development of the region. After years of battles and skirmishes between Native American groups and Euro-American settlers, particularly along trails (Barrett 2011), the 1868 Treaty of Fort Laramie brought a brief, but only partial, respite to the conflicts. It also established Indian agencies on reservations, through which Euro-Americans attempted to force tribal people to settle down for farming and ranching. The Wyoming Territory was created in 1869, which added to further land use and occupancy conflicts. In 1877 the Desert Land Act encouraged further economic development of arid and semi-arid public land in western states, including Wyoming. The Desert Land Act offered 640 acres to individuals who would reclaim, irrigate, and cultivate the land for agriculture and ranching (Larson 1978). The large-scale ranching industry initially followed the Texas model of open range practices, with railroad expansion supporting increased stock herding in the Casper area and in the Big Horn Mountains. However, the success of open range ranching was short-lived due, in part, to environmental conditions; the extremely harsh winter of 1886–1887 caused the deaths of hundreds of thousands of cattle (Larson 1978).The railroad also led to the growth of coal mining in Wyoming not only because trains required coal for power but also enabled the large-scale delivery of it. As a result of all of these factors, an increasing number of homesteaders and ranchers came to the region, and by the 1880s, Euro-Americans had largely relegated Native American tribes to reservations and claimed the region. Converse County was established in March 1888 (Converse County 2015a).

Expansion Period

Due to trends in other parts of the country, the sheep-raising industry in Wyoming expanded greatly during this period, eventually surpassing the cattle industry. Many sheep herders and ranch hands originated in Mexico, introducing a new cultural dynamic to the region (Cassity 2007). The different requirements of sheep and cattle for water, food, and herding often led to fierce disputes between ranchers. Range wars such as the Johnson County War, which occurred partly in Converse County in 1892, are well known in Wyoming (Larson 1978; Smith 1966). Troubles with competitors, rustling, diseases, and bad weather led many cattlemen to install barbed-wire fencing on their lands (Larson 1978). As a result, by the late 1800s the large-scale open range ranching system was replaced by small farms and ranches. Homestead Acts of 1909 and 1912 encouraged continued settlement in Converse County and technological advances initially led to an expansion in farm and ranch size, but World War I (1914–1918) represented a new economic impact that strained Wyoming's resources and population. In partial reaction to these impacts, the Stock-Raising Homestead Act of 1916 offered settlers 640 acres to encourage expansion of the ranching industry (Cassity 2007). Mineral prospecting in the region expanded even more due to improved delivery via railroads followed by an increase in fuel oil consumption as a result of the invention of the combustion engine and increased demand due to World War I. The Powder River Basin experienced some of the heaviest development in coal mining by the 1920s. In some cases company towns were built at the mines. In addition, railroads aggressively recruited immigrants to work coal mines, which resulted in distinctive cultural, economic, and social patterns (Cassity 2013).

Depression Era

The 1920s are sometimes called the New Deal era because of rapid social and economic changes, including a dramatic rise in the stock market, proliferation of automobiles, and growing settlement in cities. However, Wyoming's economy and population distribution in the 1920s remained relatively similar to previous decades: dependent on agriculture and mining and dispersed across the land. Although farms and ranches increased in size and became more specialized (e.g., beets or dairy), Wyoming experienced an agricultural depression before the stock market crash of 1929 due to droughts and dependence on national trends in consumption. Furthermore, increased mechanization of the mining industry led to decreased employment of miners. Conversely, increased demand for oil in the 1920s caused a steady expansion of the oil and gas industry that generally has continued into modern times. Following the stock market crash, the Hoover administration put people to work on a variety of

construction projects. In Wyoming those projects included public buildings such as courthouses, federal buildings, and post offices, as well as parks and highways. When President Roosevelt took office in 1933 he continued an emphasis on community building projects, but with different approaches. His Civilian Conservation Corps formed military-style camps that completed numerous projects for water and erosion control, vegetation planting and maintenance, and other landscape-level endeavors. In the Powder River Basin, Civilian Conservation Corps workers also expended considerable effort fighting naturally ignited fires in exposed coal seams. The Civil Works Administration program also was particularly important across Wyoming; however, it only lasted from November 1933 to April 1934. In 5 months, this program completed 402 projects primarily focused on road improvements (Cassity 2013). Additionally, the government also sought to provide assistance to the agricultural industry in 1937 through the Bankhead-Jones Farm Tenant Act, which authorized a credit program to help tenant farmers purchase land and authorized the federal government to acquire damaged lands to rehabilitate them.

World War II Era

Although World War II re-energized the nation's economy as a whole, it marked the end of public relief programs and led to social changes in Wyoming. Manufacturing employment in the state during the war increased by only a few hundred people; although, over time thousands of people left to serve in the war. Approximately 5,560 men from Wyoming were enlisted in the armed forces as of 1941, but 23,611 men and 515 women were in service by 1945. At the same time, hundreds of foreigners were brought into Wyoming via Japanese detainment camps and prisoner of war camps. The Heart Mountain Relocation Center for Japanese detainees was constructed between Cody and Powell in 1942. Prisoner of war camps, including one near Douglas, held people from various European countries during the second half of the war. Unlike most other parts of the country, Wyoming generally did not experience the benefits of increased industrial production surrounding the war. Most money went toward expansions of facilities and activities for various branches of the military such as the Casper Army Air Base and the Wyoming National Guard (TolTest and TEC 2009), and industrialization was more centralized rather than distributed among different communities (Cassity 2013).

Post-World War II Era

After World War II, Wyoming continued to be a primary producer of raw materials, but the population increased more slowly than that of most other states. Post-World War II modernization gradually led to the modern intensification of agriculture and grazing (Cassity 2011), with farming and ranching remaining important industries in the Powder River Basin. However, immediately following World War II the industries were fraught with challenges, including unsuccessful irrigation projects and a lack of available labor. To fill the labor gap, an increasing number of laborers and ranch hands immigrated to Wyoming. Some military facilities also expanded after World War II during the Cold War era (TolTest and TEC 2009). In addition, energy exploration increased to support military activities and lifestyles that were increasingly dependent on automobiles and mechanization.

Modern Era

With initial federal financial support the post-World War II economy of Wyoming has become fairly prosperous. Beginning in the mid-1950s, inventions such as better farm equipment, fertilizer, and science-based livestock breeding have supported much more intensive and successful agricultural production that feeds into the national economy (Cassity 2011), although the state experienced an economic slump in the 1960s. Extraction of oil, gas, and other minerals also has continued to be a vital part of the Powder River Basin economy.

3.2.1.5 Background

Official WYCRO file searches initially were conducted on November 6, 2013 and May 1, 2014. Files in the BLM CFO were examined on March 5 through 7, 2014 (Williamson et al. 2014a). Before 1983 there were no federal standards for archaeological inventory. Accordingly, most inventories conducted before 1983 are considered inadequate by modern standards. In 1983, the NPS published the Secretary of the

Interior's Standards and Guidelines for Archaeology and Historic Preservation (48 FR 44716) with the goal of creating more consistent, systematic, and accurate methods of archaeological data collection. The publication precipitated the establishment of methods that were somewhat more consistent, at least within agencies or regions.

The initial file search showed that, of the 1.5 million-acre CCPA, 209,222 acres (approximately 14 percent) were inventoried previously for cultural resources; although not all of the inventories were conducted to current standards. In the analysis area (i.e., within and up to a 1-mile radius beyond the CCPA), 1,716 projects were conducted between 1974 and 2013, most of which were for oil and gas-related projects including exploration and construction of well pads, access roads, and pipelines. Of the 1,716 projects, 1,662 (97 percent) were inventories, and the remaining 54 projects (3 percent) were a combination of data recovery/mitigation, historic overview and evaluation, monitoring, site testing, snow monitoring, and other unassigned projects (Williamson et al. 2014a).

A supplemental file search of WYCRO records was conducted on June 8, 2017, to obtain information about projects conducted and cultural resources recorded within and up to 1 mile beyond the CCPA since the initial 2013 file search. This supplemental file search showed that an additional 639 projects were conducted between November 2013 and June 2017. Most of the projects were related to oil and gas development, including seismic exploration and construction of well pads, access roads, pipelines, and other facilities. Other projects were conducted for waste management, cellular communication towers, electrical transmission lines, railroads, range and wildlife development, research, roads, and water storage and conveyance. Of the 639 projects, 635 (99 percent) were Class III inventories. The remaining four projects (1 percent) were monitoring (n=2) and site testing and evaluation (n=2). The total number of acres covered by those 639 projects is unknown; WYCRO does not have information about the acres covered by more than half of the projects. An unsubstantiated estimate is that the post-2013 projects covered approximately 24,000 acres.

Table 3.2-1 summarizes the types and numbers of sites recorded previously within the analysis area, based on a combination of the pre-2013 and post-2013 file searches. Within the file search area, the WYCRO database lists 2,123 previously recorded sites. Two of the sites (both rock cairns) included in the 2017 file search results are of unknown temporal affiliation. For purposes of this analysis, they were considered to be historic. Eight additional sites were identified by the 2013 BLM file search. No sites were added by the USFS file search. Of the 2,131 total sites, 1,426 are prehistoric, 568 are historic, and 137 are multicomponent (pre-2013 data from Williamson et al. 2014a). For purposes of further analysis, the multicomponent sites were split into their prehistoric and historic components, resulting in a total of 2,268 sites/components, and tallied according to those categories. Prehistoric sites were broken into nine categories: cairns/caches, alignments/hunting blinds, stone circles, lithic scatters, open camps, bison kills/bone beds, lithic quarries, burials, and other (e.g., unspecified). Lithic scatters are the most common site type within the analysis area. Historic sites were broken into 15 categories: cairns/alignments, homesteads/structures/ foundations, telegraph/telephone lines, trails/roads, bridges, dams/canals, dugouts, inscriptions, mines, railroads, military sites, debris scatters/camps/dumps, corrals, cemeteries/graves, and other. Homesteads/structures/foundations are the most common type within the analysis area (Williamson et al. 2014a).

Although a somewhat larger number of sites have been recorded in the south-central, southwestern, and northern portions of the analysis area, the distribution of recorded sites is spread across the analysis area. The southwestern portion of the analysis area, within the Pine Ridge area and adjacent drainages, contains a relatively higher number of previously recorded sites. In much of Wyoming, prehistoric sites tend to be more frequently located along drainages. Areas lacking available water are less likely to contain sites than areas near water sources (Williamson et al. 2014a).

Most NRHP eligibility evaluations were made using information from surface surveys; very few were based on site testing and/or excavation. Only six sites have been excavated, and all of those have been

recommended or determined eligible for the NRHP. As shown on **Table 3.2-1**, most of the previously recorded sites either were not eligible for the NRHP or remain unevaluated for eligibility. The most commonly eligible types of prehistoric sites were open camps and stone circles. Open camps generally retain the potential for dating, and stone circles may yield artifacts and additional information or are connected with specific kinds of activities. The most commonly eligible types of historic sites were debris scatters that can yield additional information; homesteads that are connected with early settlement, important people, or representative architecture; and trails/roads that are associated with early transportation and settlement (Williamson et al. 2014a).

Table 3.2-1 Site Types Previously Recorded in the Analysis Area

Site/Component Type	Total Number	Eligible	Not Eligible	Unevaluated
Prehistoric				
Cairns / caches	121	7	53	61
Alignments / hunting blinds	37	4	6	27
Stone circles	326	53	70	203
Lithic scatters	608	17	498	93
Open camps	453	100	227	126
Bison kills / bone beds	7	2	1	4
Lithic quarries	8	0	7	1
Burials	1	0	0	1
Other	2	0	0	2
Total Prehistoric Sites	***1,563***	***183 (12 percent)***	***862 (55 percent)***	***518 (33 percent)***
Historic				
Cairns / alignments	174	3	89	82
Homesteads / structures / foundations	217	9	131	77
Telegraph / telephone lines	3	2	1	0
Trails / roads	18	7	11	0
Bridges	12	0	11	1
Dams / canals	16	4	12	0
Dugouts	11	0	9	2
Inscriptions	11	1	8	2
Mines	12	0	9	3
Railroads	3	2	1	0
Military sites	9	2	6	1
Debris scatters / camps / dumps	194	15	142	37
Corrals	9	0	6	2
Cemeteries / graves	3	0	0	3
Other	13	2	10	1
Total Historic Sites	***705***	***47 (7 percent)***	***447 (63percent)***	***211 (30percent)***

Source: Williamson et al. 2014a; WYCRO 2017 updated files search.

3.2.2 Historic Trails

Historic trails are routes of travel used during the Protohistoric and/or Historic periods, but often with earlier origins. NHTs are "extended trails that closely follow a historic trail or route of travel of national significance" (BLM 2014g). The National Trails System Act of 1968, as amended, states that NHTs "shall have as their purpose the identification and protection of the historic route and its historic remnants and artifacts for public use and enjoyment" (NPS 2009). BLM Manual 6280 identifies requirements of NEPA processes for proposed actions that potentially could impact NHTs and/or trails that are undergoing feasibility studies to become NHTs.

3.2.2.1 Analysis Area

As with cultural resources in general (see Section 3.2.1.1), the core analysis area for historic trails is the CCPA. However, for historic trails, the consideration of indirect effects (e.g., visual, auditory, and olfactory) is as important as the consideration of direct effects (i.e., physical) because integrity of setting, feeling, and association usually are vital for the determination of significance of a historic trail. Historic trails often run long distances across relatively open landscapes; therefore, indirect effects can arise throughout extensive areas. Accordingly, the analysis area for direct and indirect effects to historic trails within and adjacent to the CCPA included both the physical routes of the trails and the viewsheds of the trails. Direct effects were considered within historic travel corridors, which ranged within and between trails from approximately 0.5 to 2.5 miles wide. The specific widths of the corridors were determined by the geographic spread of trail braiding and the distances between trail and trail-associated sites (Williamson et al. 2014b). Visual effects resulting from oil and gas infrastructure of different heights were considered within a 3-mile-wide corridor as measured from the outer edges of the historic travel corridors (**Appendix B**). Historic trails that could be directly and indirectly affected by the proposed undertaking were identified through a combination of approaches, including records searches, field inventory, historical research, and consultation (Williamson et al. 2014b).

3.2.2.2 Eligibility Criteria for Listing Historic Trails in the NRHP

The basic eligibility criteria for listing historic trails in the NRHP are the same as those for cultural resources in general. Historic trails are most often determined to be eligible under Criteria A and B for their association with events that have made a significant contribution to the broad patterns of our history (Criterion A) and as sites that are associated with the lives of persons significant in our past (Criterion B). As a result, historic trails derive a large part of their significance from their settings and viewsheds, so high degrees of integrity of setting, feeling, and association are important factors for evaluating the eligibility of trails. Integrity of setting refers to whether the character of the location is similar to its historic use, and focuses on the relationship between the site and its surroundings. Integrity of feeling is linked to the integrity of setting, and is an expression of the aesthetic or historic sense of the time period associated with the site. Integrity of association is closely related to both setting and feeling and is the historic link between an important historic event and a historic property (NPS 2002). Accordingly, maintenance of a trail's surroundings in a manner similar to those during the trail's period of significance is vital for a trail's eligibility. For trails that were created through an unsettled and undeveloped landscape, this means an area that is largely free of human construction.

3.2.2.3 Regulatory Framework

In addition to the laws, ordinances, regulations, and standards listed in Section 3.2.1.3, the following also apply to the protection of historic trails within the analysis area:

- Land and Water Conservation Fund Act of 1965, as amended (16 USC 4601-4 through 4601-11)
- U.S. Department of Transportation Act of 1966, as amended (49 USC 1653(f))
- National Trails System Act of 1968, as amended (16 USC 1242)

- Federal Advisory Committee Act of 1972, as amended (5 USC Appendix 2 1–16)
- Omnibus Public Land Management Act of 2009 (16 USC 7201–7203)
- Management and Use Plan Update Final Environmental Impact Statement: Oregon National Historic Trail (NPS 1999)
- NRHP Multiple Property Documentation Form: Historic Resources of the Bozeman Trail in Wyoming (Wyoming SHPO 1989)
- Oregon, California, Mormon Pioneer, and Pony Express National Historic Trail Final Environmental Impact Statement (NPS 1999)
- Visual Resource Inventory for the CFO (4072)

Furthermore, the following BLM manuals provide policies and guidance for the management of various kinds of historic trails:

- MS-6250, National Scenic and Historic Trail Administration (BLM 2012e)
- MS-6280, Management of National Scenic and Historic Trails and Trails under Study or Recommended as Suitable for Congressional Designation (BLM 2012h)

3.2.2.4 Cultural Overview

The CCPA includes rolling plains, broad tablelands, wide valleys, upland ridges, buttes, and a portion of the North Platte River that largely funneled prehistoric and historic travelers through the same parts of the landscape. Beginning in prehistoric times, people selected travel corridors based on their ease of use and proximity to water. As a result, prehistoric trails often followed major drainages and crossed low passes. Historic trails largely followed these earlier routes, although the use of wagons and the movement of large numbers of livestock and people sometimes necessitated travel across more open ground. Modern paved routes have destroyed portions of these historic trails where they followed the easiest paths across the landscape. Other linear constructions, including railroads as well as telegraph and electrical lines, also often followed the same routes already established by historic trails. Trails were used for millennia and Euro-Americans subsequently used them to cross through long-standing Native American territories; therefore, they were often the locations of conflict between those two populations.

This section summarizes the historical context in which people created and used the historic trails that cross the CCPA: Child's Cutoff of the Oregon Trail, the Bozeman Trail, and the Rock Creek to Fort Fetterman Route (**Figure 3.2-1**). The Oregon-California-Mormon Pioneer-Pony Express NHTs run close to, but south of, the CCPA, although possible segments may occur in the very southwest portion of the CCPA. These trails were directly related to the historical themes of transportation, expansion, settlement, and land use, as they stimulated the construction of stage routes, local roads, stage stations, and railroads that helped to develop the American West. The railroad came to eastern Wyoming in 1869, spurring the construction of new transportation routes between railheads and more remote areas. Settlement and economic growth went hand-in-hand with the ability to transport products and people. As a result, cattle and sheep ranching and settlement-based businesses such as stores and post offices developed in the region (BLM 1986a).

By the 1830s, the fur trade in the region had dwindled, but scientific exploration, westward expansion, mining, ranching, homesteading, and other endeavors drew an increasing number of people to Wyoming (Larson 1978). Explorers, trappers, traders, and settlers followed the North Platte River and other land-based routes that together became the Oregon, California, and Mormon Pioneer emigrant trails and the Pony Express route, and the first transcontinental telegraph line.

Mining exploration of the gold and silver deposits in the Laramie Range on the southern edge of the Powder River Basin also began in the mid-1800s. The copper, tungsten, chromium, iron, and vermiculite

deposits in the Powder River Basin also began to draw more miners to the area (Lane et al. 1972). With increased Euro-American travel through and interest in the region, interactions with Native American tribes between the 1850s and 1870s were characterized largely by conflicts that manifested in wars, raids, massacres, treaties, retributions, and recriminations (Larson 1978). As a result, the U.S. government constructed military forts along the emigrant and mining trails to protect people engaged in westward expansion and economic development.

Child's Cutoff

In the early 1800s fur trappers followed well-worn Native American trails and identified South Pass (west of the CCPA) as the best mountain pass for wagon travel due to its comparatively gentle topography. Between 1841 and 1869, more than 200,000 Americans traveled the shared route of the Oregon-California-Mormon Pioneer-Pony Express NHTs to escape persecution or economic hardship, seek their fortunes in gold, and/or obtain more and better land (Dary 2004). In 1850, these emigrant trails experienced their peak use as approximately 45,000 to 65,000 people traveled these routes (BLM 1986a). Over time, people identified alternate and better routes, and travel became somewhat more predictable with more clearly marked trails, particularly along the North Platte River (Hafen 1982; Unruh 1979).

Child's Cutoff of the Oregon Trail was pioneered as an alternate, safer route by Andrew Child in 1850. He had been a member of one of the first emigrant groups to veer off the main travel corridor and follow the northern side of the North Platte River. The cutoff left the main trail near Fort Laramie and followed the north bank of the river until it rejoined the Oregon Trail near present-day Casper. The main route crossed the river and traveled west to a second crossing near Casper. While earlier explorers had found the northern route difficult and many turned back, Child and a few others found a route that avoided a dangerous river crossing at Fort Laramie and reduced the journey by 2 days. Starting in 1850, the route following the northern side of the North Platte became the standard travel corridor. Child documented the route in an 1852 guidebook. Once emigrants were regularly using Child's Cutoff, entrepreneurs established toll bridges and ferries at several locations near Casper, allowing travelers to weave back and forth across the river to avoid difficult portions of the trail.

The emigrant trails continued to serve as transportation arteries even after the transcontinental railroad was constructed in 1869. Into the early 20th Century, people traveled them in both directions for local and regional movement as well as for transportation of cattle, sheep, and horses. Users of the trails represented diverse cultures, ethnic groups, religious denominations, educational backgrounds, and economic interests. Collectively they influenced statehood, national politics, international relations and boundaries, and U.S. policy toward American Indians.

Child's Cutoff has been designated as a segment of the California NHT. Authorized by the Omnibus Public Land Management Act of 2009, the NPS is conducting a feasibility study to determine if Child's Cutoff and six other routes also should be designated as segments of the Oregon NHT. Accordingly, in compliance with BLM Manual 6280, any proposed action must be evaluated to determine impacts to the values, characteristics, and settings of Child's Cutoff and if it substantially interferes with or is incompatible with the trail's nature and purposes.

Bozeman Trail

Blazed in 1863 and used most intensively between 1864 and 1868, the Bozeman Trail was a regionally important trail that left the Oregon Trail just north of present-day Douglas. Its southern end had three variants. John Bozeman established the original route of the Bozeman Trail in 1863 to take people from the Oregon Trail to the gold fields around Alder Gulch and Emigrant Gulch in western Montana. His original route followed the Salt Creek River and crossed the hunting grounds of the Northern Cheyenne and Sioux. It was most likely not a new trail, but an ancient route that was well known by tribes (Fraser Design 2006). The use of this trail, in combination with the dramatically increasing numbers of Euro-Americans who were moving into the region, led to battles between the tribes and U.S. troops.

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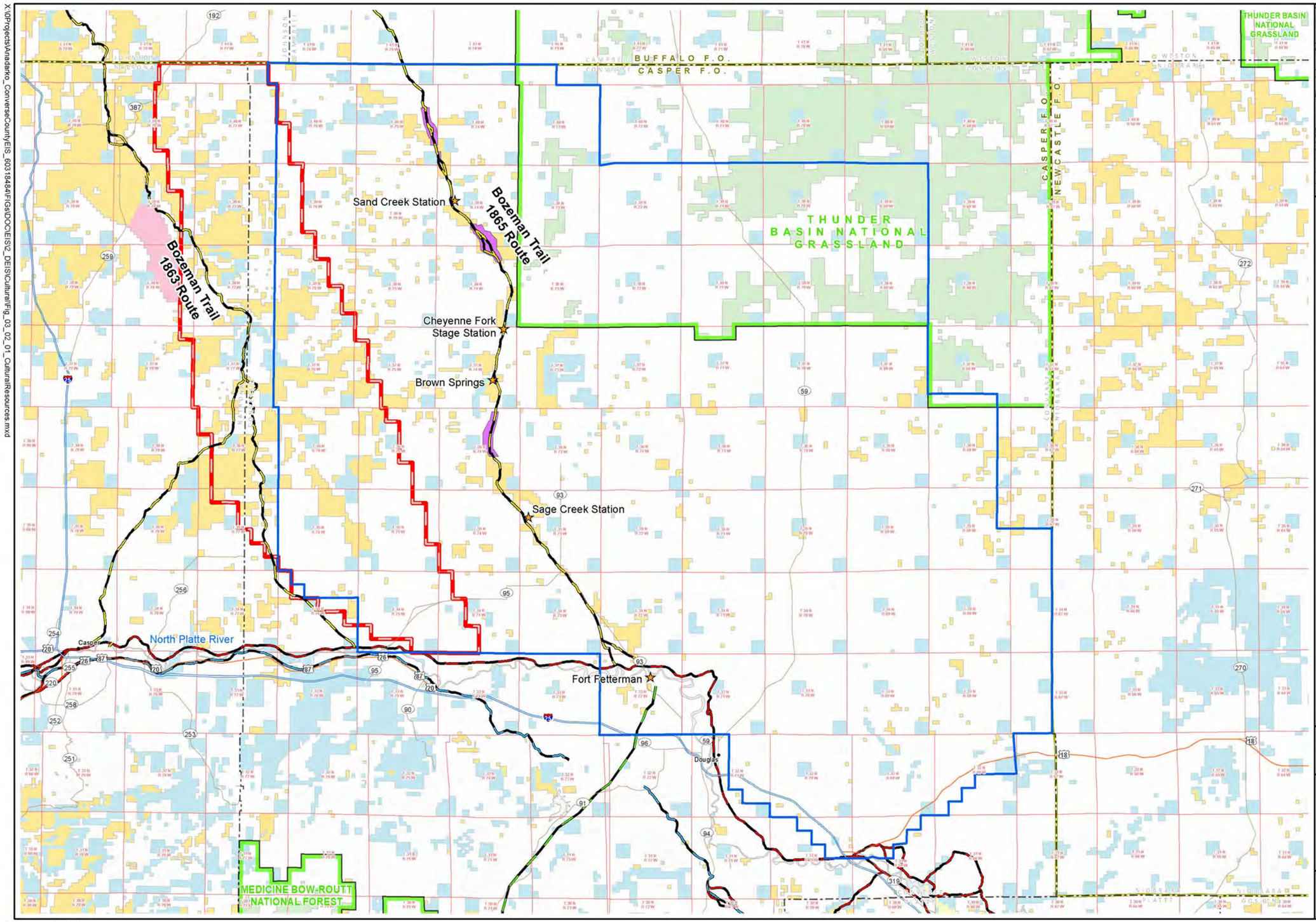

Project Boundary
BLM Field Office Boundary
USFS Administrative Boundary
Pine Ridge Special Management Area

Historic Trails

Bozeman Trail
Rock Creek to Fort Fetterman Stage Route
Child's Cuttoff
Oregon-California-Mormon-Pony Express
Bozeman Trail NSO Area
Cultural Site

Surface Ownership

Bureau of Land Management
US Forest Service
State
Private
Bureau of Reclamation
DOD/USACE

Source: BLM 2007c, 2004h.

CONVERSE COUNTY OIL AND GAS EIS

Figure 3.2-1
Cultural Resources of Special Interest

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0 2.5 5 10 Kilometers
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As the trail became increasingly militarized, members of the military adjusted its path from Bozeman's original route. In 1865 General Patrick Edward Connor took a more easterly route along the Dry Fork River during the Powder River campaign against the Sioux, Cheyenne, and Arapaho who were attacking Bozeman Trail travelers. Connor built Fort Connor, which later become Fort Reno, at the convergence of the Powder and Dry Fork rivers. Connor's route became the main route of the Bozeman Trail for transporting supplies and deploying troops during the Plains Indian wars of the 1860s and 1870s. The military adjusted the trail's route a third time by implementing a cutoff that connected two other forts along the trail—Fort Phil Kearny and Fort C.F. Smith.

Numerous battles and skirmishes were fought along the Bozeman Trail between Native Americans and Euro-Americans, primarily led by Red Cloud, a prominent Oglala Sioux chief. One of these, sometimes called the Fetterman Massacre, was one of the worst military defeats suffered by the U.S. on the plains. It and two subsequent battles during Red Cloud's War served to effectively close down the Bozeman Trail and catalyze the 1868 Treaty of Fort Laramie (Larson 2011). As soon as Fort Phil Kearney was built, Red Cloud and his warriors kept the fort under near-constant siege. In late 1866, Captain William Fetterman and 81 men were sent to rescue what was believed to be a wood cutting detail under attack. However, tribal decoys drew Fetterman and his men over Lodge Trail Ridge and into a trap. Red Cloud and reportedly 1,000 warriors killed all of Fetterman's troops. Fetterman committed suicide rather than face capture and torture by the united Sioux and Arapaho warriors. Not all battles were so one-sided though, and the Sioux, Cheyenne, and Arapaho lost many of their own along the trail between 1866 and 1868, during Red Cloud's War (also referred to as the Bozeman War and the Powder River War). After the Treaty of Fort Laramie was signed, the U.S. agreed to abandon the forts. Shortly thereafter, Fort Kearney was burned to the ground, likely by the Cheyenne (Northern Plains Reservation Aid [NPRA] 2014). Native American control of the Powder River Basin lasted only 8 years, when the U.S. made a concerted military effort to force the Sioux back onto their reservation (Barrett 2011).

The Wyoming SHPO has determined that the Bozeman Trail is eligible overall for the NRHP, and some segments of it are listed in the NRHP.

Rock Creek to Fort Fetterman Stage Route

Fort Fetterman was one of the three forts built along the Bozeman Trail to protect miners and army members from raiding tribes. It was established in 1867 on a plateau above the North Platte River, approximately 11 miles north of present-day Douglas where the Bozeman Trail bisected the Oregon Trail (i.e., at the southwest corner of the CCPA). The Rock Creek to Fort Fetterman Stage Route connected the Rock Creek Stage Station on the Overland Trail, near present-day Interstate 80 southwest of Rock River, with Fort Fetterman. Soldiers created the 83-mile-long, heavily traveled route in 1877 for transporting supplies to the fort (Thybony et al. 1985).

3.2.2.5 Background

WYCRO file searches were conducted on November 6, 2013, May 1, 2014, and June 8, 2017. Portions of the three historic trails (i.e., Child's Cutoff of the Oregon Trail, the Bozeman Trail, and the Rock Creek to Fort Fetterman Stage Route) run through the CCPA (**Figure 3.2-1** and **Table 3.2-2**). As summarized in **Table 3.2-1**, up to 15 other linear resources within the CCPA are historic roads, including four unnamed wagon or local roads, five county roads (Converse County Road 1-17, Highland Loop Road, Esau Road, Ogalala Road, and Irvine Road), two segments or off-shoots of the Bozeman Trail (Antelope Creek Crossing and Smith's Cutoff), one segment of the Overland Trail, and one segment of the Yellowstone Highway. Several buildings associated with the trails and roads also have been recorded previously within the CCPA. Those of note include Fort Fetterman, Cheyenne Fork Stage Station, Brown Springs, Sand Creek Station, and Sage Creek Station. All four of the stage stations are located along or near the Bozeman Trail. Fort Fetterman is located near the confluence of the Bozeman Trail, Child's Cutoff, and the projected location of the Oregon Trail.

The Oregon-California-Mormon Pioneer-Pony Express NHTs roughly parallel the south side of the North Platte River. Two possible segments of these emigrant trails have been recorded on the north side of the river in the very southwestern portion of the CCPA, but almost no data are available for them. Based on their location north of the river, it is possible that these segments were misidentified and are actually segments of Child's Cutoff, which runs across the south-central portion of the CCPA, roughly following the north bank of the North Platte River. The location of Child's Cutoff has been plotted based on depictions from General Land Office maps. The General Land Office-mapped length of the trail through the CCPA is 21 miles, but only 2 segments totaling 0.7 mile have been verified and recorded.

Table 3.2-2 Historic Trails Recorded Previously within the CCPA

Trail/Road	Documented Length within CCPA (miles)		Associated Site(s) in CCPA	Designation Level
	Total	Verified Segments		
National Historic Trail				
Child's Cutoff of Oregon Trail	21	0.7	N/A	National
Other Trails/Roads				
Bozeman Trail	76	30	Cheyenne Fork Stage Station, Brown Springs, Sand Creek Station, Sage Creek Station	Regional
Rock Creek to Fort Fetterman Stage Route	4	0	Fort Fetterman	Local

The easternmost variant of the Bozeman trail runs north-northwest through the CCPA, beginning just north of present-day Douglas where it met the Oregon Trail. The entire length of the trail within the CCPA has been plotted from General Land Office maps. The General Land Office-mapped length of the trail through the CCPA is approximately 76 miles. Of that length, 41 segments totaling approximately 30 miles have been verified and recorded. Most of the northern portion of the trail has been well recorded within the CCPA, including a nearly continuous 19-mile section.

The Rock Creek to Fort Fetterman Stage Route started at Fort Fetterman, just north of Douglas, and ran south past present-day Rock Creek to the Overland Trail. Only 4 miles of the route occur in the far southern portion of the CCPA. No portions of the route have been recorded previously within the CCPA, but Fort Fetterman has been.

3.2.3 Resources of Native American Concern

Resources of Native American concern are those identified through tribal consultation as being culturally sensitive. They include Indian Sacred Sites, properties of traditional religious and cultural importance, and TCPs. Indian Sacred Sites are defined in EO 13007 (NPS 1996) as "any specific, discrete, narrowly delineated location on federal land that is identified by an Indian tribe, or Indian individual determined to be an appropriately authoritative representative of an Indian religion, as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion; provided that the tribe or appropriately authoritative representative of an Indian religion has informed the agency of the existence of such a site." The term TCP was coined in an attempt to categorize historic properties that have ongoing traditional cultural significance. According to NRHP, TCPs are defined generally as cultural resources that are "eligible for inclusion in the NRHP because of [their] association with cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community" (Parker and King 1998).

Previous ethnographic research suggests that resources of Native American concern may include places named in oral histories or myths such as rock formations and the confluence of rivers; human-constructed features and sites such as petroglyphs and pictographs, burial cairns, vision quest structures, medicine wheels, game drive systems, and prehistoric habitations; landscapes, viewscapes, and battlefields; locations used for religious practices; traditional travel and gathering areas such as trails and dance locations; and natural resource areas such as plant harvesting locations as well as stone and clay deposits (Parker and King 1998; Gulliford 2000).

3.2.3.1 Analysis Area

The integrity and sacredness of resources of Native American concern can be particularly sensitive to both direct (i.e., physical) and indirect (e.g., visual, auditory, olfactory) impacts; therefore, the analysis area for resources of Native American concern is the CCPA plus their viewshed. A specific area that is partially within the CCPA but also extends outside the CCPA and was analyzed for effects from the proposed undertaking is the Pine Ridge area, comprising up to a total of 321,920 acres within and outside of the CCPA (**Figure 3.2-1**). As of 2004, just over 9 percent of the total area had been inventoried for cultural resources. While the area has relatively low site density because of its steep topography, it contains the largest number of stone alignments and hunting blinds or traps in the CFO, as well as a relatively large number of stone circles. This evidence suggests it was a favored location for hunting, particularly in the Late Prehistoric and early Historic periods. The only restriction for this area is that the minimum cultural resource block inventory size is 40 acres and the minimum linear inventory width is 100 feet on each side of surface disturbance (BLM 2007b).

3.2.3.2 Eligibility Criteria for NHRP

Resource of Native American concern such as TCPs are eligible for the NRHP if they are associated with cultural practices or beliefs of a living tribal community when the practices and beliefs are rooted in that community's history and are important in maintaining its continuing cultural identity. These properties usually are eligible under Criterion A.

3.2.3.3 Regulatory Framework

Federal law and agency guidance require federal agencies to consult with Native American tribes concerning the identification of cultural values, religious beliefs, and traditional practices of Native American people that may be affected by actions on federally administered lands. This consultation includes the identification of physical locations of traditional cultural importance to Native American tribes.

The laws, ordinances, regulations, and standards that apply to cultural resource protection in general (see Section 3.2.1.3) also apply to resources of Native American concern. Additional federal laws, regulations, and directives include, but are not limited to, the following:

- American Indian Religious Freedom Act of 1978 (42 USC 1996 & 1996a)
- Archaeological Resources Protection Act of 1979 (16 USC 470aa)
- EO 13007 Indian Sacred Sites (61 FR 104)
- Native American Graves Protection and Repatriation Act of 1990 (25 USC 3001)

Furthermore, the following BLM manual and handbook provide policies and guidance for tribal consultation:

- MS-1780, Tribal Relations (BLM 2016e)
- H-1780-1, Improving and Sustaining BLM-Tribal Relations (BLM 2016f)

3.2.3.4 Ethnographic Information

Based on historical research and on tribal consultation previously conducted by the BLM, Native American groups known to have used the CCPA prehistorically (i.e., pre-contact), protohistorically, and historically include the Crow, Eastern Shoshone, Northern Arapaho, Northern Cheyenne, and Sioux tribes. This section summarizes information about the tribes' histories and cultural practices, particularly as they relate to the CCPA.

Events Held in Common among the Tribes

The cultural history of each of the tribes is unique, but all of the tribes were affected by Euro-American-introduced diseases, the fur trade, warfare, the Dawes Act, and the Indian Reorganization Act. The Plains tribes may have been infected by smallpox as early as 1617, with the first documented epidemic devastating the Western Cree, the Arikara, and possibly the Sioux in the 1730s. Another epidemic from 1837 to 1838 caused a mortality rate as high as 95 percent among some Plains tribes. During the 1800s, plague, whooping cough, influenza, cholera, and typhoid also infected the Plains tribes. The results of such dramatic loss of life included higher suicide rates, loss of traditional knowledge, and the formation of new groups comprising small refugee populations that merged together (Swagerty 2001). At the beginning of the 1800s, having suffered often staggering losses of population, many tribes began holding the Sun Dance. Participants in the 4-day Sun Dance fasted and danced, seeking benefits for their families and communities through prayer and self-sacrifice (Stamm 1999). Shimkin (1986) views the Sun Dance as a political event with religious elements, although visions and ritual ceremonialism are very important elements of Plains cultures in general (Shimkin 1986; Wilson 1996).

Equally devastating changes to Plains tribes resulted from the expansion of the Euro-American trade industry. Initial trading of beaver pelts between French trappers and Northern Plains tribes in the 1730s was at a comparatively small scale. To facilitate larger scale trade, the Euro-American/tribal rendezvous system developed (Swagerty 2001). This was facilitated by the fact that many tribes began to acquire large numbers of horses through theft and trade beginning in the late 1600s (Cowdrey et al. 2012). Horses enabled groups to cover a much wider area and to convene at distant locations. Numerous tribes, including the Nez Perce, Flathead, Crow, Bannock, Ute, and Shoshone met with Euro-American traders in the Green River, Bear River, Snake River, and Wind River drainages during the summer to exchange robes, skins, and especially beaver furs for manufactured goods (Stamm 1999; Utley 1984). Fifteen annual meetings were held between 1825 and 1840 (Russell 1967). However, once beaver pelts went out of fashion by the early 1840s, the rendezvous system disbanded (Dolin 2010). Based in large part at what became Fort Bridger in 1843, an important stop for emigrants on the Oregon Trail in southwestern Wyoming, the buffalo robe industry replaced the beaver trade and rose to a much greater magnitude, dominating the Plains economy by the mid-19th Century (Swagerty 2001). In 1848, the American Fur Company alone shipped 110,000 robes. Between the 1830s and 1860s, annual averages of 90,000 to 100,000 robes were sent to St. Louis, with smaller numbers going to other hubs. The decimation of herds led to the end of the buffalo robe trade. In 1883 40,000 robes were traded, but in 1884 only 300 were sent (Dolin 2010). By 1889 the total buffalo population in North America was 1,091. Before Europeans arrived in North America, the buffalo population may have exceeded 30 million (Chittenden 1986; Dolin 2010). Needless to say, this destruction of the buffalo population, on which Plains tribes had formerly depended for food, clothing, and more esoteric purposes, forever impacted Plains cultures and helped force them onto reservations (Dolin 2010).

This was compounded by the Dawes Severalty Act of 1887. The objective of this act was to completely change Native American lifeways and assimilate tribal people into Euro-American society. One element of the act was to allot reservation land to individuals, rather than having the tribe hold it in common. This was thought to protect Native Americans from broken treaties and bring them into a mainstream farming economy, despite the fact that most allotted lands were unsuitable for farming (Debo 1985). However, the Dawes Act had several other consequences. The primary result of the act was confiscation of large amounts of tribal land. After giving set numbers of acres to people of different standings and genders, an

enormous amount of reservation land remained unallotted, which Euro-Americans were allowed to claim, further reducing reservation sizes. Between 1889 and 1891, approximately 11.5 percent (12,071,380 acres) of tribal lands were "restored" to the public (Debo 1985). Furthermore, allottees were required to become U.S. citizens and tribes living on reservations did not have to give consent for allotment to proceed. Other provisions and amendments caused further complications for tribes, who widely protested the law. Euro-Americans also attempted to acculturate Native Americans through education. In the late 1800s and early 1900s, thousands of youth were forcibly taken from their families and sent to off-reservation schools where their hair was cut, their names were Anglicized, and they were forbidden to speak their native languages (Chief Dull Knife College 2008). Many people strongly resisted this acculturation, holding onto their traditional ways in secret if necessary.

President Franklin D. Roosevelt's Indian Reorganization Act of 1934 ended allotment, restored surplus lands to tribal ownership, and allowed for tribes to purchase additional land (Swagerty 2001). In addition, the act charged the Bureau of Indian Affairs (BIA) with creating a model constitution for tribal governments. Once tribes ratified charter constitutions, they became eligible for government loans (Debo 1985; Swagerty 2001). The movement of tribes onto reservations greatly challenged their traditional ways of life, as the BIA also enacted rules that outlawed horse raids, polygamy, giveaways, medicine men, selling a horse to another Native American, hunting off-reservation with a special pass, and most ceremonies including the Sun Dance (Frey 1987; Voget 2001). With few other choices, hundreds of families were attempting to take up farming by the mid-1880s, but the Dawes Act hampered that and many families were eventually forced to lease out their lands for income (Voget 2001).

Crow

The Crow are a Siouan-speaking tribe that lived on the Upper Missouri River in North Dakota with the Hidatsa until sometime during the 16th Century. At that time, they separated from the Hidatsa and moved west to Montana and Northern Wyoming (Voget 2001). At the beginning of the 19th Century, the Mountain Crow and River Crow were two politically distinct bands. By 1850, the Kicked in the Bellies band formed as an offshoot of the Mountain Crow. While River Crow territory ranged from the lower Yellowstone River to the Milk and Marias rivers on the Northwestern Plains, Mountain Crow territory ran along the Bighorn, middle Yellowstone, and Powder rivers and into the surrounding mountains. Kicked in the Bellies spent their winters in the Wind River region but often joined the Mountain Crow at other times of the year. In 1851, the first Treaty of Fort Laramie defined Crow lands as 38 million acres along the Yellowstone River and in the Big Horn and Wind River Mountains (Frey 1987; Rzeczykowski 1999). However, in 1868 the second Treaty of Fort Laramie reduced Crow lands to just 8 million acres in Montana.

The Crow were nomadic hunter-gatherers who became a particularly powerful tribe after they acquired horses in 1730, probably through trade with the Comanche (Ewers 1980; Voget 2001). Horses enabled the Crow to become powerful middlemen in intertribal and Euro-American trade networks of the Northern Plains by the beginning of the 19th Century (Voget 2001), exchanging beaver pelts and then horses and mules for manufactured goods. The Crow traveled to various trading posts and many rendezvous were held in Mountain Crow territory in the Wind River Mountains (Voget 2001). Another vital part of Crow culture was cultivating tobacco for ceremonial purposes (Lowie 1956). Crow oral tradition identifies the Big Horn Mountains as the origin of the Sacred Tobacco Society. Petroglyphs found there depict figures with flat headdresses, which are thought to portray members of the Sacred Tobacco Society. The Big Horn Mountains remain a sacred area for the Crow (Francis and Loendorf 2002).

In 1864 the Bozeman Trail opened to facilitate the gold mining industry in Montana. Passing through the Powder River Basin on the eastern side of the Big Horn Mountains, the trail traversed the heart of Crow territory. At that time the Sioux and Blackfoot were trying to move the Crow off their own buffalo hunting grounds. When the Sioux sought to form an alliance with the Crow to fight the U.S. Army and the Bozeman Trail, the Crow chose to remain neutral. After a time, some Crow became couriers between forts for the U.S. Army (Rzeczykowski 1999) and eventually allied with the U.S. Army to better resist the

Sioux. They also became scouts in U.S. Army campaigns against the Northern Cheyenne and Arapaho (Fowler 2001a). In 1876 Crow men served with the U.S. Army at the Battle of the Little Bighorn (Rzeczykowski 1999). However, the Crow Agency was established in 1883 (Voget 2001), and reservation laws removed the Crow's means of counting coup, destroying the system whereby men acquired prestige and selected chiefs. Yet, despite these extraordinary challenges to their culture, the Crow have maintained many of their traditions and adopted new ones.

Eastern Shoshone

The Eastern Shoshone are a Numic-speaking tribe with origins in the Great Basin Culture Area, on the western side of the Rocky Mountains (Deaver 1996; Shimkin 1986; Steward 1938). Archaeologists do not all agree on the timing of the Numic expansion into Western Wyoming, but some suggest that ancestral Shoshonean groups were present in that area by the Early Archaic period (Larson and Kornfeld 1994). Linguistic and historical information provide evidence that the Eastern Shoshone were along the Wyoming Front Range by the 1500s (Deaver 1996; Shimkin 1986). A century later, a group of Eastern Shoshone moved onto the Southern Plains and became known as the Comanche, although the groups retained close ties (Deaver 1996; Shimkin 1986). The Eastern Shoshone also are affiliated with the Northern or Lemhi Shoshone, the Shoshone-Bannock, and the Northern Paiute (Steward 1938). Lewis and Clark encountered Shoshone groups on both sides of the Rocky Mountains and as far north as southern Saskatchewan (Larson and Kornfeld 1994; Shimkin 1986). In the early 1900s, most of western Wyoming, past the Wind and Bighorn rivers, was considered to be Eastern Shoshone territory (Steward 1938). During early historic times, it seems that the Wind River Basin in central Wyoming was particularly important (Deaver 1996; Shimkin 1986; Stamm 1999). The most sacred places there are those containing pictographs and petroglyphs (Shimkin 1986), traditionally believed to have been made by spirits (Francis and Loendorf 2002). As reflected in Eastern Shoshone culture itself, the Wind River Basin represented an interface between the Great Basin and Plains Culture Areas; their social organization was similar to that of other Great Basin groups, but adapted to the Plains ecosystem (Shimkin 1986; Stamm 1999).

The Eastern Shoshone were seasonally mobile hunter-gatherers who came together to communally hunt buffalo, various artiodactyls, and jackrabbits, and to fish, often using weirs. Plant resources also were vital to their economies and were largely provided by women. Eastern Shoshone bands often joined with other Plains tribes, particularly the Crow and Comanche, for hunting buffalo and trading (Shimkin 1986). The Eastern Shoshone acquired horses by at least the beginning of the 18th Century, most likely from the Comanches, who had obtained them from the Spanish (Ewers 1980). As for many other Plains tribes, horses allowed the Eastern Shoshone to travel more widely and participate in large-scale communal buffalo hunts. The Shoshone and Comanche may have been some of the earliest mounted buffalo hunters on the Plains. In addition, horse ownership gave them military superiority (Stamm 1999). However, this changed when the Blackfeet acquired both guns and horses in 1750 before the Eastern Shoshone obtained the former (Ewers 1980; Stamm 1999). In addition, smallpox epidemics in 1781 and 1800 greatly reduced their population. As a result of these and other factors, the Eastern Shoshone largely retreated back to the Big Horn and Wind River basins; by 1806 only small hunting parties or individual traders ventured east of the Big Horn Mountains (Stamm 1999).

About this same time, the Eastern Shoshone had their first direct contact with Euro-American fur trappers and traders (Shimkin 1986). The Eastern Shoshone soon acquired guns and other manufactured goods from traders, giving them more equal standing with other Plains tribes (Stamm 1999). After the demise of the beaver pelt trade and the rendezvous system, a community of trappers and Eastern Shoshone gathered around Fort Bridger in southwestern Wyoming, which was an important stop for emigrants on the Oregon Trail and served as a focal point for the buffalo robe trade. Bands often gathered at Fort Bridger for the Sun Dance after the spring buffalo hunt and in the fall to receive annuities from the U.S. government (Stamm 1999). In the 1840s, most Eastern Shoshone joined under Chief Washakie in reaction to escalating confrontations with the Blackfeet, Arapaho, Cheyenne,

Gros Ventre, and Sioux. They also made several alliances with the growing number of Euro-Americans in the area to continue to acquire guns and ammunition (Stamm 1999).

After the 1851 Treaty of Fort Laramie gave the upper Wind River Basin, the Big Horn Basin, and much of the Yellowstone region to the Crow, the Eastern Shoshone were forced to travel to Montana for buffalo. This caused friction among the two tribes and may have led Chief Washakie to repeatedly negotiate with the U.S. government for a reservation in the Wind River region. The government viewed the Eastern Shoshone as peaceful, and granting them a reservation in the Wind River may have helped discourage more hostile groups from entering the area (Stamm 1999). The Shoshone, Bannock, and U.S. signed a treaty in June 1868 creating the Wind River Reservation. That reservation is unique in that it was the only one in the U.S. to encompass lands chosen by the tribe assigned to it (Shoshone Indian Tribe 2003). Shoshone started moving to the reservation in the early 1870s but continued to hunt and gather off the reservation as well. As with tribes relegated to other reservations, the Eastern Shoshone were expected to give up hunting and become farmers. However, the latter was unsuccessful and the U.S. government often did not provide enough food. To help feed themselves and their families, many Shoshone men joined the Army to fight against their traditional Native American enemies. In the 1874 Bates Battle the Shoshone supported the Army during an engagement against the Northern Arapaho (Stamm 1999). After the battle, the Northern Arapaho petitioned the U.S. government for a reservation of their own, and in 1877 the Eastern Shoshone agreed to let the Northern Arapaho temporarily settle on the eastern side of their reservation. However, that situation became permanent after the first bands of Arapaho arrived in 1878 (Shoshone Indian Tribe 2003), violating Eastern Shoshone treaty rights. In 1939 the Eastern Shoshone received compensation for the loss of that land. As a result of encroachment by Euro-American settlers and stockmen, the decimation of the buffalo population, and the Dawes Allotment Act of 1887, two-thirds of the Wind River Reservation had passed out of tribal ownership by 1904 (Stamm 1999). In the face of great poverty and even starvation, the Eastern Shoshone continued to practice the Sun Dance as a source of hope and healing. Some people also adopted elements from Mormonism, Christianity, peyote rituals, and the Ghost Dance (Shimkin 1986; Stamm 1999).

Northern Arapaho

The Northern Arapaho are Algonquian speakers but their language is very different from that of the Blackfoot and Cheyenne who are the other Algonquian speakers on the Plains. It appears that the languages probably separated as long as 1,000 years ago (Schlesier 1994). During prehistoric (i.e., pre-contact) times, the Arapaho appear to have lived in villages in the Great Lakes and upper Mississippi River region as semi-sedentary horticulturalists (Schlesier 1994). However, it seems that pressure from other groups, most likely the Sioux, led the Arapaho to move south and west at some unknown time (Anderson 2001; Fowler 2001b; Gregg 1994). This geographic move coincided with a change to a more mobile lifestyle on the Northern Plains that was intimately tied to the buffalo as well as to horses by at least the late 1600s or early 1700s (Ubbelohde et al. 1995).

Before 1800, the Spanish called the Arapaho “Caminanbiches” and reported that they lived on the headwaters of the Cheyenne River in western South Dakota and eastern Wyoming near the Kiowa. A map obtained from the Gros Ventre (an Arapaho tribe) in 1800 showed four separate Arapaho groups. At that time, Arapaho lived between the Yellowstone and Platte rivers, were wealthy in horses, and traded prairie turnip flour to the Arikara for corn. They also used hunting grounds in the Black Hills, where in 1806 they formed an alliance with the Cheyenne, largely to counter the Sioux who were pushing west from the Missouri River (Fowler 2001b). Either simultaneously (Ubbelohde et al. 1995) or with the Arapaho moving first (Baker et al. 2007), the two tribes traveled farther south along the east edge of the Rocky Mountains in the early 1800s, pushing out the Kiowa who then joined the Comanches south of the Arkansas River. Based on historical accounts, by about 1815 the Arkansas River generally separated the ranges of the Arapaho and Cheyenne from those of the Kiowa and Comanche (Ubbelohde et al. 1995). The Arapaho and Cheyenne traveled seasonally between the Continental Divide in the Rocky Mountains on the west and the open plains to the east.

In 1846 the U.S. government created the Upper Platte and Arkansas Indian Agency. In 1849, the government bought the American Fur Company's post at Fort Laramie for an Indian agent base, which was the site of a Great Plains Indian council in 1851, with more than 10,000 Indians attending. Represented tribes included the Cheyenne, Arapaho, Snake, Sioux, Assiniboine, Gros Ventre, Arikara, and Crow. The meeting resulted in a treaty through which the tribes agreed to hunt within designated tribal boundaries and to let non-Native Americans journey through tribal lands and build forts to protect travelers on overland trails. In return the agents promised to distribute $50,000 worth of trade goods each year for the next 15 years. However, this amount decreased to $15,000 per year by the time the treaty was enacted (Ubbelohde et al. 1995). The Cheyenne and Arapaho were assigned to an area defined by the Platte River on the north and the Arkansas River on the south. It included much of eastern Colorado, southeastern Wyoming, southwestern Nebraska, and western Kansas. Still, Euro-Americans settled in tribal territories, so some Arapaho bands began to move north and others south (Fowler 2001b).

In 1858, gold was discovered at the confluence of the Platte River and Cherry Creek near Denver, Colorado. This brought much larger numbers of Euro-American settlers to the region, with miners moving onto lands reserved for tribes and demanding that the government dissolve Indian claims (Clark 1999). In reaction, a group that became known as the Northern Arapaho began to withdraw into the Bighorn region of Wyoming and Montana, allying themselves with the Sioux and Northern Cheyenne. Another group that became known as the Southern Arapaho withdrew down the Arkansas River (Fowler 2001b). In 1861 the Southern Arapaho and Cheyenne were pressured to relinquish their previously assigned territory, but they chose not to go to war with the U.S. That changed after the Sand Creek Massacre in September of 1864, when a peaceful encampment of some Arapaho and many more Cheyenne was attacked. The incident led to war between the tribes of the southern and central Plains and the U.S. (Fowler 2001b).

Lands of the Northern Arapaho who had moved to Wyoming and Montana also were trespassed on by Euro-Americans, particularly after gold was discovered in Montana in 1862. A war between Native Americans and Euro-Americans over hunting territory lasted from 1865 to 1868. Negotiations during that time led to the Northern Arapaho, Cheyenne, and Sioux agreeing to cede much of their more extensive territory, established during the aforementioned 1851 treaty. They agreed to settle on a reservation as long as they were able to hunt undisturbed north of the Platte River and east of the Big Horn Mountains. For a while the Northern Arapaho worked to develop good relations with army officers at Fort Fetterman near Douglas in east-central Wyoming. They also pursued peace with the Eastern Shoshone, their former enemies, who had obtained a reservation in Wyoming in 1868, and considered arranging settlement on the Gros Ventre reservation in Montana. For a while the Northern Arapaho did live on the Eastern Shoshone reservation but conflicts with trespassing Euro-Americans resulted in their relocation to the Red Cloud Agency of the Oglala Sioux. However, continuing conflicts with Euro-Americans and Eastern Shoshones between 1870 and 1876 led to many deaths and to pressure from peace commissioners for the Arapaho, as well as the Cheyenne and Sioux, to cede their claims to the Black Hills and all lands outside the Great Sioux Reservation. The Northern Arapaho were amenable to settling with the Sioux or Southern Arapaho but continued to negotiate for their own separate reservation. Most of the Northern Arapaho warriors enlisted in the U.S. Army in 1876–1877; therefore, they gained the army's backing for their settlement in Wyoming and moved back to the Wind River Reservation in March 1878 (Fowler 2001b). In 1900, the Northern Arapaho accepted allotment of a large block of land to receive official title to land on the Wind River Reservation (Fowler 2001b).

Northern Cheyenne

Like the Arapaho, the Cheyenne are Algonquian speakers who appear to have originated in the Great Lakes region (Binnema 1998; Moore et al. 2001; Schlesier 1994). The Cheyenne comprise two affiliated groups, the Tsistsistas and the Sutaio (BLM and Joe Little Coyote 2002; Moore et al. 2001). The name Cheyenne first appeared as a Sioux village on a 1678-1679 map of present-day Minnesota. At that time,

the Cheyenne subsisted largely on wild rice and other locally available resources, making occasional buffalo hunting trips to the eastern edge of the plains (Swagerty 2001).

During the 18th Century, in the early days of the fur trading era, the Chippewa and Assiniboine obtained firearms through trade and used them against the Cheyenne (Moore et al. 2001). This apparently led the Cheyenne to move west to the Black Hills of South Dakota. Once there, the Tsistsistas and Sutaio unified and stopped practicing horticulture (Swagerty 2001). The Cheyenne soon became close allies with the Arapaho (Binnema 1998). Like many other Plains tribes, the Cheyenne also obtained horses during the 1700s and began following and hunting buffalo herds as well as other animals (Ewers 1980). In addition, they gathered at least 40 different edible plants as the Cheyenne moved across the landscape. Buffalo hunts occurred in early summer and fall (Moore et al. 2001). After becoming horse people, the Cheyenne's territory increased from the Black Hills to encompass the Great Plains from the Dakotas to the Arkansas River (Northern Cheyenne Tribe 2013).

The Cheyenne split into northern and southern branches in the 1830s. The Southern Cheyenne stayed fairly close to that area. Nearby Bent's Fort provided good trading opportunities (BLM and Joe Little Coyote 2002; Moore et al. 2001). In contrast, the Northern Cheyenne traveled north and lived in the Black Hills, the Powder River, the Yellowstone River, and the Tongue River regions in the Dakota and Montana Territories (BLM and Joe Little Coyote 2002). Still, the two tribal divisions remained in close contact.

The Oregon-California Trail ran through Northern Cheyenne territory and the Santa Fe Trail ran through Southern Cheyenne territory. It is estimated that approximately 19,000 Euro-American emigrants crossed the Plains between 1840 and 1848, putting pressure on the resources available to all of the Plains tribes. Furthermore, the cholera epidemic of 1848–1849 killed over half of the Cheyenne people (Swagerty 2001), eliminated two of the original ten bands, and forced the survivors of the Flexed Leg Society to merge with the Dog Soldiers (Moore et al. 2001). As a result, Bent's Fort was abandoned.

In 1825 the U.S. signed the first "friendship treaty" with the Cheyenne as an attempt to bring them in line with the government's Indian Policy (Swagerty 2001). The 1851 Treaty of Fort Laramie officially recognized the two divisions of the Cheyenne (Moore et al. 2001) and assigned the Cheyenne to an area shared with the Arapaho north of the Arkansas River and south of the North Platte River in present-day Wyoming, Colorado, Nebraska, and Kansas. The Sioux received the area north of the North Platte River even though both Northern Cheyenne and Northern Arapaho bands were living there (Fowler 2001b).

Due largely to encroachment of Euro-Americans, the Cheyenne went to war with the U.S. in 1854 and engaged U.S. troops in nearly 50 battles between 1854 and 1879 (Moore et al. 2001). The 1864 Sand Creek Massacre was the culmination of a campaign of extermination carried out by the U.S. against the Cheyenne (BLM and Joe Little Coyote 2002). After another short period of warfare against the U.S., the Southern Cheyenne and Southern Arapaho were removed to Oklahoma in 1868 (Moore et al. 2001). The Northern Cheyenne also fought in some well-known battles, including The Great Sioux War of 1876–1877 (Moore et al. 2001). During the Battle of the Little Bighorn, allied tribes overwhelming defeated General George Armstrong Custer. Despite winning the battle, the Northern Cheyenne and Teton Sioux lost the war and were forced onto reservations. The Northern Cheyenne temporarily relocated to the Cheyenne-Arapaho Agency in Oklahoma (Fowler 2001b) beginning in 1877. Nearly 300 Northern Cheyenne broke out of the Agency in 1878 (Chief Dull Knife College 2008; Fowler 2001b) but were followed by the U.S. Army and suffered many casualties and starvation as they eventually made their way home. They eventually settled with other Northern Cheyenne in Montana (Chief Dull Knife College 2008; Moore et al. 2001).

The Tongue River Reservation was established in 1884 near present-day Colstrip in southeastern Montana (Fowler 2001b). Originally 371,200 acres, the reservation's size was increased in to 444,157 acres in 1900, at which time it came to be known as the Northern Cheyenne Indian Reservation

(Chief Dull Knife College 2008; Peters and Wooley 2014). At first the Northern Cheyenne ran a successful livestock industry, but the BIA implemented policies that limited the size of their herds in order to reduce competition with Euro-American ranchers (BLM and Joe Little Coyote 2002). Most of the Northern Cheyenne reservation was conducive to ranching but not farming; therefore, their lands were not disastrously allotted in the way that many of the other tribes' reservation lands were (Chief Dull Knife College 2008). However, the Northern Cheyenne chose allotment in the 1930s (Fowler 2001a). They also adopted their own constitution at that time and regained a small herd of cattle (BLM and Joe Little Coyote 2002; Fowler 2001a; Moore et al. 2001). In the 1970s the tribe effectively put a stop to oil and gas extraction by outside parties. In 1972 the tribe established Dull Knife College to help revitalize their language and culture and to educate future generations. The Northern Cheyenne still hold Sun Dances and other traditional ceremonies and view Bear Butte in South Dakota as a particularly special place (Chief Dull Knife College 2008).

Sioux

The Sioux are Siouan language speakers who may have originated in North Carolina but were first historically documented in 1640 in Minnesota (Kaelin and the Pikes Peak Society 2008). The Sioux Nation consisted of seven separate tribes: the Mdewakanton, the Wahpeton, the Wahpekute, the Sisseton, the Yankton, the Yanktonai, and the Teton (including six additional bands), the Brulé, the Oglala, Two Kettle, the Minneconjou, Sans Arc, and the Hunkpapa (Hoover 1988). After their enemies, the Chippewa, obtained firearms from Canadian traders in the 1700s, the Sioux moved westward to the Black Hills of western South Dakota. This became their core area, although their territory extended from the upper Mississippi River Valley in Minnesota to the Black Hills (Hoover 1988) and from Wyoming as far south as Pike's Peak in southern Colorado (Howard 1966). Raiding and hunting of buffalo herds took small groups of Sioux to those distant places (Kaelin and the Pikes Peak Society 2008).

By the 1830s the Oglala and Brulé moved into eastern Wyoming (Deaver 1996), pushed west by Euro-American settlers. In turn the Sioux tried to move the Crow farther west. However, when the Bozeman Trail opened through the Powder River Basin in 1864 to facilitate the movement of men and supplies to the Montana gold mines, the Sioux were outraged and sought an alliance with the Crow, who refused to fight. Eventually the Crow allied with the U.S. Army to better resist the Sioux (Rzeczykowski 1999).

Between 1868 and 1870 the Sioux made incursions into the Wind River Basin and attacked the Shoshone several times (Deaver 1996). At one point, like many other tribes, the Sioux claimed the Yellowstone River region as their own (Deaver 1996; Frey 1987). The Sioux sometimes allied with the Cheyenne and Arapaho, and in the 1890s large bands of Sioux left their reservations in the Dakotas and traveled to the Wind River Reservation to visit with the Northern Arapaho and Eastern Shoshone (Deaver 1996). However, most Sioux life occurred in the Dakotas during this time (DeMallie 2001; Kaelin and the Pikes Peak Society 2008).

The 1868 Treaty of Fort Laramie established the Great Sioux Reservation, encompassing all of present-day western South Dakota and acknowledging a large portion of eastern Wyoming and northern Nebraska as "unceded" territory. After gold was discovered in the Black Hills in 1874, miners frequently trespassed on the reservation. In 1877, the U.S. appropriated the Black Hills, and in 1887 they broke up the reservation into five smaller reserves. In the first decades of the reservation, the U.S. delivered cattle to the Sioux as live animals and tribal people used horses to hunt them, thereby maintaining some semblance of their traditional way of life. However, in 1901 the government began delivering already butchered meat, which also deprived the Sioux of income from selling hides. In the 1930s the Civilian Conservation Corps briefly helped to stimulate the reservation's economy. Although the Sioux made a claim for their traditional lands in the Black Hills, the U.S. has offered only monetary compensation (DeMallie 2001).

3.2.3.5 Background

WYCRO file searches were conducted on November 6, 2013, May 1, 2014, and June 8, 2017. Files in the BLM CFO were examined on March 5–7, 2014. The WYCRO database identified two known TCPs within the CCPA. No additional known TCPs or other sites of cultural significance were identified in the BLM or USFS files. Tribal consultation was previously conducted for the two sites, finding that both are culturally significant and eligible for the NRHP.

Previous inventories identified additional site types that potentially also could be TCPs or other resources of Native American concern.

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3.3 Geology and Mineral Resources

The analysis area for geology and minerals is the CCPA and a 2-mile buffer. Impacts on these resources from the Project primarily would be limited to direct surface disturbance and drilling activities; however, a 2-mile buffer around the CCPA also was considered to account for effects that may extend beyond the Project boundary. The CCPA is located in the southern Powder River Basin, an area with a history of oil, gas, uranium, and coal production from underlying sedimentary strata. Exploration and development of these resources are likely to continue, subject to favorable economic conditions. The topography of the CCPA has been shaped by the erosion of continental deposits over geological time, leaving widespread deposits of residuum, alluvial channels, and exposed bedrock.

3.3.1 Laws, Ordinances, Regulations, and Standards

Major federal laws applicable to mineral resources include the General Mining Law of 1872 (30 USC Sections 22-42), the Mineral Leasing Act of 1920 (30 USC 181 et seq.), the Mineral Materials Act of 1947 (30 USC 601 et seq.), and the Multiple Minerals Development Act of 1954 (30 USC 521 et seq.). These laws are implemented through associated regulations on BLM- and USFS-administered lands. Specific stipulations and other mitigation regarding mineral development on federal lands in the CCPA are implemented through management decisions and guidelines in the Casper RMP ROD (BLM 2007b) and TBNG LRMP ROD (USFS 2002). For example, subject to valid existing rights, the portion of the CCPA in the BLM CFO includes areas closed to oil and gas leasing or subject to no surface occupancy (NSO) stipulations (i.e., surface disturbance prohibited).

The State of Wyoming regulates oil and gas development through statutes found in Title 30, Chapter 5, Oil and Gas, of the Wyoming Code (WS Ann. 30-5-100 et seq.) and the rules and regulations promulgated and enforced by the WOGCC. Laws, ordinances, regulations, and standards discussed in the Paleontology, Soils, and Water sections may have indirect effects on geology but are not specifically intended to preserve or manage geological resources.

3.3.2 Geologic Setting

The description of the affected environment for geology and minerals is composed of the following elements:

- Structural Geology – Geologic history and characteristics of the major structural basin encompassing the CCPA.
- Surficial Geology – Type and distribution of landforms and unconsolidated sediments that occur at the ground surface.
- Bedrock Geology – Characteristics, distribution, and depths of consolidated rock formations that are buried beneath the ground surface or exposed as outcrops.
- Geologic Hazards – Historic occurrence and anticipated risks of earthquakes, landslides, wind and water erosion of sand dunes, and floods.
- Minerals – Historic and ongoing oil and gas development and mining activities as well as major mineral-bearing formations in the analysis area that present opportunities for future development of mineral resources.

3.3.2.1 Geologic Structure

The analysis area occupies the southern portion of the Powder River Basin. In its entirety, the Powder River Basin is roughly 100 miles wide from east to west and 300 miles from north to south, encompassing approximately 25,500 square miles (Thamke et al. 2014). As shown in **Figure 3.3-1**, the basin is bounded by the Miles City Arch to the north; the Black Hills uplift to the east; the Laramie Range to the south, as defined by the Northern Boundary Fault of Blackstone (1996); and the Casper Arch,

Bighorn Mountains, the Pryor Uplift, and the Porcupine Dome to the west (Blackstone 1996; Thamke et al. 2014). The southern boundary of the basin is structurally complex and buried beneath a cover of Tertiary deposits. An example cross-section of the structural relationships at the boundary with the northern Laramie Range is shown in **Figure 3.3-2**.

The Powder River Basin was formed through uplift of the surrounding mountains during the Laramide Orogeny (70 to 50 million years ago) in the late Cretaceous and early Tertiary periods (BLM 2004g). The basin forms an asymmetrical syncline whose axis runs parallel to the eastern front of the Bighorn Mountains near the western margin (Thamke et al. 2014). The basin contains over 17,000 feet of Paleozoic to Tertiary sedimentary rocks that rest on Precambrian rocks. Structural relief from the basin axis to the Big Horn Mountains is over 20,000 feet (Jensen 1972; Kleinkopf et al. 1972). The sedimentary rocks dip steeply on the west side of the basin, while east of the basin axis the sedimentary section dips gently to the west.

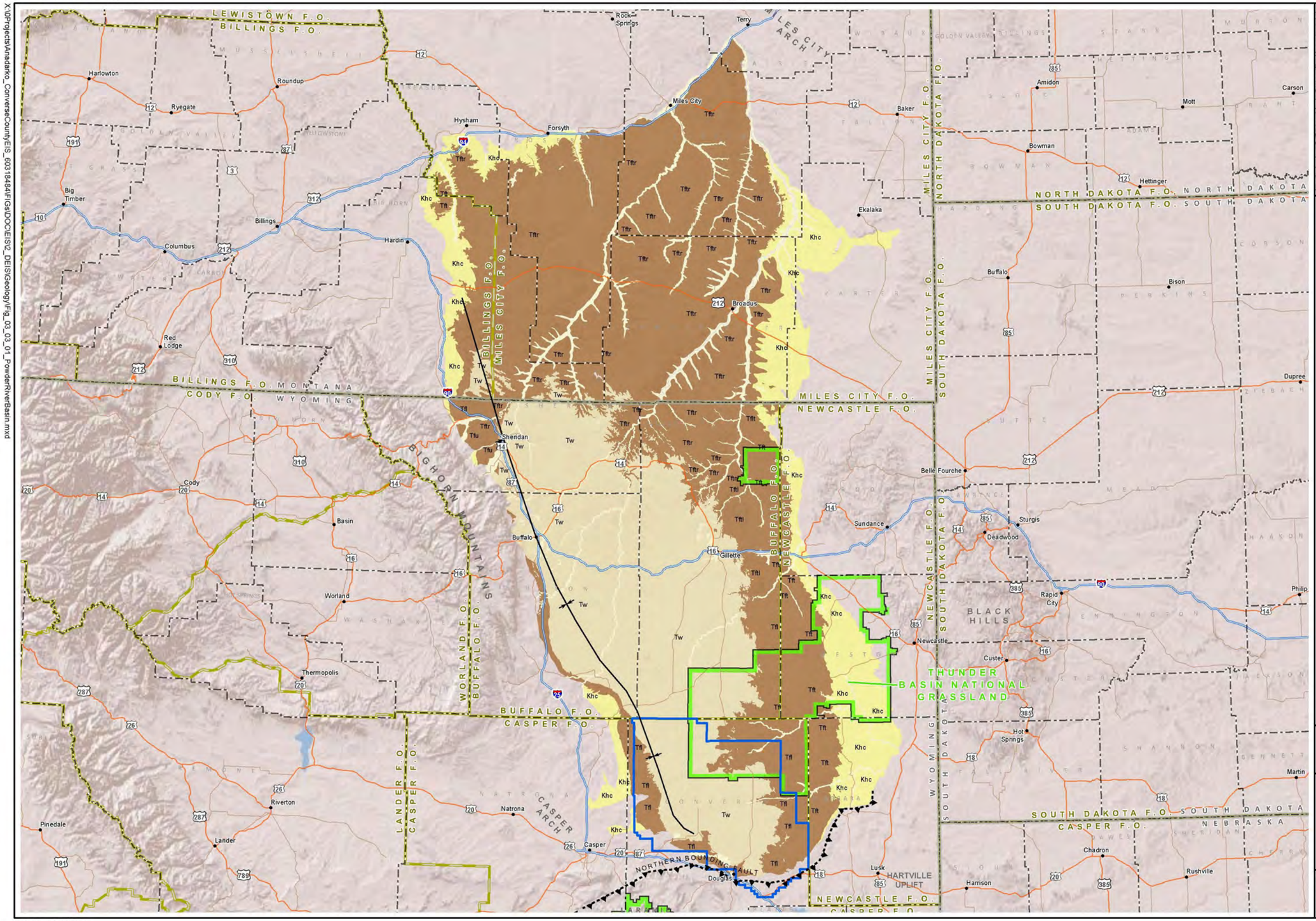
3.3.2.2 Surficial Geology

The CCPA is located in the unglaciated Missouri Plateaus section of the Great Plains physiographic province (Feeneman 1928). The topography of the CCPA consists of rolling hills, mesas, broad uplands, wide valleys, and badlands and was formed primarily through erosion of continental deposits that covered the basin during Oligocene and Miocene time (34 to 5 million years ago) (Beikman 1962). Important topographic features in the area are high-level, low relief terraces called “flats” bounded by escarpments that are thought to be the remnants of former erosion surfaces (Sharp and Gibbons 1964). The general topographic gradient slopes down to the northeast and elevations range from approximately 6,000 feet amsl on the west side of the CCPA to approximately 4,500 feet amsl on the east side of the CCPA. Elevations along the North Platte River are approximately 5,000 feet amsl.

Surficial deposits consisting of residuum mixed with alluvium, eolian deposits, slopewash, grus, or bedrock outcrops are widespread throughout the analysis area (Wyoming State Geological Survey [WSGS] 1998). Deeper alluvial deposits occur in incised drainages that generally run in a northeasterly direction across the analysis area. Slopewash and colluvium are concentrated along the eastern slope of higher elevation areas that run parallel to the southwest border of the analysis area. The southwest corner of the analysis area contains an area of eolian sand dunes. Surficial cover is often too thin to be mapped accurately; therefore, deposits are likely to occur over larger areas than depicted on **Figure 3.3-3**.

3.3.2.3 Bedrock Geology

The Powder River Basin contains a greater than 17,000-foot sequence of Phanerozoic sedimentary strata (542 million years ago to present) that overlie Precambrian basement rocks. The Precambrian rocks are granitic and gneissic in composition and may range in age from 3,200 to 2,500 million years ago (Sims et al. 2001). Phanerozoic strata are divided into three primary age classes: Paleozoic rocks (541 to 252 million years ago), which are approximately 2,500 feet thick and primarily consist of marine carbonate rocks and sandstone; Mesozoic rocks (252 to 66 million years ago) composed of marine and non-marine siltstone and sandstone, which are approximately 9,500 feet thick; and Cenozoic rocks (66 million years ago to the present), which are 4,000 to 6,000 feet thick and largely composed of sandstone, shale, and coal (Beikman 1962). The following paragraphs briefly describe, in ascending order, the geologic units that outcrop or are relatively shallow (i.e., 10 to 3,000 feet deep) in the subsurface and are important from the standpoint of mineral resources, paleontological resources, and groundwater resources in the CCPA. The bedrock units are shown on **Figure 3.3-4**.



Project Boundary
BLM Field Office Boundary
USFS Administrative Boundary

Geologic Units

Qt - Alluvium
Tw - Wasatch Formation
Tfu - Fort Union Formation
Khc - Hell Creek Formation

Reverse Fault
Basin Axis

Sources: Blackstone 1996; Flores et al. 2010; Love and Christiansen 1985.

CONVERSE COUNTY OIL AND GAS EIS

Figure 3.3-1

Powder River Basin

0 15 30 45 Miles
0 15 30 45 Kilometers
1:2,000,000
N

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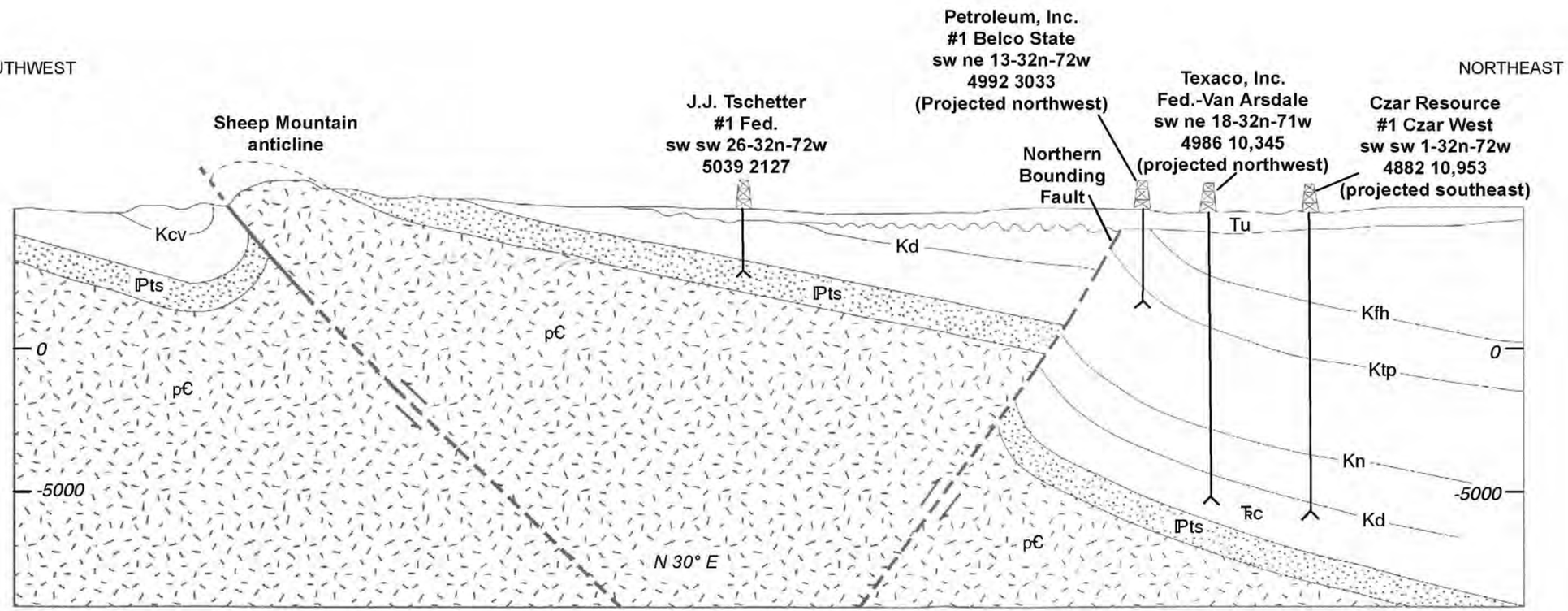

D. Southwest-Northeast cross section D-D' across Sheep Mountain and the Northern Bounding Fault (NBF).

Tu - Tertiary undivided
Kfh - Fox Hills Sandstone
Ktp - Teapot Sandstone
Kn - Niobrara Formation
Kd - Dakota Sandstone
Kcv - Cloverly Formation
Trc - Chugwater Formation
IPts - Tensleep Sandstone
pC - Precambrian Rocks

Source: Blackstone 1996

CONVERSE COUNTY OIL AND GAS EIS

Figure 3.3-2
Cross-section of the
Southern Powder River Basin

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THUNDER BASIN NATIONAL GRASSLAND

BUFFALO F.O.

CASPER F.O.

CASPER F.O.

NEWCASTLE F.O.

THUNDER BASIN NATIONAL GRASSLAND

North Platte River

Casper

Douglas

MEDICINE BOW-ROUTT NATIONAL FOREST

MONTANA

WYOMING

UTAH

COLORADO

Project Boundary

BLM Field Office Boundary

USFS Administrative Boundary

Surficial Geology

- Alluvial Fan Deposit
- Alluvium
- Bedrock
- Bench
- Clinker
- Colluvium
- Eolian Deposit
- Grus
- Lake
- Landslide
- Large Open Pit Mine/Quarry
- Residuum
- Slopewash
- Terrace Deposits

Source: WSGS 1998.

CONVERSE COUNTY OIL AND GAS EIS

Figure 3.3-3

Surficial Geology

0 2.5 5 10 Miles

0 2.5 5 10 Kilometers

1:450,000

N

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THUNDER BASIN NATIONAL GRASSLAND

BUFFALO F.O.
CASPER F.O.
NEWCASTLE F.O.

Tw
Tfl
Tft
Qa
Qs
Khc
Tmu
Tmo
Twr

D
D'

Northern Bounding Fault

North Platte River

Casper
Douglas

MEDICINE BOW-ROUTT NATIONAL FOREST

Project Boundary
BLM Field Office Boundary
USFS Administrative Boundary

Geologic Units

- Qa - Alluvium
- Qs - Dunes
- Tmu - Upper Miocene Rocks
- Tmo - Miocene and Oligocene Rocks
- Twr - White River Formation
- Tw - Wasatch Formation
- Tfl - Fort Union Formation, Lebo Member
- Tft - Fort Union Formation, Tongue River Member
- Khc - Hell Creek Formation
- Reverse Fault
- Basin Axis

Source: Love and Christiansen 1985.

CONVERSE COUNTY OIL AND GAS EIS

Figure 3.3-4

Bedrock Geology

0 2.5 5 10 Miles
0 2.5 5 10 Kilometers
N
1:450,000

Print Date: 8/7/2017

The upper Cretaceous Fox Hills Sandstone does not outcrop in the CCPA, but rather underlies the White River Formation that is in angular unconformity with older units at the southern end of the basin. The White River Formation also obscures the trace of the Northern Bounding fault of the Laramie Range that defines the southern extent of the Powder River Basin (**Figure 3.3-2**). The Fox Hills Sandstone consists of marginal marine sandstones and interfingers with the overlying Hell Creek Formation (Connor 1992). The boundary between the units is hard to define because of the interfingering relationship between the upper portion of the Fox Hills and the lower Hell Creek Formation; however, the Fox Hills Sandstone generally is considered to be 100 to 300 feet of largely massive sandstone measured from the base of the unit. The upper transitional portion of the Fox Hills Sandstone is composed of shale, siltstone, and thin sandstones and is difficult to distinguish from the Hell Creek Formation. The contact between the Fox Hills Sandstone and the underlying Pierre Shale (or Lewis Shale) generally is quite distinct because of the abrupt change upward from marine shale to clean sandstone.

The Hell Creek Formation outcrops in the southwestern corner of the CCPA. It is the uppermost Cretaceous unit in the Powder River Basin and is equivalent to the Lance Formation, a commonly used name for rocks in the uppermost Cretaceous interval. Hell Creek Formation is used in this document to be consistent with the hydrostratigraphic nomenclature discussed in Section 3.16.2. The Hell Creek Formation is composed of thick-bedded sandstone and shale with thin lenses of conglomerate, sandstone, and shale. It also has thin coal beds and carbonaceous shale beds (U.S. Geological Survey [USGS] 2014b). The Hell Creek Formation ranges in thickness from approximately 3,000 feet in the southern portion of the CCPA to approximately 2,500 feet on the north side of the CCPA (Connor 1992). The Paleocene Fort Union Formation outcrops on the west, south, and east sides of the CCPA and is composed of, in ascending order, the Tullock, Lebo, and Tongue River Members. The Fort Union Formation was deposited in a river system and is largely composed of sandstone, shale, claystone, and coal. The different members are distinguished by lesser or greater proportions of coarse and fine materials and relative amounts of coal (Lewis and Hotchkiss 1981). The Tullock Member is composed of sandstone, shale, and thin coal, grading upward to sandier material. The Lebo Member generally is finer-grained than the Tullock Member and contains predominantly shale, carbonaceous shale, siltstone, and thin coals. However, isolated lenticular sandstones may occur randomly in the Lebo (Connor 1992). The Tongue River Member contains thick-bedded medium- to coarse-grained sandstones and thick coal zones that can be correlated over many miles. Work by Flores et al. (2010) indicates individual coal seams in the Tongue River Member may not be as widespread as originally thought, but the seams are still remarkably thick and widespread compared to coal in other geologic settings. The coal seams are thickest and most numerous in the northern and western portions of the basin and become thinner and less numerous to the south. Generally, the Fort Union Formation is approximately 3,600 feet thick in Converse County and thickens to the north and west (Flores 2004). The Tullock Member is approximately 1,900 feet thick in the southern Powder River Basin and thins to the north.

The Wasatch Formation is composed of continental deposits of medium- to coarse-grained sandstone, siltstone, mudstone and coal (Ethridge and Jackson 1980). It is the primary bedrock unit exposed or shallowly buried throughout the central and western portions of the analysis area (Love and Christiansen 1985). Similar to the Tongue River Member, Wasatch coals can be thick and widespread but are abundant north of Converse County. The Wasatch Formation was deposited in a north-flowing river system that transported sediment from uplifted areas to the south and west (Ethridge and Jackson 1980). The Wasatch Formation ranges in thickness from 1,400 feet in Johnson County (Flores 2004) near the axis of the basin to zero thickness at the outcrop limits. In northwest Converse County along the axis of the basin, the Wasatch Formation is approximately 500 feet thick, but in most of the CCPA it is approximately 100 feet thick or less.

The Oligocene White River Formation is exposed along the southern boundary of the analysis area. The White River Formation in Converse County is composed of tuffaceous claystone and lenticular coarse-grained conglomeratic sandstone and is up to 750 feet thick (Evanoff et al. 1992; USGS 2014b).

Figure 3.3-5 is a chart illustrating the general stratigraphy of the Powder River Basin. Formations that are of particular interest for this Project are those that are known to contain recoverable mineral resources, may contain fossils, are known or potential aquifers, and those that have been identified as possible zones for produced water injection. The mineral resources of the CCPA are summarized in Section 3.3.3, Mineral Resources. For information on the water-bearing properties and paleontological potential of geologic formations in the analysis area, refer to Section 3.16, Water Resources and Section 3.8, Paleontological Resources.

3.3.2.4 Geologic Hazards

Seismicity and Faults

The location, magnitude, intensity, and recurrence intervals of earthquakes are subject to extreme variation from predicted values, especially at small geographic scales and over short spans of time; therefore, the ability to forecast future seismic activity in the analysis area is limited. However, historic seismicity, fault patterns, and probabilistic analysis, as described below, suggest that seismic risks in the analysis area are unlikely to damage facilities or disrupt common activities.

One way to measure the strength of earthquakes is magnitude, which measures the energy released at the source (epicenter) of the earthquake based on seismograph readings. A search of the USGS (2014a) earthquake catalog from 1973 to the present using a search radius of 60 miles from a point in the center of the CCPA indicated earthquake magnitudes of generally between 2.0 and 3.0. Many earthquake events recorded to the north of the CCPA were identified as coal mine cast shots and quarry explosions. Two events of magnitude 4.5 and 5.3 occurred in October 1984 southwest of Douglas in the northern Laramie Range (Case et al. 2002). Although earthquakes have been felt, no damage has been reported in association with earthquakes in or near Converse County.

The energy generated by an earthquake results in ground movement that can cause damage to structures and endanger people. One method of measuring the potential for damage is to estimate the amount of horizontal ground motion from a hypothetical strong earthquake that could occur in a given region. The USGS has compiled seismic hazard maps that estimate the probabilities of ground motions that could occur over different time intervals (Petersen et al. 2015). The longer the time interval, the greater the probability of a strong event to occur and a correspondingly greater probability that strong ground motions also would occur. USGS seismic hazard mapping indicates that the analysis area could experience peak ground acceleration ranging from 14 to 21 percent of the acceleration of gravity over a 2,500-year recurrence interval, with a 2 percent probability of exceedance in 50 years (Petersen et al. 2015). The highest peak ground accelerations are likely to occur in the south and west portions of the CCPA and decrease along a northeasterly gradient.

There are no known active faults with a surficial expression in Converse County (Larsen and Wittke 2013). A fault is considered to be active if it can be determined that movement has occurred in the last 10,000 years. Fault activity is based on the ability to measure the displacement of surficial deposits; therefore, earthquake potential exists from active faults that are buried and have no surface expression.

Induced Seismicity

Seismicity is commonly regarded as a natural phenomenon, but human actions also can cause earthquakes or seismic events. Anthropogenic causes of earthquakes are referred to as induced seismicity (Larsen and Wittke 2014). Although there are numerous sources of induced seismicity, coal mine blasting is a well-documented cause in the Powder River Basin. There also is a potential, but not identified, cause of induced seismicity from the injection and withdrawal of fluids.

Era	System	Series	Stratigraphic Units		
			West		East
Cenozoic	Quaternary	Holocene	Undifferentiated unconsolidated deposits[1]		
	Tertiary	Oligocene	White River Formation[2]		
		Eocene	Wasatch Formation[3]		
		Paleocene	Fort Union Formation	Tongue River Member[4]	
				Lebo Member	
				Tullock Member	
Mesozoic	Upper Cretaceous		Hell Creek Formation[2]		
			Fox Hills Sandstone[2]		
			Teckla Sandstone – Lewis Shale[5]		Pierre Shale[2]
			Mesaverde Formation	Teapot Sandstone Member[5]	
				Parkman Sandstone Member[5]	
			Cody Shale[7]	Sussex Sandstone Member[5]	
				Shannon Sandstone Member[5]	
					Niobrara Formation[5,7]
					Carlile Shale[7]
			Frontier Formation	Turner Sandstone Member[5]	Greenhorn Formation[7]
					Belle Fourche Shale[7]
	Lower Cretaceous		Mowry Shale[5]		
			Muddy Sandstone[5]		Newcastle Sandstone[6]
			Thermopolis Shale[7]		Skull Creek Shale[7]
			Cloverly Formation		Fall River Formation[6]
					Lakota Formation[6]
	Jurassic		Morrison Formation		
			Sundance Formation		
			Gypsum Spring Formation		
	Triassic		Chugwater Group/Formation		Spearfish Formation
Paleozoic	Permian		Goose Egg Formation		Goose Egg Formation
					Minnekahta Limestone
					Opeche Shale
	Pennsylvanian		Tensleep Sandstone		Minnelusa Formation
			Amsden Formation		
	Mississippian		Madison Formation		Pahasapa Limestone
					Englewood Limestone
	Devonian		No Units		
	Silurian		No Units		
	Ordovician		Bighorn Dolomite		Whitewood Dolomite
			Harding Sandstone		Winnipeg Formation
	Cambrian		Gallatin Limestone		Deadwood Formation
			Gros Ventre Formation		
			Flathead Sandstone		
Precambrian			Gneiss and Granite		

Mineral Commodities from formation:

[1] Aggregate
[2] Uranium
[3] Coal, coalbed natural gas, uranium, and clinker
[4] Coal, coalbed natural gas, and clinker
[5] Oil and gas
[6] Oil and gas, uranium
[7] Bentonite

Source: AECOM 2012a; Love et al. 1993.

Figure 3.3-5 Generalized Stratigraphic Nomenclature for the Powder River Basin

Induced seismicity due to coal mine blasting is a common occurrence in the vicinity of the CCPA. The surface coal mines that are located at various distances north of the CCPA are responsible for the induced seismicity that has been detected by the USGS (USGS 2014a). The blasting or cast shots typically involve the use of hundreds of thousands to millions of pounds of explosives to facilitate the removal of overburden or to break up the coal seams (Arrowsmith et al. 2006). The seismic energy generated not only comes from the blast, but from the collapse of overburden. Most of the seismic events that have occurred to the north of the CCPA were due to blasting at surface coal mines with magnitudes ranging from 2.0 to 3.0. The coal mine blasting is highly documented due to extensive research to determine better methods for detection of detonation of underground nuclear weapons.

Other potential causes of induced seismicity related to the proposed Project could involve injection and withdrawal of subsurface fluids and hydraulic fracturing. Withdrawal of fluids can result in seismic activity, but the well-lithified rocks in the Powder River Basin are not likely be subjected to deformation that could cause seismic events (De Bruin et al. 2004). Subsurface injection of water also poses potential risk for induced seismicity, but recent work by the WSGS indicated that there were no recorded seismic events that could be related to the underground injection of fluids in the Powder River Basin (Larsen and Wittke 2014). The statewide study investigated some of the major oil and gas producing basins, but did not find compelling evidence of seismicity associated with fluid injection. However, at the Lost Soldier and Wertz fields, the evidence was inconclusive and more study including monitoring was recommended. The aforementioned fields are located in the Red Desert area, which is more than 100 miles southwest of the CCPA.

Hydraulic fracturing has been suspected of inducing seismic events that are capable of causing damage. Although it is undisputed that hydraulic fracturing is a source of induced seismicity in the strict definition of the term, the magnitude of induced seismicity due to hydraulic fracturing is quite small and is referred to as “micro-seismicity.” Oil and gas operators and oilfield hydraulic fracturing service companies use micro-seismicity to measure and monitor the direction and growth of fractures to assess the efficiency and efficacy of fracturing operations. Thousands of measurements from various shale gas basins indicated that the magnitudes typically are less than -2.5 and average -3.0 (Warpinski et al. 2012). Given that the earthquake magnitude scale is logarithmic, these micro-seismicity magnitudes are several orders of magnitude smaller than the coal mine cast shots described previously.

Landslides

No landslides have been mapped in the analysis area (WSGS 2004). Small landslides or slumps could occur in localized areas along rims and buttes, incised stream and river banks, and other areas with steep slopes along the southern and western margins of the analysis area. Large storm events are the most common natural triggers.

Wind and Water Erosion of Sand Dunes

Active eolian sand dunes in the southwestern portion of the analysis area are highly unstable and pose hazards for development. Areas of stable eolian deposits that border active dune fields may become active again if disturbance occurs in the absence of proper stabilization and revegetation. Refer to Section 3.12 (Soils) for a detailed discussion of soil susceptibility to erosion and erosion hazards.

Floods

The most probable areas in Converse County prone to flooding occur along the North Platte River, despite much of the flow in the river being strictly controlled by upstream dams (Converse County 2014d). Heavy runoff from rapid snowmelt or precipitation from heavy storms can cause flooding of low-lying areas and tributaries to the river such as Antelope Creek and East Antelope Creek located northeast of Douglas. Flooding also is prone to occur in the mountainous areas south of the river. Elsewhere in the county, localized flooding could occur along other drainages located in the CCPA.

3.3.3 Mineral Resources

3.3.3.1 Fluid Leasable Minerals

Fluid leasable minerals include oil, gas, and geothermal resources. As of January 2015, there were 1,520 existing oil, gas, and industry service wells of various status categories and classifications as shown on **Table 3.3-1** (WOGCC 2015). Producing oil wells composed the largest category of wells, followed by producing gas wells. **Figure 3.3-6** displays the oil and gas infrastructure of the CCPA.

Table 3.3-1 Well Status and Classification in the CCPA

	Well Classification (number of wells)										
Well Status	**Disposal Class I**	**Class II**	**Gas**	**Gas Orphaned**	**Injector**	**Monitoring**	**Oil**	**Source**	**Strat Test**	**Water Supply**	**Total**
Active injector	9	15			11						**35**
Dormant							4	1	1		**6**
Flowing			2								**2**
Monitoring well						1					**1**
Not determined			3				1				**4**
Notice of intent to abandon			5		1	1	29				**36**
No report			1				2				**3**
Producing			70				1,119				**1,189**
Pumping rods							12				**12**
Shut in	2	5	5	5			38			2	**57**
Suspended operations		1					15				**16**
Well spudded		1					68				**69**
Subsequent report abandoned		1	6	1		1	62				**71**
Temporarily abandoned			2				17				**19**
Grand Total	**11**	**23**	**94**	**6**	**12**	**3**	**1,367**	**1**	**1**	**2**	**1,520**

Source: WOGCC 2015b.

At the end of 2014, there were approximately 300 existing permits for wells that presumably had not been spud (i.e., drilling operations had not commenced) and approximately 1,250 wells had been plugged and abandoned (WOGCC 2014a). Wells with approved WOGCC permits to drill may still require additional approvals prior to drilling, especially for wells that require access to federal surface or mineral estate. Approximately 72 percent of wells in the CCPA are vertical wells, 26 percent are horizontal wells, and 1 percent are directional wells; approximately 0.4 percent were not identified (WOGCC 2015c). Wells drilled in the analysis area have an average depth of 9,044 feet, with a minimum depth of 90 feet, and maximum depth of 22,454 feet (WOGCC 2015c).

Within the CCPA, many wells were drilled in the 1930s before the official discovery in 1936 of the Shawnee Field (WOGCC 2014b). The Shawnee Field is located in the southeast part of the CCPA and has produced approximately 650,000 barrels of oil and 1.8 billion cubic feet of gas. Wells targeting the Frontier, Muddy, Teapot, and Parkman reservoirs accounted for approximately 74 percent of the 188 million barrels of oil produced in Converse County from 1978 through 2014 (WOGCC 2016a). Gas production has been reported primarily from the Frontier, Muddy, and Teapot reservoirs (80 percent of total volume). **Table 3.3-2** provides a summary of cumulative oil, gas, and water production by reservoir from 1978 through the end of 2014. Approximately 188.5 million barrels of oil and more than 809 trillion cubic feet of natural gas have cumulatively been produced from Converse County**.**

The 2009 USGS oil and gas resource assessment for the entire Powder River Basin (including Montana) indicated mean undiscovered resources of 638.96 million barrels of oil, 16,631 billion cubic feet of gas, and 131 million barrels of natural gas liquids (Anna et al. 2010). Based on this USGS resource assessment, there is an estimated undiscovered mean 142 million barrels of oil, 2,123 billion cubic feet of gas, and 19 million barrels of natural gas liquids in the CCPA.

Prospective geological targets for the Project include (but are not limited to) the Frontier, Muddy, Mowry, Niobrara, Parkman, Shannon, Sussex, Teapot, Tekla, and Turner. Other prospective zones may be identified in the future. The Niobrara and Mowry formations are considered unconventional shale formations and the remaining formations contain conventional sandstone reservoirs that may have enhanced productive potential when subjected to modern drilling and completion methods (horizontal drilling and hydraulic fracturing) that have been successful in the shale formations.

The BLM forecasted to the year 2020 a high potential (100 to 500 wells per township) of coalbed natural gas development in southern Campbell County and northern Converse County just north of the CCPA; with moderate to low development potential ranging from 2 to 200 wells per township for most of the CCPA (BLM 2005). However, it has since been determined that this level of development is not likely to occur over the specified time period because of southward thinning of coals, fewer coals, unfavorable economics, and the emphasis on the development of oil and gas resources that can be recovered using horizontal drilling and modern hydraulic fracturing. As of March 2017, a total of 399 coalbed natural gas well permits had been issued in Converse County; 310 permits expired without drilling, 75 wells were plugged and abandoned, 3 had notices of intent to abandon, and 11 wells were completed (i.e., production status not determined).

Although geothermal resources in the analysis area could be developed for heating or electrical power generation for domestic or small-scale commercial use, no areas have been identified with sufficiently high temperatures to produce steam to generate electricity for distribution (BLM 2007b).

THUNDER BASIN NATIONAL GRASSLAND

BUFFALO F.O.

CASPER F.O.

NEWCASTLE F.O.

MEDICINE BOW NATIONAL FOREST AND THUNDER BASIN NATIONAL GRASSLAND

Project Boundary
BLM Field Office Boundary
USFS Administrative Boundary
Oil and Gas Field

Processing Plants
Gas Plant
Refinery

Compressor Stations
Natural Gas
Crude Oil

Pipelines
Crude Oil
NGL
Natural Gas
Product

Existing Roads
Primary Route, Class 1
Secondary Route, Class 2
Road, Class 3

Surface Ownership
Bureau of Land Management
US Forest Service
State
Private
Bureau of Reclamation
DOD/USACE

Source: WPA 2015b; WSGS 2015.

CONVERSE COUNTY OIL AND GAS EIS

Figure 3.3-6
Oil and Gas Fields
and Existing Infrastructure

0 2.5 5 10 Miles
0 2.5 5 10 Kilometers
1:450,000

N

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Table 3.3-2 Cumulative Oil, Gas, and Water Production in Converse County 1978 through 2014

Reservoir	Cumulative Production 1978-2014		
	Oil (barrels)	Gas (thousand cubic feet)	Water (barrels)
Frontier	37,972,446	365,349,063	4,942,311
Muddy	30,487,515	155,706,828	91,704,747
Teapot	42,656,039	123,248,676	24,116,626
Parkman	28,153,473	36,388,325	23,555,432
Dakota	12,164,040	48,692,731	181,487,088
Niobrara	8,875,089	40,866,961	3,961,882
Sussex	14,994,357	11,558,955	1,877,890
Teckla	3,961,782	7,601,696	13,577,609
Turner	2,040,931	6,199,845	246,813
Teapot-Parkman	1,205,491	1,470,517	831,165
Shannon	1,173,175	979,566	727,977
Teapot-Teckla	830,662	991,377	1,974,693
Sussex-Parkman	561,310	1,150,184	159,309
Frontier-Dakota	494,033	1,149,578	12,243
Dakota-Lakota	157,680	1,383,299	2,560
Frontier-Niobrara-Greenhorn	184,312	1,127,939	166,608
Coal Bed Natural Gas[1]	0	1,253,511	19,403,218
Muddy-Turner	283,427	901,211	8,411
Lakota	649,181	372,778	15,173,108
Mowry	122,442	831,032	199,205
Wall Creek	677,309	8,160	20,999,600
Hell Creek	88,536	568,223	1,402,669
Belle Fourche Shale	366,615	272,826	5,896
Frontier-Niobrara	56,409	463,687	20,267
Mowry-Frontier	159,625	182,682	57,499
Dakota-Muddy-Turner	36,334	253,312	1,915
Lewis	20,943	268,014	34,438
Dakota-Turner	12,636	49,401	3,758
Frontier-Sussex	48,005	5,677	0
Stray	51,094	0	27,159
Muddy-Greenhorn	24,482	9,169	1,094
White River	29,863	300	3,404
Other[2]	3,360	1,595	58
Total	**188,542,596**	**809,307,118**	**406,686,652**

[1] Includes multiple named formations in the WOGCC database that account for coalbed natural gas production only.

[2] Includes other named formations in the WOGCC database that account for a smaller percentage of cumulative production than those listed.

Source: WOGCC 2016b.

1

3.3.3.2 Solid Leasable Minerals

The CCPA is within the Powder River Basin Coal Field and coal is the primary solid leasable mineral. The primary subbituminous coal-bearing formations in the Powder River Basin are the Wasatch, Fort Union, Hell Creek, and Mesaverde formations (Glass 1978). Historic coal production in the CCPA occurred primarily from Glenrock Coal Company's Dave Johnston Mine, a surface mine that produced 104 million tons of coal from more than 13,000 acres between 1958 and 2000 (**Figure 3.3-7**) (Office of Surface Mining Reclamation and Enforcement 2012). Although there has been recent expansions of the Antelope and North Antelope/Rochelle mines north of the CCPA, there currently are no active coal mines within the CCPA (WSGS 2012) and future coal development is not anticipated (BLM 2004g).

3.3.3.3 Locatable Minerals

Uranium is the primary locatable mineral produced in the CCPA, occurring as roll-front deposits in the sandstones of the Wasatch Formation and, to a limited extent, the Fort Union Formation (BLM 2004g; Davis 1970). Uranium mineralization in the Wasatch Formation extends from approximately 10 miles north of Douglas to southwest Campbell County and is approximately 80 miles long and 10 to 25 miles wide (Sharp and Gibbons 1964). Numerous small mines and exploration prospects within the CCPA were worked in the 1950s, some under the auspices of the Atomic Energy Commission. The largest of these small mines had a pit measuring approximately 300 feet across and 30 feet deep. None of these earlier mines appear to have reached the level of commerciality. However, the Exxon-Mobil Highland uranium mine eventually was developed and produced over 11.3 million tons of ore from 1970 to 1984 from surface, in situ, and underground mines (U.S. Nuclear Regulatory Commission [NRC] 2014). The facility is still under reclamation due to groundwater concerns.

Cameco USA's Smith Ranch/Highland Uranium Mine is an active in situ leaching mining operation in the CCPA with current plans for expansion. The Smith Ranch/Highland Uranium Mine produced 17.6 million pounds of uranium from 2002 to 2013, 1.7 million pounds of which was produced in 2013 alone. (Cameco USA 2014). Three additional in situ leaching uranium projects have been proposed or are under construction in the CCPA including the Reynolds Ranch, Allemand-Ross, and Ludeman projects (World Information Service for Energy 2016a). There are no mining claims for other locatable minerals in the CCPA (BLM 2004g).

3.3.3.4 Saleable Minerals

Sand and gravel, scoria (clinker), limestone, crushed stone, and decorative stone are the primary salable minerals produced in the analysis area. There are 29 permitted mineral sites in the CCPA for sand and gravel (WDEQ 2016d). Gravel deposits cap hills and ridges and may be residual material from the erosion of the White River Formation that once covered the entire area (Sharp and Gibbons 1964). Scoria, or rock that has been altered by coal seam fires, also is used as road base and is present in the northern part of Converse County, but the deposits are largely outside of the CCPA (Luppens et al. 2008). The demand for sand and gravel is likely to be strong because of current and proposed oil and gas development in the region.

A commodity called leonardite is mined in the CCPA. Leonardite is a form of low-grade or lignite coal that has properties that make it valuable as a drilling fluid additive. The Black Hills Leonardite mine is located less than 1.0 mile from the northern boundary of the old Dave Johnston Mine (WDEQ 2014). Production in 2008 was 54,162 tons, an increase of approximately 3,000 tons over the previous year's production, but production in 2013 was down again to approximately 50,000 tons (AECOM 2011; Wyoming Department of Revenue 2014a). Prospective locations for mineable leonardite occur in the southwest portion of the CCPA.

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THUNDER BASIN NATIONAL GRASSLAND

BUFFALO F.O.

CASPER F.O.

CASPER F.O.

NEWCASTLE F.O.

THUNDER BASIN NATIONAL GRASSLAND

Reynolds Ranch

Black Hills Leonardite

Dave Johnston Coal Mine

Highland Ranch

Smith Ranch

Ludeman

Casper

Douglas

MEDICINE BOW-ROUTT NATIONAL FOREST

MONTANA

WYOMING

UTAH

COLORADO

Project Boundary

BLM Field Office Boundary

USFS Administrative Boundary

Active Coal Permit

Reclaimed Coal Mine

Gravel Pit

Uranium Occurrence

Other Mine

Producer

Past Producer

Surface Ownership

Bureau of Land Management

US Forest Service

State

Private

Bureau of reclamation

DOD/USACE

Source: USGS 2010b; WDEQ 2011..

CONVERSE COUNTY OIL AND GAS EIS

Figure 3.3-7

Mines and Quarries

0 2.5 5 10 Miles

0 2.5 5 10 Kilometers

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3.4 Hazardous Materials, Solid Waste, and Public Health and Safety

The affected environment considers the presence of hazardous materials and solid waste that may affect air, water, soil, biological resources, and human health. Other considerations for public health and safety are hazards that not only present risks to oil field workers, but to the public at large. The analysis area for public health and safety is the CCPA.

3.4.1 Hazardous Materials and Solid Waste

3.4.1.1 Regulatory Definitions of Hazardous Materials

Hazardous materials, which are defined in various ways under a number of regulatory programs, can represent potential risks to both human health and to the environment when not properly managed. The term hazardous materials include the following materials that may be utilized or disposed of in conjunction with fluid minerals drilling and completion operations:

- Substances covered under the OSHA Hazard Communication Standard (29 CFR 1910.1200). The types of materials that may be used in drilling and completion activities and that would be subject to these regulations would include almost all of the materials covered by the regulations identified below.
- Hazardous materials as defined under the USDOT regulations in 49 CFR, Parts 171.8 and 172.101.
- Hazardous substances as defined by the CERCLA as listed in 40 CFR Table 302.4.
- Hazardous wastes as defined in the RCRA Subtitle C (40 CFR Parts 260-299).
- Hazardous substances and extremely hazardous substances that are subject to reporting requirements (Threshold Planning Quantities) under Sections 311 and 312 of the Superfund Amendments and Reauthorization Act. Hazardous substances under the reporting requirements include petroleum or products derived from petroleum including crude oil, condensate, methane, gasoline, diesel, propane, and a wide variety of chemicals and materials that are used in drilling and production.
- Petroleum products defined as “oil” in the Oil Pollution Act of 1990. The types of materials used in drilling and completions activities and that would be subject to these requirements include fuels, lubricants, hydraulic oil, and transmission fluids.

Hazardous materials as defined by USDOT would include fuels and other chemical products. These materials often are transported to work sites in accordance with applicable USDOT rules and regulations. Gasoline and diesel are required for construction, drilling equipment, and vehicles, and typically are transported along roads during the construction and operational phase of an oil and gas development project. In conjunction with the definitions noted above, the following lists provide information regarding management requirements during transportation, storage, and use of particular hazardous chemicals, substances, or materials:

- Superfund Amendments and Reauthorization Act Title III List of Lists (USEPA 2012d) also known as the Consolidated List of Chemicals Subject to the Emergency Planning and Community Right-to-Know Act and Section 112(r) of the CAA.
- USDOT listing of hazardous materials in 49 CFR 172.101.

3.4.1.2 Project-related Hazardous Materials

A large variety of hazardous materials are used or stored in oil and gas drilling and production. Chemicals and materials that may be used for this Project are listed in **Table 3.4-1**. Potentially

hazardous substances used in the development or operation of wells are kept in limited quantities on drill pads and at production facilities for short periods of time. Some of the chemicals or materials listed in **Table 3.4-1** are found on the Superfund Amendments and Reauthorization Act Title III List (USEPA 2012d) of Lists or defined as hazardous materials by the USDOT.

Table 3.4-1 Potentially Hazardous Materials Used or Stored in Typical Oil and Gas Well Drilling, Completion, and Production Operations

Drilling and Completion Operations	
Diesel	Engine lubricants
Gasoline	Biocides
Drilling fluid additives	Solvents
Caustics	Paint and thinners
Well completion and treatment fluid and additives (to include hydraulic fracturing chemicals)	Pipe thread sealer
Silica sand	Explosives (for perforating)
Corrosion inhibitors	Compressed gases
Cement	Lead-acid batteries
Cement additives	Ethylene glycol
Hydraulic fluids	Weight materials (e.g., barite)
Production Operations[1]	
Crude oil, condensate, natural gas liquids, natural gas, carbon dioxide (CO_2), hydrogen sulfide (H_2S).	Methanol (line freezing prevention, gas wells)
Well workover treatment chemicals	Water treatment chemicals
Emulsion breakers (oil wells)	Catalysts (natural gas processing, sulfur recovery)
Corrosion inhibitors	Caustics (gas treatment)
Triethylene glycol (natural gas dehydration)	Paint and thinners
Biocides	Lead-acid batteries
Diesel and gasoline	Herbicides
Amines (natural gas processing)	Defoamers

[1] Includes field gas processing and gathering pipelines.

Source: AECOM 2012a; Government Accountability Office 2012, Interstate Oil and Gas Compact Commission (IOGCC) 1999, USFS and BLM 2003.

Under Emergency Planning and Community Right-to-Know Act, operators are required to report the presence of chemicals or substances on-site if those materials are considered hazardous by OSHA and exceed threshold planning quantities. Chemicals subject to reporting in quantities more than 10,000 pounds may be used or stored at well pads or facilities. There are substances that are defined as Extremely Hazardous Substances that may have threshold planning quantities much lower than 10,000 pounds. Types of chemicals or materials that may trigger reporting requirements include the following (Government Accountability Office 2012; IOGCC 1999):

- Cement and associated additives
- Silica
- Shale control additives

- Drilling mud and associated additives
- Deflocculants
- Lubricants
- Alkalinity and pH control material
- Produced hydrocarbons
- Fuels

The above list contains just a few examples of the thousands of chemicals subject to Emergency Planning and Community Right-to-Know Act reporting requirements (USEPA 2014). It is important to note that produced hydrocarbons are considered hazardous materials subject to Emergency Planning and Community Right-to-Know Act reporting and seemingly small amounts would exceed the threshold planning quantity for those materials. For instance, the threshold amount for crude oil or condensate is approximately 33 barrels (Elliott 2013), a quantity that could be easily exceeded at many typical oil and gas field sites. A release of a reportable quantity of a hazardous substance must be reported to the WDEQ, and possibly to the USEPA depending on the circumstances and the substance involved (WDEQ 2014a). As required by regulation, operators would develop and maintain SPCC plans as part of overall emergency response plans for well pad development and production facilities in the CCPA to prevent and contain accidental releases.

3.4.1.3 Regulatory Definition of Solid Waste

Solid waste comprises a broad range of materials that include garbage, refuse, sludge, non-hazardous industrial waste, municipal wastes, and hazardous waste (USEPA 2011). Solid waste as defined includes solids, liquids, and contained gaseous materials. Hazardous waste are those materials that either exhibit certain characteristics (as defined by laboratory analysis), are generated from specific industrial processes, or are chemical compounds that if abandoned or discarded, could pose a threat to human health and the environment. Non-hazardous solid waste is regulated under Subtitle D of RCRA, and hazardous waste is regulated under Subtitle C. In Wyoming, solid waste is regulated by the WDEQ under a USEPA delegated RCRA program.

The USEPA has specifically exempted certain waste materials generated in oil and natural gas exploration and production from regulation as hazardous waste (USEPA 1993b, 1988). To classify as exempt exploration and production waste, these materials must be intrinsic or uniquely associated with the production of oil and natural gas. Examples of exempt exploration and production waste include, but are not limited to, produced water, drilling mud, hydraulic fracturing flow back fluids, and treatment chemicals (e.g., acids) that have been used in the well. Although specifically exempted from regulation as hazardous waste, these materials are solid waste and must be disposed of in ways that are protective of human health and the environment. Although specific exploration and production wastes are exempted from RCRA Subpart C, it does not mean that the waste can be discarded in a haphazard manner or disposed onsite. Disposition of exempt waste is regulated by the WOGCC, the BLM, or the WDEQ depending on the particular waste and the manner of disposition.

RCRA non-exempt waste would include materials such as spent solvents, discarded lubricants, and paints. These and other non-exempt wastes would be classified according to the process that generated the waste and are handled and disposed or recycled in accordance with applicable rules and regulations. Project-related activities may generate non-exempt waste that may be hazardous, but these would be generated in limited quantities and would have to be disposed of according to hazardous waste rules.

Another type of waste is derived from the presence of naturally occurring radioactive material (NORM), which primarily occurs in formation water or in the rocks at low levels. In general, radionuclides include the following (USEPA 2016d):

- Uranium and decay products.
- Thorium and decay products.
- Radium and decay products.
- Potassium-40.
- Lead-210/Polonium-210.

NORM in Wyoming was characterized by the USGS (1999) as being at background levels or marginally detectable. Although uranium and thorium are not very soluble in water, the radioactive decay daughter products such as radium are soluble (USEPA 2016d). Although NORM may occur at low levels, the radionuclides can be concentrated in various types of oil and gas waste. This concentration of NORM is termed technically enhanced naturally occurring radioactive materials (TENORM). TENORM occurs in the following waste streams (Schieffelin 2017):

- Filter socks
- Tank bottoms
- Sludge
- Drill cuttings
- Filter press cake
- Discarded pipes and flowlines
- Materials generated in maintenance such as scale that may occur in pipelines, separators, dehydrators, and various vessels and storage tanks

In Wyoming, the disposal of TENORM is regulated by the WDEQ Solid and Hazardous Waste Division under Guideline #24. The guideline sets the threshold above which TENORM is managed as a solid waste and subject to Solid and Hazardous Waste Division regulations. TENORM (or NORM) is defined according to Guideline #24 as:

- Any waste material exceeding the greater background levels found in non-impacted natural soils at the surface (i.e., 8 picoCuries per gram radium-226; and/or
- Decommissioned equipment from crude oil/gas operations exceeding 50 microRoentgens per hour emanation at any accessible point.

Any waste exceeding these thresholds is subject to controls and guidance by Solid and Hazardous Waste Division. Guideline #24 also explicitly states that waste generators have the responsibility to know what is in their waste and manage the waste accordingly. Guideline #24 does not provide for mandatory reporting for all TENORM waste generated and disposed.

3.4.1.4 Uncontrolled Hazardous Sites

Wyoming Voluntary Remediation Program Sites

The Wyoming Voluntary Remediation Program, administered by the WDEQ Solid Waste Division, was established to provide a mechanism to allow owners and developers to clean up contaminated sites and return them to a condition fit for productive use (WDEQ 2014b). There are three Wyoming Voluntary Remediation Program sites in the CCPA where contaminants and spills are being remediated (**Figure 3.4-1**):

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THUNDER BASIN NATIONAL GRASSLAND

BUFFALO F.O.

CASPER F.O.

CASPER F.O.

NEWCASTLE F.O.

THUNDER BASIN NATIONAL GRASSLAND

Number 1

Mikes Draw Booster Station

Number 2

Well Draw Station

Former Sand Dunes Facility

Casper

Douglas

MEDICINE BOW-ROUTT NATIONAL FOREST

MONTANA

WYOMING

UTAH

COLORADO

- Project Boundary
- BLM Field Office Boundary
- USFS Administrative Boundary
- Voluntary Remediation Program Site
- Formerly Used Defense Site

Surface Ownership

- Bureau of Land Management
- US Forest Service
- State
- Private
- Bureau of Reclamation
- DOD/USACE

Source: WDEQ 2014b.

CONVERSE COUNTY OIL AND GAS EIS

Figure 3.4-1
Uncontrolled Hazardous Sites

0 2.5 5 10 Miles

0 2.5 5 10 Kilometers

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- Niject Services Company, Former Sand Dunes Facility; Section 26, T34N, R75W; Status: No Further Action.
- Belle Fourche Pipeline Company, Well Draw Station; Section 15, T35N, R69W; Status: Open.
- DCP Midstream, Mikes Draw Booster Station; Section 16, T37N, R70W; Status: Certificate of Completion.

Formerly Used Defense Sites

Casper Precision Bombing Range Number 1 and Number 2 are formerly used defense sites located within the CCPA (**Figure 3.4-1**). These formerly used defense sites are located approximately 20 and 12 miles north of Douglas, Wyoming, respectively. Both sites primarily were used for precision bombing practice in connection with the Casper Army Air Field during World War II and have been decommissioned. The Department of Defense retains the responsibility for any remaining ordnance, explosives, or munitions on public lands, and the USACE is responsible for implementing the formerly used defense sites cleanup program. The BLM supports USACE cleanup activities by providing access for investigation, surveys, and cleanup activities while also providing stipulations to protect natural and cultural resources.

Although no extensive on-the-ground investigations have been performed for these formerly used defense sites, initial reports conducted by the USACE indicate that various hazards could be present (BLM 2007b). These hazards include unexploded ordnance, lead contamination, metal fragments, ammunition casings, and abandoned structures.

3.4.2 Health and Safety

The individuals most likely to be affected by health and safety concerns are the Project workers as well as rural residents. Health and safety issues associated with oil and gas development may arise from improper handling of hazardous materials, improper disposal of solid waste, unauthorized access to oil and gas facilities, uncontrolled release of fluids from a well (blowout), unsafe drilling and maintenance practices, and unsafe vehicle travel. These health and safety concerns are addressed by the operators' compliance with state and federal regulations that require compliance with spill plans, OSHA regulations, and all applicable regulations listed in Section 3.4.1 or **Table 1.5-1**. Oil and gas drilling and production sites can be fenced to limit access and promote onsite security, and employees are required to take safety training and adhere to safety regulations. Public uses in the CCPA include livestock grazing, hunting, and motorists traveling on local roads and highways.

3.4.2.1 Oil and Gas Exploration, Development, and Production Operations

Health and safety concerns within the CCPA primarily are associated with occupational hazards from oil and gas exploration, development, and operations as well as potential hazards related to vehicle accidents, contact with objects and equipment, fires and explosions, falls, and overexertion. Natural gas gathering, compression, stabilization, and transmission operations also currently take place in the CCPA. Operators working within the CCPA are governed by the Wyoming OSHA program, which has adopted the general construction rules and regulations of the federal OSHA program. These include special rules for oil and gas development and operations. Most natural gas transmission and gathering operations are regulated by the USDOT Office of Pipeline Safety. The Office of Pipeline Safety regulations require stringent system maintenance programs, emergency response planning, risk management planning, and individual personnel operations and maintenance training for regulated pipeline systems.

Nationwide, a total of 1,400 recordable nonfatal injuries and illnesses and 112 fatal work-related injuries occurred in the oil and gas extraction industry in 2011 (U.S. Bureau of Labor Statistics 2014). In 2011, transportation incidents accounted for 51 fatalities, contact with objects and equipment accounted for 26 fatalities, and fires and explosions accounted for 12 fatalities (U.S. Bureau of Labor Statistics 2014b).

In 2013, 4 fatalities were recorded in the mining and oil and gas extraction industries in Wyoming (Wyoming Department of Employment 2014). Additionally, the Wyoming State Occupational Epidemiology Program releases annual reports detailing worked-related injuries and fatalities. In some instances, a large percentage of oil and gas related fatalities are related to transportation (**Table 3.4-2**). The annual 2014 Work-related Fatal and Non-Fatal Injury Report indicates that of the nine fatalities associated with oil and gas extraction in 2014, six (67 percent) were transportation related involving vehicle rollovers.

Table 3.4-2 Oil and Gas Extraction Occupational Fatalities

Year	Total Fatalities (Oil and Gas Extraction)	
	Number	Transportation related
2015	4	0
2014	9	6
2013	4	0
2012	3	0

Source: Wyoming Department of Workforce Services 2016a, 2015, 2014e, 2013.

H_2S gas that can occur naturally with oil and gas or as a result of bacterial contamination of oil and gas production wells is of particular concern for worker and public safety. H_2S may be produced in sufficient quantities to pose health and safety concerns beyond drill sites and production and processing facilities. It is a toxic gas that can be dangerous or immediately lethal in relatively small concentrations (i.e., 1,000 ppm or 0.1 percent) (EP Energy 2012). In addition to its toxic effects, H_2S is highly flammable, and the combustion products can be hazardous (SO_2). The gas is heavier than air, so it can be trapped in low areas. Due to the hazards posed by H_2S, the BLM requires that an operator conduct contingency planning to deal with the hazards when there is a "reasonable" expectation that that H_2S would be encountered. Onshore Order Number 6, Hydrogen Sulfide Operations (BLM 1990), requires that "for proposed drilling operations were formations will be penetrated which have zones known to contain or which could reasonably be expected to contain concentrations of H_2S of 100 ppm in the gas stream" an H_2S Drilling Operation Plan must be submitted with the APD. If applicable, the operator also must submit a Public Protection Plan. The threshold H_2S concentration of 100 ppm is not expected in oil and gas wells that would be drilled and produced pursuant to the Project. The nearest occurrences of H_2S with oil and gas production include oil production in western Niobrara County, production areas in central Natrona County, and at the Salt Creek oil field in northeast Natrona County (BLM 2012g, 1984).

3.4.2.2 Vehicle Safety Issues

Existing health and safety concerns within the CCPA include occupational hazards associated with the operation of vehicles on improved and unimproved roads, winter driving conditions, and potential collisions with livestock and big game. I-25 and Highways 20, 59, and 93 intersect the CCPA. These high-volume highways provide access to the CCPA for contractors, drilling crews, production personnel, and the general public. As indicated in Section 3.4.2.1, highway accidents accounted for three-quarters of U.S. oil and gas industry transportation-related fatalities in 2008 and comprised 31 percent of all fatalities for that year (U.S. Bureau of Labor Statistics 2010). During 2013, there were 3 fatalities on Converse County roads out of a total of 544 crashes that included fatalities, injuries, and property damage only (WYDOT 2014).

3.4.2.3 Emergency Services

The Converse County Emergency Planning Agency is responsible for emergency planning, information, and hazard mitigation. Inventories of hazardous chemicals required by Emergency Planning and

Community Right-to-Know Act would be submitted to the Converse County Emergency Planning Agency.

There are three fire departments in Converse County, including the Converse County Rural Fire Department and the volunteer fire departments of the towns of Glenrock and Douglas. Converse County is divided into nine zones; each zone has a designated fire warden. The CCPA lies primarily within zones 1, 2, 3, 5, 7, 8, and 9 (Converse County 2014c).

One hospital is located in the vicinity of the CCPA. Memorial Hospital of Converse County is a state-licensed, 25-bed critical access facility located in downtown Douglas, Wyoming. Memorial Hospital is a voluntary non-profit facility with approximately 186 full-time nurses and other medical professionals.

The Converse County Sheriff's Office is located in downtown Douglas, Wyoming. The largest municipal police department near the CCPA is the Douglas Police Department; additional municipal police departments are located in the towns of Glenrock, Lost Springs, and Rolling Hills.

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3.5 Land Use

The primary land uses within the CCPA are mineral extraction, agriculture, livestock grazing, wildlife habitat, and recreation. There is a small amount of cultivated cropland (mostly hay and wheat) near the North Platte River. Additionally, a large portion of the CCPA has a mixed grassland / sage land cover that is conducive to grazing. The majority of recreational activities, such as big game hunting as well as boating and fishing, take place along the North Platte River.

3.5.1 Regulatory Guidance

3.5.1.1 Federal

FLPMA mandates that the BLM manage public lands and their resource values on the basis of multiple use (43 USC 1701[a][7]). Oil and gas development and livestock grazing are the predominant uses for public lands within the CCPA, with recreation and agricultural uses occurring in adjacent and overlapping areas. Current land use patterns are consistent with Section 103 of the FLPMA (43 USC 1702[l]), which identifies mineral exploration and production and domestic livestock grazing among the principal uses on public lands.

Lands administered by the BLM within the CCPA are managed under the guidance of the Casper RMP (BLM 2007b). The CFO issued a ROD for a new RMP in 2007; however, subsequent updates and amendments have been made through 2012. The Casper RMP provides management objectives and actions for BLM-administered lands in portions of the CCPA. The development of federal oil and gas leases, as well as associated ROW applications and temporary use permits, must be authorized by BLM, subject to the terms and conditions incorporated into the approved APD or ROW grant by BLM. To maintain multiple-use management and meet resource management objectives, BLM can apply a variety of surface use restrictions pertaining to mineral development and other activities (e.g., visual resource management designations, closure/withdrawal, no surface occupancy, controlled surface use, seasonal limitations).

Lands administered by the USFS within the CCPA are managed under the guidance of the TBNG LRMP (USFS 2001) and associated ROD (USFS 2002), which provides management objectives and actions for National Forest System lands in portions of the CCPA. In 2006, the USFS completed a Supplemental Information Report for available lands and oil and gas leasing west of the Wyodak coal outcrop (USFS 2006a). Later that year, they issued a ROD (USFS 2006b) and a subsequent errata to the ROD (USFS 2006c) pertaining to this report. Numerous special leasing restrictions for oil and gas activities were included, addressing drilling or production activities within the TBNG. Oil and gas leasing and development activities on USFS-administered federal lands within the TBNG are allowed, subject to the limitations imposed by the LRMP as well as the 2002 and 2007 RODs. Proposed projects must be in conformance with the management goals. Under the FOOGLRA, USFS lands that are available for oil and gas leasing were identified, along with the stipulations that are considered appropriate to protect surface resources.

3.5.1.2 Wyoming State Lands

The State Land Use Planning Act (WS 9-849 through 9-862) was enacted by the Wyoming legislature in 1975; it established the State Land Use Commission to guide land use planning in the state. The Office of State Lands and Investments, the administrative and advisory arm of the Board of Land Commissioners and State Loan and Investment Board, is responsible for all leases, easements, and temporary uses on state lands.

The WOGCC regulates drilling and well spacing, and requires an approved APD for all oil and gas wells drilled in the State of Wyoming regardless of land ownership, including wells on federal lands. The APD approval process includes securing the necessary legal access to or across state or privately owned lands.

3.5.1.3 Converse County

The Converse County Land Use Plan (Converse County 2015a) describes the current land use in the CCPA as primarily agriculture, predominantly dryland (non-irrigated) grazing. Mineral extraction is the second prominent use for this portion of the county. Mineral extraction is exempted from local regulations by state law; however, mineral processing is regulated to minimize conflicts between mineral extraction and historic surface land uses. Converse County currently does not have county-wide zoning.

The general statement of the county's goal for mineral resources as contained in the Converse County Land Use Plan is "to minimize the conflict between mineral extraction and the historic surface use" (Converse County 2015a). The county's stated objective for mineral resources is to "discourage non-compatible increases in the intensity of the surface use in areas underlain by extractable minerals, i.e., residential and commercial uses." (Converse County 2015a).

3.5.2 Surface Ownership and Land Use

As summarized in **Table 3.5-1** and shown in **Figure 3.5-1**, the majority of the land in the CCPA is privately held, followed by state land, BLM-administered lands, and USFS-administered lands. Mineral extraction, grazing, wildlife habitat, and recreation are common land uses on both BLM- and USFS-administered lands. Mineral extraction and grazing are detailed below, as well as in Sections 3.3 and 3.9, respectively. Recreation and wildlife habitat are discussed in Sections 3.10 and 3.18, respectively.

The Wyoming Office of State Lands and Investments manages State Trust Land. Revenues generated by trust lands and minerals are reserved for the exclusive benefit of public schools and certain other designated public institutions in Wyoming such as the Wyoming State Hospital (Wyoming Office of State Lands and Investments 2011). Wyoming state-administered lands account for approximately 7 percent of land ownership in the CCPA.

Table 3.5-1 Surface Land Ownership/Administration

Ownership/Administrator	Percent Ownership/Administered	Acres
Private Lands	83	1,247,477
State Lands	7	101,012
Federal Lands (BLM)	6	88,466
Federal Lands (USFS)	4	63,911
Water	<1	1,515
Total	**100**	**1,502,381**

3.5.2.1 Rangeland

Cattle and sheep grazing is a substantial land use within the CCPA. There are 83 grazing allotments fully or partially within the CCPA totaling 1,162,316 acres. Of these, 62 allotments are administered by the BLM and 21 allotment (also referred to as range management units) are administered by the USFS. More detailed information regarding livestock grazing is located in Section 3.9, Range Resources.

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THUNDER BASIN NATIONAL GRASSLAND

JOHNSON NATRONA CAMPBELL CONVERSE BUFFALO F.O. CASPER F.O. WESTON NIOBRARA CASPER F.O. NEWCASTLE F.O.

THUNDER BASIN NATIONAL GRASSLAND

MEDICINE BOW-ROUTT N.F.

Casper

Douglas

MONTANA SOUTH DAKOTA IDAHO WYOMING UTAH COLORADO

Project Boundary
BLM Field Office Boundary
USFS Administrative Boundary
Sand Hills Management Area
Bixby Public Access Area

Surface Ownership

Bureau of Land Management
US Forest Service
State
Private
Bureau of Reclamation
DOD/USACE

Source: BLM 2011g.

CONVERSE COUNTY OIL AND GAS EIS

Figure 3.5-1
Surface Ownership and Special Management Areas

0 2.5 5 10 Miles
0 2.5 5 10 Kilometers
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3.5.2.2 Agriculture

Less than 1 percent (approximately 10,426 acres) of the CCPA has been identified as land in agricultural production (primarily hay and wheat) and has been designated as cultivated cropland. These areas consist of a combination of row crops and crops on pivot irrigation and are concentrated near the North Platte River northwest of Douglas and adjacent to the Town of Orin. There also is agricultural acreage near County Roads 53 and 47, mainly consisting of row crops.

3.5.2.3 Energy

The CCPA contains numerous oil and gas fields and related activity, which includes three gas processing plants and a network of pipelines for natural gas, crude oil, and other products (**Figure 3.3-5**). As of January 2015, there were 1,520 wells supporting existing oil and gas activities within the CCPA (WOGCC 2015b). However, in addition to oil and gas production, there are many other types of energy production that occur within the CCPA, including coal, uranium, and wind energy, as depicted in **Figure 3.5-2**.

The CCPA is within Powder River Basin coal field and coal is the primary leasable mineral. There are no active coal mines within the CCPA at this time, although historic coal production did occur primarily from Glenrock Coal Company's former Dave Johnston Mine. The Antelope and North Antelope/Rochelle coal mines north of the CCPA near the Converse County and Campbell County border are active and have experienced recent expansions. The Antelope Mine shipped 31.4 million tons of coal in 2013 (Cloud Peak Energy 2014).

Uranium mining also has a presence within the CCPA. This concentrated energy source is highly valued for its use in nuclear power and electrical generation, and Wyoming contains the largest known economic uranium ore reserves in the U.S. (WSGS 2014). Uranium production in the U.S. steadily increased from 2009 to 2013, reaching levels not seen since the mid-1990s (Converse County 2014a). Although numerous small mines and exploration prospects within the CCPA were worked in the 1950s, some under the auspices of the Atomic Energy Commission, none of these were commercially viable. However, Converse County is now home to one commercially active uranium mine. The Smith Ranch/Highland Uranium Mine, operated by Cameco-owned Power Resources, has been in continuous operation since the early 1990s and is the nation's largest in situ leaching uranium mine in terms of production capacity (Converse County 2014; WSGS 2014). The mine has a production capacity of 5.5 million pounds of uranium per year (Converse County 2014a). See Section 3.3, Geology and Minerals, for details regarding oil and gas production as well as coal and uranium mining within the CCPA.

Portions of the CCPA are within high class ratings of wind energy with approximately 20 percent and 44 percent designated as Classes 3 and 4 wind potential, respectively. Another 28 percent of the CCPA has been designated as Class 5, and 6 percent has been designated as Class 6. Areas designated as Class 3 or greater typically are suitable for most utility-scale wind turbine applications. **Table 3.5-2** provides a summary of wind power classes as defined by the National Renewable Energy Lab 2014.

Currently, there are six wind energy centers that are online within the CCPA. Most of the wind energy centers are located north of the Town of Glenrock (National Renewable Energy Lab 2014). The largest wind energy center in terms of megawatt (MW) capacity is the Top of the World Windpower energy center, operated by Duke Energy. The wind energy center has a 200-MW capacity and consists of 110 wind turbines on 17,000 acres of land (Duke Energy 2015). The six wind energy centers within the CCPA are shown in **Figure 3.5-2**.

Table 3.5-2 Classes of Wind Power Density at 10 meters and 50 meters (a)

Wind Power Class	10 meters (33 feet)		50 meters (164 feet)	
	Wind Power Density (W/m 2)	Speed (b) m/s (mph)	Wind Power Density (W/m 2)	Speed (b) m/s (mph)
1	0	0	0	0
	100	4.4 (9.8)	200	5.6 (12.5)
2	150	5.1 (11.5)	300	6.4 (14.3)
3	200	5.6 (12.5)	400	7.0 (15.7)
4	250	6.0 (13.4)	500	7.5 (16.8)
5	300	6.4 (14.3)	600	8.0 (17.9)
6	400	7.0 (15.7)	800	8.8 (19.7)
7	1000	9.4 (21.1)	2000	11.9 (26.6)

m/s = meters per second

mph = miles per hour

W/m 2 = watts per square meter

a. Vertical extrapolation of wind speed based on the 1/7 power law

b. Mean wind speed is based on Rayleigh speed distribution of equivalent mean wind power density. Wind speed is for standard sea-level conditions. To maintain the same power density, speed increases 3%/1000 m (5%/5000 ft) elevation.

3.5.2.4 Special Management Areas

There are no special recreation management areas (SRMAs), wilderness study areas, or inventoried roadless areas within the CCPA (BLM 2007b; USFS 2001). There is one management area, the Sand Hills Management Area, which transects the CCPA boundary. The Sand Hills Management Area totals 20,090 acres, of which 2,006 acres are located within the boundary of the CCPA (**Figure 3.5-1**). Within the Sand Hills Management Area, specific routes are designated as open for motorized use including off-highway vehicles (OHVs). Routes designated for authorized use only are limited to persons who have permitted uses in the area. Within the management area, 28 miles of primitive roads are open to motorized use, 12 miles of primitive roads are limited to authorized use only, and 8 miles of existing travel routes are closed.

The Bixby Public Access Area is a designated recreation area just outside of the CCPA along the North Platte River. It is portrayed in **Figure 3.5-1**.

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Reno Junction
Cambria
THUNDER BASIN NATIONAL GRASSLAND
BUFFALO F.O.
NEWCASTLE F.O.
BUFFALO F.O.
CASPER F.O.
Gillette
Sussex
Dry Cheyenne
Reynolds Ranch
Glenrock
Rolling Hills
Highland Ranch
Smith Ranch
Morton Ranch
Three Buttes
Glenrock
Top of the World
Glenrock
Top of the World
Ludeman
Lost Springs
CASPER F.O.
NEWCASTLE F.O.
Natrona
Casper
Douglas
Lusk
MEDICINE BOW-ROUTT NATIONAL FOREST
MEDICINE BOW-ROUTT NATIONAL FOREST
CASPER F.O.
RAWLINS F.O.

MONTANA
WYOMING
UTAH
COLORADO

Project Boundary
BLM Field Office Boundary
USFS Administrative Boundary
Wyoming Coal Fields
Uranium Energy Center
Wind Energy Center

Surface Ownership

Bureau of Land Management
US Forest Service
State
Private
Bureau of Reclamation
DOD/USACE

Source: WSGS 2015.

CONVERSE COUNTY OIL AND GAS EIS

Figure 3.5-2

Energy Centers

0 2.5 5 10 Miles
0 2.5 5 10 Kilometers
1:650,000

N

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3.6 Lands and Realty

The BLM and USFS lands and realty program is aimed at managing the underlying land base that hosts and supports all resources and management programs. The key activities of the lands and realty program include: 1) land use authorizations (e.g., leases and permits, airport leases); 2) land tenure adjustments (e.g., retention, disposal, acquisition); 3) withdrawals, classifications, and other segregations; and 4) ROW grants. The BLM and USFS work cooperatively to execute the lands and realty program with other federal agencies, the State of Wyoming, counties and cities, and other public and private landholders. Management actions incorporated into the alternatives are described in more detail in Chapter 2.0.

3.6.1 Regulatory Guidance

Lands administered by the BLM within the CCPA are managed under the guidance of the Casper RMP (BLM 2007b). The CFO issued a ROD for a new RMP in 2007 with subsequent updates and amendments as posted to the BLM CFO website. The Casper RMP provides management objectives and actions for BLM-administered lands in portions of the CCPA. The development of federal oil and gas leases, as well as associated ROW applications and temporary use permits, must be authorized by BLM. To maintain multiple-use management and meet resource management objectives, BLM can apply a variety of surface use restrictions pertaining to mineral development and other activities (e.g., visual resource management designations, closure/withdrawal, no surface occupancy, controlled surface use, seasonal limitations).

Lands administered by the USFS within the CCPA are managed under the guidance of the TBNG LRMP (USFS 2001) and associated ROD (USFS 2002), which provides management objectives and actions for National Forest System lands in portions of the CCPA. In 2006, the USFS completed a Supplemental Information Report for available lands and oil and gas leasing west of the Wyodak coal outcrop (USFS 2006a). Later that year, they issued a ROD (USFS 2006b) and a subsequent errata to the ROD (USFS 2006c) pertaining this report. Under the FOOGLRA, USFS lands that are available for oil and gas leasing were identified along with the stipulations that are considered appropriate to protect surface resources. In the case of the TBNG where the USFS administers federally owned surface estate, a special use permit is required to authorize any disturbance to federally owned surface. A special use permit includes conditional provisions (USFS 2001).

3.6.2 Key Activities

3.6.2.1 Land Use Authorizations

Land use authorizations include various authorizations to use public surface for leases, permits, and easements under Section 302(b) of the FLPMA; Section 28 of the MLA; Recreation and Public Purpose leases under the Recreation and Public Purposes Act (Recreation and Public Purpose Act) of June 14, 1926 (43 USC 869 et seq.); and airport leases under the Act of May 24, 1928, as amended (49 USC Appendix, Sections 211-213). The development of federal oil and gas leases (which may include associated ROW applications and temporary use permits), must be authorized by BLM, subject to the terms and conditions incorporated into the approved APD or ROW grant by BLM. On USFS-administered surface, a special use permit is required to authorize any disturbance to federally owned surface. The existing surface management pattern within the CCPA is shown on **Figure 3.5-1** and detailed in Section 3.4. The Recreation and Public Purpose Act is discussed further in Section 3.6.2.2. The BLM or USFS do not administer any airport leases within the CCPA (surface stipulations surrounding the Converse County Airport are detailed in Section 3.6.2.2).

3.6.2.2 Land Tenure Adjustments

Land tenure adjustments refer to those actions that result in the retention of public land, disposal of public land, the acquisition by a federal agency of non-federal lands or interests in land. FLPMA requires

that public land be retained in public ownership unless, as a result of land use planning, disposal of certain parcels is warranted. Lands identified for retention usually consist of special designations or resources that serve the public interest. Acquisition of and interests in land can be accomplished through several means, including exchange, purchase, donation, and condemnation. Land disposals, exchanges, and stipulations are further discussed below.

Disposals and Exchanges

The BLM's policy for disposing of public lands is through the federal land exchange program rather than through competitive land sales. Disposal areas include tracts of land that are economically difficult to manage and/or parcels that could serve important public objectives including, but not limited to, expansion of communities and economic development. Prior to any disposal, a site-specific analysis must determine that the lands considered contain no important wildlife, recreation, or other resource values, the loss of which could not be mitigated; have no overriding public values; represent no substantial public investments; and have no hazardous materials present. Disposal also must serve the public interest. Lands will not be considered for disposal if they are allocated for a specific use, even though they meet the general disposal criteria.

Exchange is the process of trading lands or interests in lands and serves as a viable means for the BLM and USFS to accomplish their goals and mission. Public lands may be transferred from BLM or USFS to other federal agencies for management; furthermore, disposal by sale or through the Recreation and Public Purpose Act also can occur. The Recreation and Public Purpose Act authorizes the federal land administrator to lease or convey public surface to state and local governments and qualified nonprofit organizations for recreation or public purposes. Lands are leased or conveyed for less than fair market value or at no cost for qualified uses. Examples of typical uses under the Recreation and Public Purpose Act include historic monument sites, campgrounds, schools, parks, public works facilities, and hospitals. Leases and conveyances under the Recreation and Public Purpose Act reserve all minerals in the land to the U.S. Currently, there are no lands within the CCPA that the BLM administers as either Recreation and Public Purpose Act conveyances or leases.

On BLM-administered land within the CCPA, approximately 64,785 acres have been identified for disposal, 361 acres for restricted disposal, and 23,363 acres for retention. These locations are depicted on **Figure 3.6-1**. The TBNG LRMP includes criteria for identifying lands or interests in land for acquisition or disposal, but it does not identify specific parcels that meet the criteria (USFS 2001).

The BLM, NPS, and the State of Wyoming are working on a land exchange to acquire lands for the NPS in Teton National Park and dispose of lands to the State of Wyoming in northwestern Converse County. The proposal has yet to be finalized.

Formerly Used Defense Sites

The DOD is responsible for environmental restoration of properties that formerly were owned by, leased to, or otherwise possessed by the U.S. under the jurisdiction of the Secretary of Defense. These properties are known as formerly used defense sites. The USACE is responsible for implementing the formerly used defense sites cleanup program. The BLM supports USACE cleanup activities through providing access for investigations, surveys, and cleanup activities; providing stipulations to protect natural and cultural resources; and assisting in the development of appropriate cleanup standards. Various hazards potentially present on these sites include unexploded ordnance, lead contamination, metal fragments, ammunition casings, and abandoned structures. With the exception of livestock grazing, commercial use is allowed on these sites with notification of the risk and a requirement to submit a safety plan prior to use. There are two formerly used defense sites within the CCPA (**Figure 3.6-1**). The larger site is approximately 10,320 acres and is located just east of Ross Road CR 31, approximately 8 miles north of the intersection of Ross Road and SR 96. The smaller site approximately 2,635 acres and is located north of the intersection of Ross Road CR 31 and Jenne Trail Road CR 34. Both sites were associated with military munitions.

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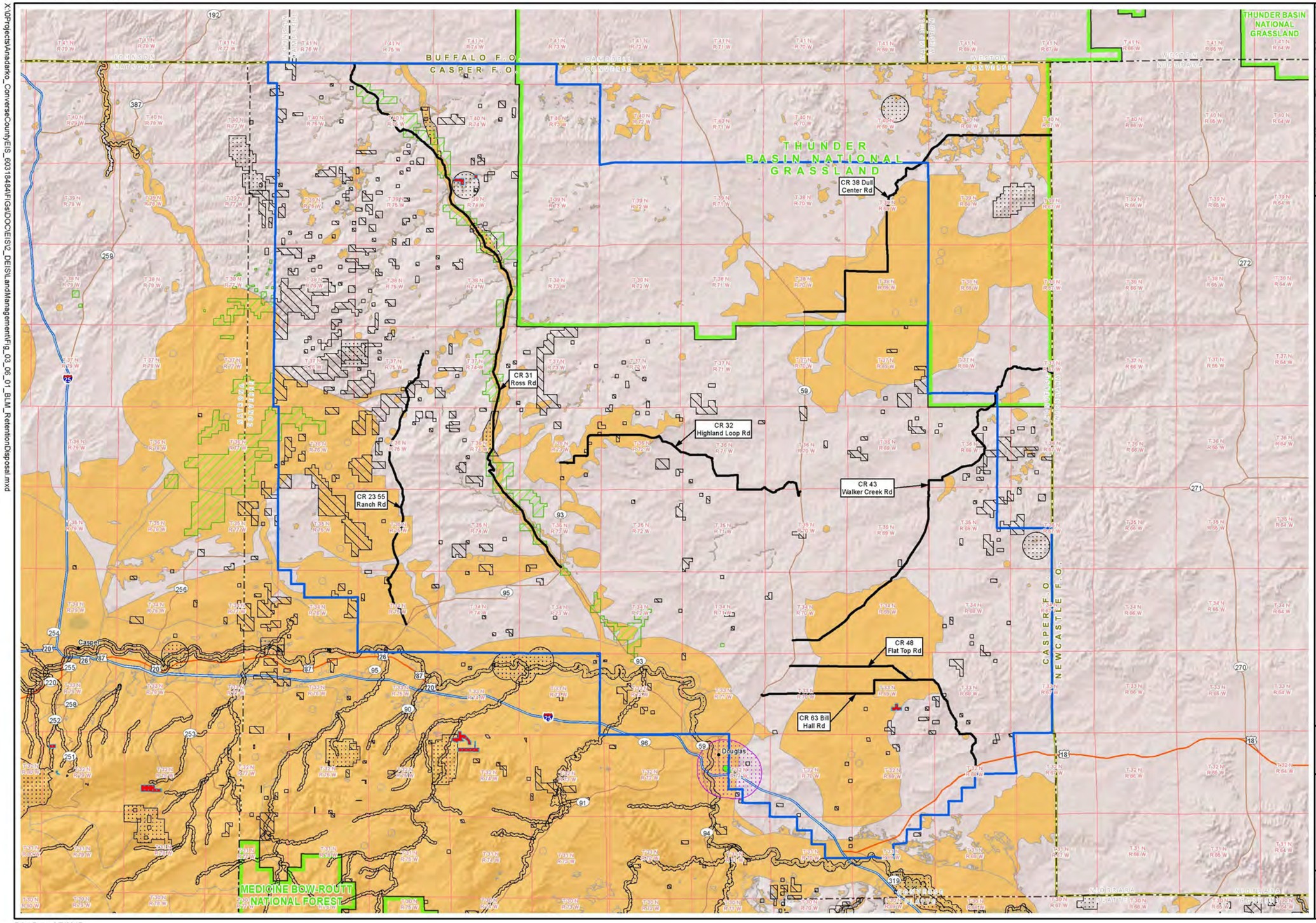

Project Boundary
BLM Field Office Boundary
USFS Administrative Boundary

Retention/Disposal Lands and NSO/CSU

Decision 6044: Public Surface Identified for Retention
Decision 6045: Public Surface Identified for Disposal
Decision 6046: Public Surface Identified for Restricted Disposal
Converse County Airport
No Surface Occupancy
Controlled Surface Use
CSU Restricted Air Fly Zone

Source: BLM 2011i.

CONVERSE COUNTY OIL AND GAS EIS

Figure 3.6-1
BLM Retention/Disposal Lands and NSO/CSU

0 2.5 5 10 Miles
0 2.5 5 10 Kilometers
1:450,000
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Surface Use Stipulations

A ROW exclusion area typically is an area with high resource values where new ROW development is prohibited. Approximately 5,555 acres of BLM-administered surface within the CCPA have been designated as ROW exclusion areas. Of this acreage, 2,006 acres are within the Sand Hills Management Area.

A ROW avoidance area is an area designated in a land use plan for which a ROW should be avoided if at all possible and typically includes additional constraints. Approximately, 80,181 acres have been designated as ROW avoidance areas on USFS- and BLM-administered surface (BLM 2007b). The majority of ROW avoidance areas in the CCPA are associated with historic trails and protected wildlife such as raptor nests. ROWs are discussed further in Section 3.6.2.4.

Land that is designated as closed generally is an area that is not available for a particular use or uses. Approximately 8,297 acres of BLM-administered surface estate are closed to specific activities. Of this acreage, 2,005 acres are closed to oil and gas activity as well as other leasable solids, 5,306 acres are closed to salable mineral activity, and the remaining acreage (986 acres) is closed to OHV use.

A conditional surface use (CSU) stipulation is applied where current stipulations are deemed insufficient to achieve the level of resource protection necessary to protect the public interest, but where a NSO is deemed overly restrictive. Approximately 464,398 acres within the CCPA are under CSU stipulations. These areas include but are not limited to, areas with sensitive vegetation and wildlife (e.g., greater sage-grouse core areas and potential habitat for Ute ladies' tresses) as well as areas with high scenic quality. Surface occupancy or use within 10,000 feet of the Converse County Airport near the city of Douglas also is subject to a CSU restriction to protect aircraft fly zones (**Figure 3.6-1**). This acreage is included in the 464,398 acres of CSU within the CCPA. Further information on these resources can be found in Section 3.14, Vegetation; Section 3.15, Visual Resources; and Section 3.18, Wildlife and Aquatic Biological Resources.

An NSO stipulation prohibits occupancy or disturbance of all or part of the surface to protect special values. Approximately 3,567 acres of BLM-administered surface estate are under NSO stipulations. These areas include, but are not limited to, sensitive cultural resources and species habitat. Further analysis of cultural resources is located in Section 3.2, Cultural Resources. On USFS-administered lands within the CCPA there are 29,507 acres under NSO stipulations. Land managed under NSO or CSU is depicted in **Figure 3.6-1**. These areas are comprised almost exclusively of sensitive wildlife habitat and are further detailed in Section 3.18, Wildlife and Aquatic Biological Resources.

3.6.2.3 Withdrawals

Withdrawals are formal land designations that set aside, withhold, or reserve federal lands for a specific public use. Withdrawals accomplish one or more of the following:

- Transfer total or partial jurisdiction of federal land between federal agencies.
- Close federal land from operation of all or some of the public land laws and/or mineral laws.
- Dedicate federal land to a specific purpose.

Withdrawals are established for a wide range of public purposes such as military reservations, administrative sites, national forests, reclamation projects, recreation sites, stock driveways, and power site reserves. There are three major types of withdrawals: 1) administrative withdrawals – those made by the Secretary of the Interior or some other authorized officer of the executive branch of the federal government; 2) congressional withdrawals – withdrawals legislated by Congress; and 3) Federal Power Act or Federal Energy Regulatory Commission withdrawals – power project withdrawals established under the authority of the Federal Power Act of June 10, 1920. Nearly 603 acres in the CCPA have been withdrawn from various types of activities, such as locatable and leasable minerals.

3.6.2.4 Right-of-Way Grants

A ROW grant is an authorization to use specific pieces of public land for certain projects such as developing roads, pipelines, electrical lines, and communication sites. The grant authorizes rights and privileges for a specific use of land for a specific period of time. The BLM and USFS manage ROWs through a system of designated corridors and designated ROW exclusion and avoidance areas. The BLM and USFS have encouraged the placement of new facilities within established corridors, and overlapping or adjacent ROWs are issued whenever possible. Generally, the use of designated ROW corridors for ROW grants is actively encouraged; however, the presence of a designated ROW corridor or a system of ROW corridors does not preclude the granting of a ROW on public lands outside the designated corridor, if appropriate.

Various existing ROWs have been authorized on BLM- and USFS-administered lands in the CCPA, primarily for pipelines, roads, electrical lines, and railroads. In the CFO RMP, the BLM has identified preferred locations for the placement of new ROWs as designated ROW corridors, such as the Cabin Creek Corridor from the southwestern CFO boundary to the northern CFO boundary. This 1-mile-wide corridor does not transect the CCPA, but traverses northwest of the CCPA boundary. In the TBNG LRMP, guidelines for Management Area 3.65, Rangeland with Diverse Natural-Appearing Landscapes, require new utilities to be located along road corridors or within other areas already disturbed. The remainder of the TBNG within the CCPA is in Management Area 6.1, Rangeland with Broad Resource Emphasis, which has no specific restriction on the placement of utilities (USFS 2001).

3.7 Noise

Noise is defined as any sound that is undesired, extraneous or interferes with one's hearing. Noise is considered a human health concern as it can interfere with speech communication and hearing or is otherwise considered annoying. An individual's response to noise is influenced by the type of noise, perceived importance of the noise, appropriateness in the setting, time of day, type of activity during which the noise occurs, and the sensitivity of the individual.

3.7.1 Regulatory Guidance

The USEPA Noise Control Act of 1972 provides guidance on noise levels to protect public health and welfare against hearing loss, annoyance and activity interference. Outdoor noise levels below 55 decibels are identified as preventing activity interference and annoyance.

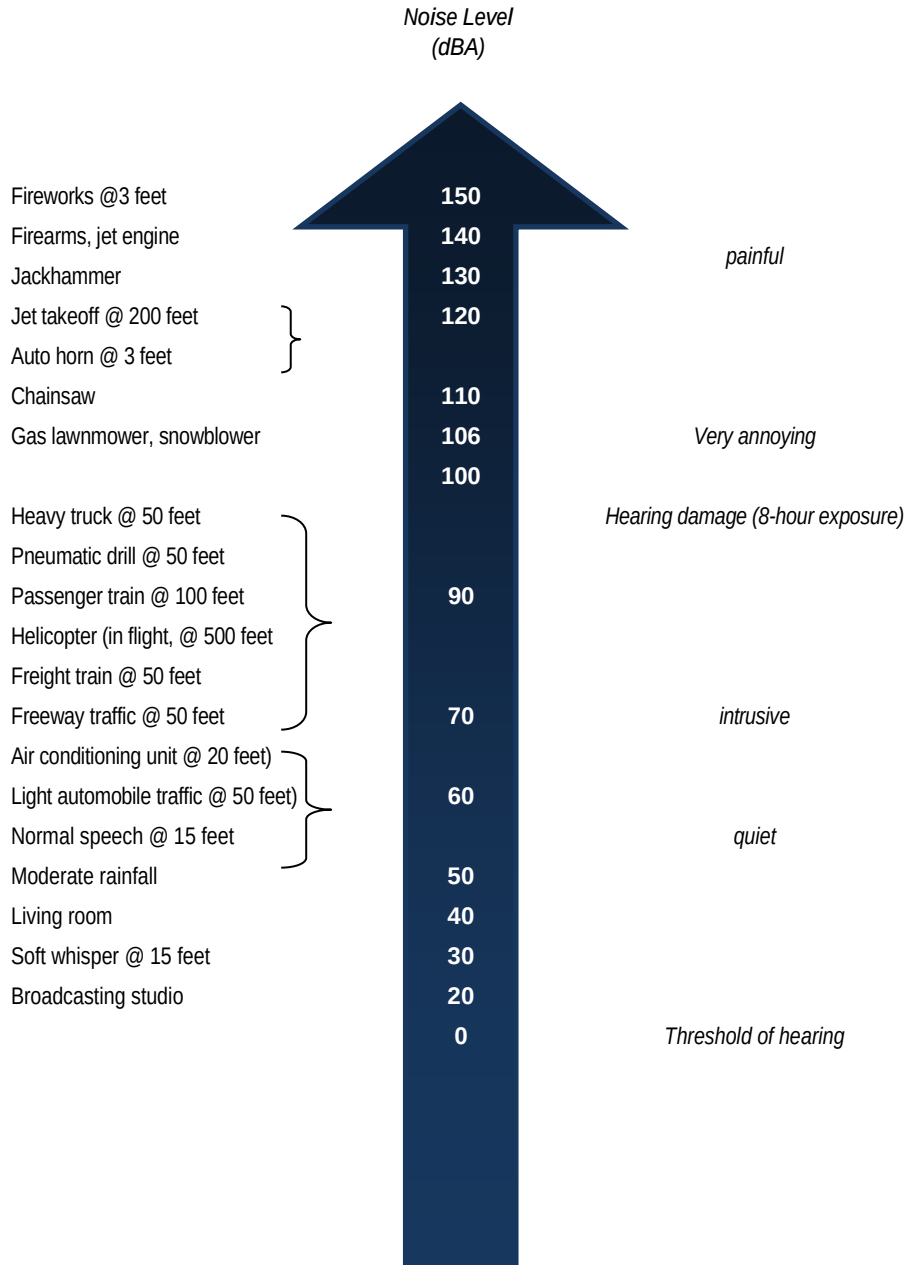
Wyoming EO2015-4, as adopted by BLM, specifies Wyoming's statewide requirements for protecting greater sage-grouse. General stipulations in Wyoming EO 2015-4 related to noise are further discussed in Section 3.18, Wildlife and Aquatic Biological Resources. Additionally, WS 31-5-1601 states that OHVs operating on public lands in Wyoming must have a muffler that reduces noise to less than 102 dBA.

There are no local noise standards relevant to the study area that pertain to unincorporated areas of Converse County.

3.7.2 Acoustics and Existing Background Noise Levels

Sound is measured in dBA and is based on a logarithmic scale to account for the wide range of audible sound intensities. The "A-weighted" sound level approximates the frequency response of the average healthy human ear when listening to most ordinary sounds. Under the logarithmic scale for sound (and noise), a 10-dBA increase would increase sound intensity by a factor of 10; a 20-dBA increase would increase sound intensity by a factor of 100. As a result, methods have been developed for weighting the sound frequency spectrum to approximate the response of the human ear. The dBA scale is widely used for environmental noise assessments because of its relative convenience and accuracy in correlating with people's judgments of what constitutes noise. Typical A-weighted sound and noise levels associated with common activities or situations are shown in **Figure 3.7-1**.

Ambient noise, or background noise, is defined as the total noise from nearby and distant sources, relatively steady and homogeneous, with no particular source identifiable within it (GE Energy 2005; National Wind Coordinating Committee 2002). The proposed project would occur primarily in rural rangeland areas (a small percentage of agricultural land is present within the CCPA). Ambient noise levels in rural rangeland areas of Wyoming typically are near 24 dBA (Ambrose and MacDonald 2015). Levels near developed areas and along area roads and highways (e.g., SR 59 and U.S. Highway 18/20) are likely to be higher due to vehicle movement and other human activities. As detailed in Section 3.13, traffic on local and major roads within the CCPA has increased in recent years, adding to the background ambient noise level. Rail lines in the CCPA also provide for elevated noise levels. Wind is frequently a major contributor to ambient noise levels within the area, as is agricultural machinery noise when operated near residences and other sensitive receptors. Existing gas field developments are distributed throughout the CCPA and generate noise through construction and operation activities. These activities include, but are not limited to, well pad and access road construction, construction and operations traffic, construction and operation of ancillary facilities, and flaring. Sensitive receptors within the study area are limited to residents in scattered rural locations as well as low population urban areas, and to greater sage-grouse leks and nesting areas.



Source: Council on Environmental Quality 1970.

Figure 3.7-1 Typical A-weighted Noise Levels

Noise level from a line source (e.g., a highway) will decrease by 3 dBA for every doubling of the distance away from the source (Truax 1999). This concept is known as cylindrical spreading. Noise level from a point source (e.g., concentrated construction activity) will decrease by 6 dBA for every doubling of the distance away from the source (Truax 1999). This concept is known as geometric spreading, and is based on the inverse square law. This law states that the intensity of the influence at any given radius is the source strength divided by the area of the sphere. The energy twice as far from the source is spread over four times the area, hence the sharp drop off in intensity. Sound intensity follows the inverse square law assuming there are no reflections or reverberations. **Table 3.7-1** displays the human perception of a change in dBA levels.

Table 3.7-1 Human Perception of Noise Level Changes

Change in Noise Level (dBA)	Result
1	Insignificant
3	Barely discernible
5	Noticeable community response
10	Causes an adverse community response

As shown above, when comparing similar sounds (e.g., changes in traffic noise levels) a 3-dBA change in sound-pressure level is considered detectable by the human ear in most situations. A 5-dBA change is readily noticeable by most people, and a 10-dBA change is perceived to be a doubling (or halving) of sound or noise. Impacts to wildlife from noise are addressed in Section 3.18, Wildlife and Aquatic Biological Resources.

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3.8 Paleontological Resources

The analysis area for paleontology is the CCPA because impacts on paleontological resources from the Project would be limited to areas of direct surface disturbance and drilling activity.

3.8.1 Regulatory Framework

The primary statute under which the BLM and USFS manage paleontological resources is the Paleontological Resource Preservation Act (Public Law 111-11, Title VI, Subtitle D, Sections 6301-6312, 123 Stat. 1172, 16 USC 470aaa). The Paleontological Resource Preservation Act defines paleontological resources as "any fossilized remains, traces, or imprints of organisms, preserved in or on the earth's crust, that are of paleontological interest and that provide information about the history of life on earth." (BLM 2017b)

Other statutes and regulations that govern the management of paleontological resources on federal lands include the following:

- FLPMA (Public Law 94-579).
- NEPA (Public Law 91-190).
- Various sections of BLM regulations in Title 43 CFR that address the collection of invertebrate fossils and, by administrative extension, fossil plants.
- USFS regulations in Title 36 CFR 228.62(e) and 261.9(j i) governing petrified wood and special use authorization for removal of any paleontological resource for commercial purposes.

In addition to the statutes and regulations listed above, paleontological resources on public lands are managed through the use of internal BLM guidance and manuals. Included among these are the BLM Manual 8270 and the BLM Handbook H-8270-1.

Management direction for paleontological resources also is provided in the BLM Casper RMP (BLM 2007b) and the USFS TBNG LRMP (USFS 2001). Various internal instructional memoranda have been issued to provide guidance to the BLM in implementing management and protection of paleontological resources.

3.8.2 Potential Fossil Yield Classification

Paleontological resource classification is a ranking of areas and geologic units according to their potential to contain vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils. These rankings are used in land-use planning as well as for identifying areas that may warrant special management or special designations.

The Potential Fossil Yield Classification (PFYC) system classifies geologic units on the basis of relative abundance of vertebrate fossils or uncommon invertebrate or plant fossils and sensitivity to adverse impacts. A higher class number indicates a higher potential for occurrence of fossils. The classification should be applied at the geologic formation or member level. The system provides baseline guidance to assess and mitigate impacts on paleontological resources. The classification should be an intermediate step in the analysis and used to assess additional mitigation needs. The PFYC originally contained five major classes of fossil potential, but new classes were recently added (BLM 2016c). The classes are summarized below.

- Class 1: Very low potential for fossil remains.
- Class 2: Low potential for fossils such as alluvial deposit.
- Class 3: Moderate potential for fossil content that varies in significance and predictable occurrence.

- Class 4: High potential for occurrence of fossils not exposed on the surface but may be exposed by disturbance of the surface.
- Class 5: Very high potential for highly fossiliferous geologic units that consistently and predictably produce vertebrate or important invertebrate or plant fossils.

The new PFYC classes that have been added are summarized below (BLM 2016c):

- Class U, Unknown Potential: Geologic units that cannot receive an informed PFYC assignment. Until a provisional assignment is made, geologic units that have an unknown potential have medium to high management concerns. Lacking other information, field surveys normally are necessary, especially prior to authorizing a ground-disturbing activity.
- Class W, Water: Includes any surface area that is mapped as water. Most bodies of water do not typically contain paleontological resources. However, shorelines should be carefully considered for uncovered or transported paleontological resources. Reservoirs are of special concern because important paleontological resources often are exposed during low water intervals. In karst areas, sinkholes and cenotes may trap animals and contain paleontological resources. Dredging river systems may result in the disturbance of sediments that contain paleontological resources.
- Class I, Ice: Includes any area that is mapped as ice or snow. Receding glaciers, including exposed lateral and terminal moraines, should be considered for their potential to reveal recently exposed paleontological resources.

3.8.3 Existing Conditions

Using the PFYC System and data from the Casper RMP (BLM 2007b) and USFS LRMP (USFS 2001), the acres of the PFYC designations within the CCPA are provided in **Table 3.8-1** and on **Figure 3.8-1**.

Table 3.8-1 PFYC Designations and Acres in the CCPA

PFYC	Acres in CCPA
2 – Low	54,203
3 – Moderate	1,359,390
5 – Very High	88,788

Source: BLM 2007a; USFS 2001.

The PFYC System was used to determine the paleontological sensitivities of the six primary geologic groups and/or formations exposed within the CCPA (**Table 3.8-2**). The six older units (from older to younger) that outcrop in the CCPA and have potential to contain scientifically important fossils are the Cretaceous Lance Formation, Paleocene Fort Union Formation, Paleocene to Eocene Wasatch Formation, Eocene to Oligocene White River Formation, lower Oligocene to Miocene Rocks (no formation designation), and upper Miocene rocks (no formation designation). Geologic units are depicted in **Figure 3.3-4**. The alluvial and colluvial deposits of Quaternary age are either too young to contain fossils or have a very low PFYC classification; therefore, they are not included in this table. The one notable exception is a single mammoth fossil find in Pleistocene lake bed deposits in northwest Converse County within the CCPA (Sundell 2014).

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THUNDER BASIN NATIONAL GRASSLAND

BUFFALO F.O.
CASPER F.O.

CASPER F.O.
NEWCASTLE F.O.

THUNDER BASIN NATIONAL GRASSLAND

MEDICINE BOW-ROUTT NATIONAL FOREST

Casper

Douglas

Project Boundary
BLM Field Office Boundary
USFS Administrative Boundary

Potential Fossil Yield Class (PFYC)

5
3
2

Source: BLM 2014c.

CONVERSE COUNTY OIL AND GAS EIS

Figure 3.8-1
Potential Fossil
Yield Classifications

Miles
Kilometers
1:450,000

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Table 3.8-2 Paleontological Sensitivities of Geologic Units in the CCPA Using the PFYC System

Geologic Unit[1]	Age	Typical Fossils	Source	PFYC[2]
Upper Miocene Rocks	Miocene	Mammals, birds, reptiles	University of Wyoming (2014a)	Class 5
Lower Miocene and Oligocene Rocks	Oligocene to Miocene	Mammals, reptiles	University of Wyoming (2014b)	Class 5
White River Group	Eocene to Oligocene	Mammals, birds, reptiles	University of Wyoming (2014c)	Class 5
Wasatch Formation	Paleocene to Eocene	Mammals, birds, reptiles, fish	University of Wyoming (2014d)	Class 5, 3
Fort Union Formation	Paleocene	Mammals, birds, reptiles, fish	University of Wyoming (2014e)	Class 3
Lance/Hell Creek Formation	Cretaceous	Dinosaurs, mammals, birds, reptiles, fish	University of Wyoming (2014f); University of California Berkeley Museum (2014a)	Class 5

[1] Love and Christiansen 1985.

[2] BLM 2008b.

3.8.4 Geologic Units in the CCPA

The Wasatch Formation geographically dominates the CCPA. The Fort Union Formation is second in geographic extent, occupying less than one-fifth the area of the Wasatch Formation and bounding it to its east, west, and south. The remainder of the formations occupy small areas in the southern CCPA margins.

3.8.4.1 Upper Miocene Rocks

Geological Description

Upper Miocene Rocks (Tmu) in eastern Wyoming consist of light colored claystone, sandstone, and conglomerate. They are equivalent to the Moonstone Formation of central Wyoming and the Ogallala Formation of the Denver Basin. Upper Miocene Rocks unconformably overlie the Lower Miocene and Oligocene Rocks and crop out in a very small area at the south edge of the CCPA (Love and Christiansen 1985; Love et al. 1993).

Paleontological Potential of the CCPA – Fossils from Equivalent Rocks

Camelids, sparse mammal bones, and teeth were found in the Upper Miocene Rocks of central Wyoming (Love 1961). A new species of camelid from Carbon County, Wyoming, was identified (Cassiliano 2008). In northern Kansas, the Ogallala Formation, an equivalent of the Moonstone Formation, has yielded vertebrates such as horse, rhinoceros, tortoise, fish, and birds (Frye et al. 1956); in New Mexico, vertebrate tracks (artiodactyl and carnivore) (Williamson and Lucas 1996).

3.8.4.2 Lower Miocene and Oligocene Rocks

Geological Description

Lower Miocene and Oligocene rocks (Tmo) in eastern Wyoming consist of light colored sandstone and white claystone and siltstone. They are equivalent to the Arikaree Formation in the Denver Basin. Lower

Miocene and Oligocene rocks unconformably overlie the White River Formation and crop out in very small isolated areas at the south edge of the CCPA (Love and Christiansen 1985; Love et al.1993).

Paleontological Potential of the CCPA – Fossils from Equivalent Rocks

In North Dakota, mammals were found in the Lower Miocene and Oligocene Rocks (Hoganson et al. 1998). The Lower Miocene and Oligocene Rocks have produced fossil tracks of large (hooved) mammals in western Nebraska (Loope 1986). Carnivores were found in the Lower Miocene and Oligocene Rocks of southeast Wyoming; these also were found in several other Wyoming localities (Hunt 2002). The Chalk Canyon Formation of Arizona produced mammals of Arikareean age (Late Oligocene to Late Early Miocene); other referred material of the same type and age was found in Arizona, California, New Mexico, Wyoming, and Nebraska (Lander and Lindsay 2011).

3.8.4.3 White River Group

Geological Description

In eastern Wyoming, the White River Formation (31–35 million years ago) consists of white to pale pink claystone and arkosic conglomerate (Twr). It unconformably overlies the Wasatch and Fort Union formations and is unconformably overlain by Upper and Lower Miocene and Oligocene rocks. It has three members, Chadron, Brule, and Upper Conglomerate. Locally, the Brule Member may include the Upper Conglomerate. The Upper Conglomerate is a light gray conglomeratic sandstone and conglomerate. The Brule is pale pink to white claystone and sandstone. The Chadron is light gray to dark red claystone, sandstone, and conglomerate (Love and Christiansen 1985; Love et al. 1993).

Paleontological Potential of the CCPA – Fossils from Equivalent Rocks

In North Dakota, the Chadron has produced numerous mammals as well as fish, amphibians, and reptiles (Hoganson et al. 1998). The Brule of North Dakota has produced many mammal orders, fish, amphibians, reptiles, and one bird (Hoganson et al. 1998). Boyd et al. (2013) details small mammals from the Chadron of South Dakota and Nebraska. A mammal (insectivore) was found in the Middle White River Group (Meehan and Martin 2012).

3.8.4.4 Wasatch Formation

Geological Description

The Wasatch Formation (Tw) is the most geographically widespread unit exposed on the surface in the CCPA. Its PFYC rank in the Powder River Basin (CCPA) is 3; elsewhere, its PFYC rank is 5 (BLM 2008a). It is composed of light gray sandstone, variegated to gray mudstone and claystone, and coal and unconformably underlain by the Fort Union Formation. The Wasatch Formation is unconformably overlain by the White River Group along its southern margin in the CCPA. In some areas of eastern Wyoming, the Wasatch Formation has two conglomeratic members. From the base, they are the Kingsbury conglomerate and the Moncrief (Love and Christiansen 1985; Love et al 1993).

Paleontological Potential of the CCPA – Fossils from Equivalent Rocks

Outside the CCPA, the Wasatch Formation of Wyoming has yielded an abundance of diverse vertebrate fossils. The University of Wyoming Geological Museum online collection summaries show vertebrate fossils in the early Eocene Wasatch Formation in Fossil Basin (southwest Wyoming) and in the Table Rock area of the northern Washakie Basin (south-central Wyoming), mammals in the Great Divide Basin (west-central Wyoming), and birds from the Bird Quarry in the northeastern Green River Basin (University of Wyoming 2014a).

Specific reports detail the occurrence of mammals, birds, fish, and reptiles in the Wasatch Formation, from southwestern to central Wyoming, and north of the Rock Springs Uplift to south-central Wyoming (Roehler 1991); lizards from southeastern Wyoming (Caldwell 2003; Gauthier 1982); mammals, birds, salamander tracks, and fish from the Green River Basin (Foster 2001; Robinson et al. 2004); and diverse

species of mammals as well as reptiles from the Fossil Butte National Monument in western Wyoming (Gunnell et al. 2002).

North of the CCPA, the Wasatch in the Powder River Basin of Wyoming has yielded mammal fossils that include multituberculates, marsupials, insectivores, primates, rodents, carnivores, and horses (Delson 1971) (Robinson and Ivy 1994; Robinson and Williams 1997).

3.8.4.5 Fort Union Formation

Geological Description

In eastern Wyoming, the Fort Union Formation (Tfl and Tft) consists of light gray to yellowish brown sandstone, light gray siltstone, mudstone, gray to black carbonaceous shale, and thin coals. Most areas underlain by the Fort Union Formation are mantled with soils and residuum and/or exhibit baked or clinker outcrops in red “scoria” hills (Love and Christiansen 1985; Reheis and Coates 1987). The Fort Union Formation unconformably overlies the Lance Formation and is unconformably overlain by the Wasatch Formation. In the Powder River Basin, it has three members, Tullock, Lebo, and Tongue River, in ascending order (Love and Christiansen 1985; Love et al. 1993).

Paleontological Potential of the CCPA – Fossils from Equivalent Rocks

The University of Wyoming Geological Museum online collection summaries show Fort Union Formation vertebrate fossils only outside the Powder River Basin of Wyoming. Fort Union Formation mammals have been collected from the southern and southwestern Bighorn and eastern Washakie Basins and the eastern Rock Springs uplift. Fort Union Formation vertebrates also have been reported from the Bison and the northern Wind River basins (University of Wyoming 2014b).

No published vertebrate fossil records from the Fort Union Formation in the CCPA have been found. Beyond the Powder River Basin, the Fort Union Formation of Wyoming has yielded bird tracks (Mustoe 2002); mammals in Carbon County (Rigby 1980) and the Carbon Basin (Secord 1998); lizards, amphibians, turtles, and fish in the Big Horn Basin (Estes 1975); and mammals in the Rock Springs Uplift area (Winterfeld 1982).

3.8.4.6 Lance/Hell Creek Formation

Geological Description

In the CCPA, the Late Cretaceous Lance/Hell Creek Formation is composed of brown and gray sandstone and shale, with thin coals and dark shale beds (Love and Christiansen 1985). It conformably overlies the Fox Hills Sandstone and partially unconformably underlies the Fort Union Formation (Love et al. 1993).

Paleontological Potential of the CCPA – Fossils from Equivalent Rocks

Most vertebrate fossils from the Lance Formation are from the type locality in Niobrara County, east of the CCPA. Fossils include dinosaurs reptiles, amphibians, mammals, birds, and fish (Dalman 2013; Donohue et al. 2013; Elzanowski et al. 2000; Encyclopedia Britannica, no date; Estes 1964; Estes and Sanchíz 1982; Forster 1996). The Alkali Divide Paleontological Special Interest Area in the TBNG has yielded fossils from not only the animals described above, but also triceratops, shark teeth, coprolite, and stingray teeth.

3.8.4.7 Paleontological Resources in the CCPA

A rich and diverse assemblage of vertebrate fossils has been uncovered in Converse County from the White River Formation in the Douglas area. They include mammals, reptiles, birds (Cavigelli 2014), and fish (Sundell 2001). Both large and small mammals have been found.

Online listings of the University of California, Berkeley Museum for this area show 76 vertebrate specimens, mostly Oligocene mammals from localities near Douglas and Orin Junction (University of California Berkeley Museum 2014b). Eastern museums, including the Smithsonian, have collected from this area of the White River Formation for a century, and the University of Wyoming also has large holdings of White River Formation vertebrates. In addition, approximately 250 skulls a year are collected commercially from this area (Cavigelli 2014; Sundell 2014).

Northeast of Douglas, Wyoming Miocene outcrops (undifferentiated formations) have produced a few vertebrate fossils (Cavigelli 2014).

The large number of known localities demonstrates the paleontological importance of the CCPA. Current data reveal that fossils are found primarily in badland or residuum topography (i.e., exposures of eroded and incised mudstone and small sandstone units involving primarily the White River and Lance formations). Conversely, relatively undissected areas within the CCPA are unlikely to yield fossils because of alluvium and grasslands cover (Sundell 2014).

3.9 Range Resources

Approximately 61 percent (914,667 acres) of the CCPA consists of grazing allotments that encompass privately owned lands in addition to state and federally managed public lands (**Figure 3.9-1**). Approximately 10 percent (88,365 acres) of this acreage is BLM-administered land, 7 percent (64,215 acres) is USFS-administered land, 7 percent (65,050 acres) is state owned land, and 76 percent (697,037acres) is privately owned land and/or open water. Grazing within these allotments is by cattle, sheep, and wildlife (elk, mule deer, and pronghorn).

3.9.1 Overview

The CCPA consists of 1,502,381 acres and includes, fully or in part, 83 grazing allotments. Of these, 62 allotments are administered by the BLM providing approximately 17,657 AUMs, and 21 allotments (also referred to range management units by the USFS) are administered by the USFS providing approximately 26,862 AUMs within the TBNG (**Table 3.9-1**). An AUM is defined as the amount of forage necessary to sustain a cow/calf pair or equivalent for 1 month.

The following statutes, regulations, and orders authorize or are relevant to BLM's grazing administration program:

- The Taylor Grazing Act of 1934.
- The Federal Land Policy and Management Act of 1976.
- The Public Rangelands Improvement Act of 1978.
- EOs 10046 of March 24, 1949; 10175 of October 25, 1950; 10234 of April 23, 1951; 10322 of January 26, 1952; 10787 of November 6, 1958; and 10890 of October 27, 1960. These EOs transferred land acquired under the Bankhead-Jones Farm Tenant Act, 7 USC1010, to the Secretary of the Interior for administration under the Taylor Grazing Act. EO 12548 of February 14, 1986 indefinitely extended the PRIA grazing fee formula.
- The Oregon and California Railroad Grant Land Act of 1937, 43 USC 1181d.
- Other public land orders, EOs, or agreements that relate to the Secretary of the Interior's authority to administer livestock grazing on specified lands.

Furthermore, the BLM-administered allotments are managed to permit livestock grazing in accordance with the 2007 Casper RMP and the Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for Public Lands Administered by the BLM in the State of Wyoming (BLM 1997).The USFS-administered allotments are managed in accordance with the Granger-Thye Act of 1950, the National Forest Management Act of 1976, Forest Service Manual 2200, the 2002 TBNG LRMP, and the Thunder Basin Grazing Association Grazing Agreement #TBGA-2012.

Under the 1997 Wyoming Standards and Guidelines for Livestock Grazing Management, the BLM is responsible for achieving the following four fundamentals of rangeland health on public lands (BLM 1997):

- Watersheds are functioning properly. This requires adequate soil stability, water infiltration, optimal plant growth, and minimal surface water runoff.
- Water, nutrients, and energy are cycling properly. Riparian and wetland vegetation need to display structural, age, and species diversity as well as adequate resiliency to human disturbance, the ability to provide forage and ground cover, dissipate energy, and provide for groundwater recharge.

- Water quality meets State of Wyoming standards. All actions authorized by the BLM that affect chemical, physical, or biological characteristics will comply with federal and state water quality rules and regulations.
- Protection of special status species habitat. Rangeland conditions are capable of sustaining viable and diverse populations of native plant and animal species and providing habitat to support threatened and endangered species, special status species, and species of concern.

The Casper RMP and ROD establishes the objectives for managing livestock grazing on BLM-administered lands. Through these objectives, the BLM is committed to avoiding a net loss of AUMs whenever possible and to identifying and implementing opportunities to improve vegetation and increase AUMs available to livestock grazing operations. Additionally, the Casper RMP requires an adequate supply of forage vegetation be available for livestock grazing and encourages the conversion of suitable abandoned oil and gas wells to water wells in areas that have a need based on livestock or wildlife activity (BLM 2007b).

3.9.2 Existing Conditions

3.9.2.1 BLM Allotments

Livestock operators graze cattle and sheep throughout the CCPA on the 62 BLM-administered grazing allotments (**Table 3.9-1**). These BLM allotments provide for a total of 17,657 AUMs for cattle and sheep. Operators typically are permitted to graze livestock year-round on the BLM portion of the allotments; however, 10 of the 62 allotments do have seasonal timing restrictions for grazing.

Management Categories

Depending on overall rangeland health, the BLM manages allotments at different levels of intensity per three management categories as follows (BLM 2008g):

- Improve (I) Category – Monitoring will be required for allotments that do not meet rangeland health standards. Rangeland health evaluations will be completed prior to processing authorizations to determine if the allotment meets or does not meet rangeland health standards. If the allotment does not meet rangeland health standards, causal factor(s) will be identified and a proposed action and alternatives will be developed to comply with NEPA.
- Maintain (M) Category – Rangeland health evaluations will need to be conducted, if not already completed, and monitoring may be required to detect changes in rangeland health. NEPA analysis may be required to process authorizations for livestock grazing.
- Custodial (C) Category – Grazing authorizations will be processed using existing information. Rangeland health evaluations will only be required in the case of fire or drought events or if first (category I) or second (category M) priority work has caused a change in overall rangeland health.

Of the 62 BLM-managed allotments, nine are designated under the Improve category, and the remaining 53 are designated as Custodial. Within the CCPA, the greatest threats to livestock grazing operations is the loss of forage vegetation due to oil and gas and other forms of development as well as infestations of noxious weeds and invasive plant species.

Rangeland Improvements

Rangeland improvements can include fencing, cattle guards, water tanks and wells, reservoirs, and vegetation manipulations (e.g., seedings and prescribed burns). The BLM typically documents Water improvements; however, not all improvements are documented. Thirty-seven water improvement projects have been documented on BLM allotments within the CCPA (**Table 3.9-2**). Livestock fencing is prevalent throughout the CCPA.

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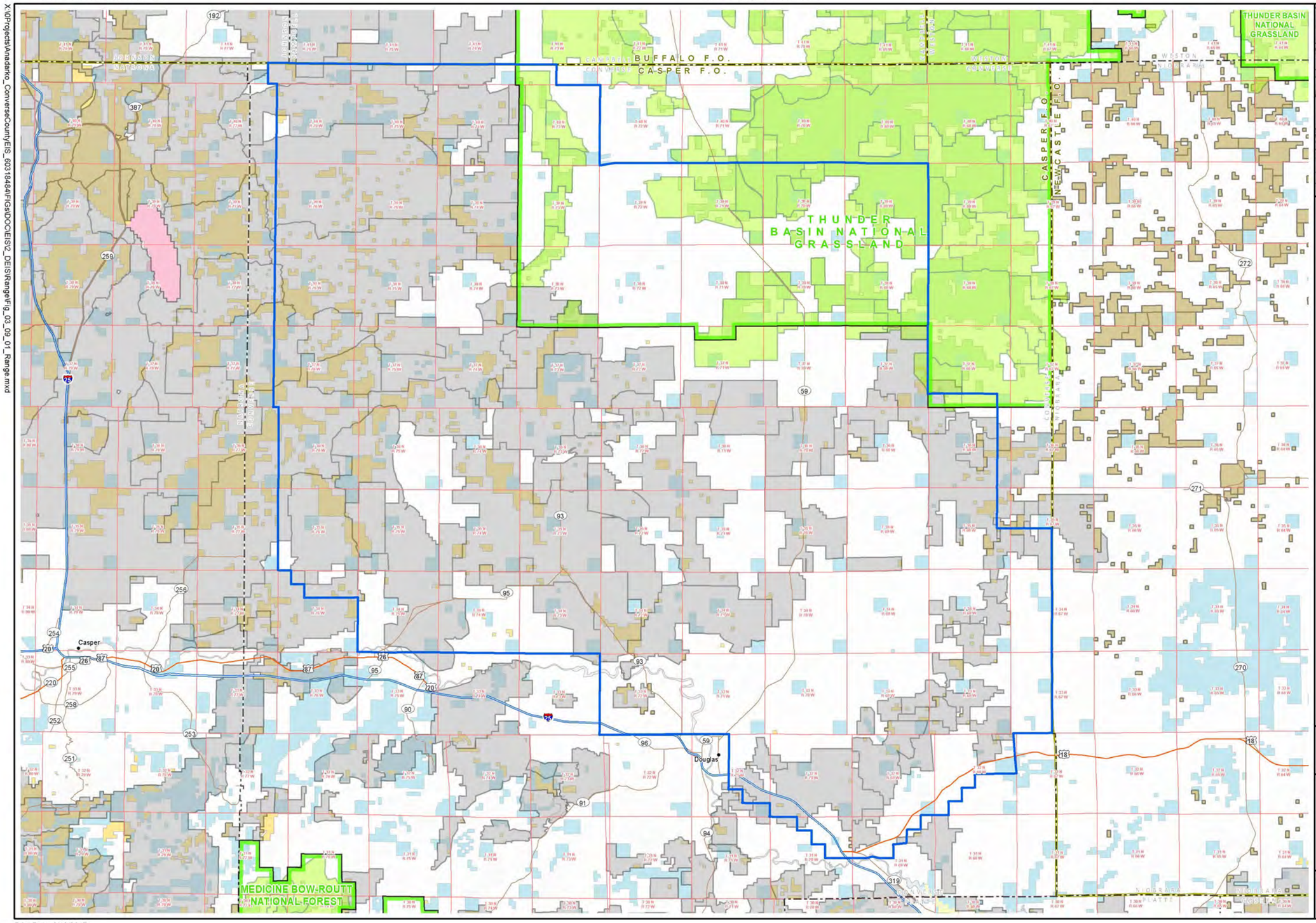

- Project Boundary
- BLM Field Office Boundary
- USFS Administrative Boundary
- BLM Grazing Allotment
- USFS Range Mangement Unit

Surface Ownership

- Bureau of Land Management
- US Forest Service
- State
- Private
- Bureau of Reclamation
- DOD/USACE

Source: BLM 2011h; USFS 2012b.

CONVERSE COUNTY OIL AND GAS EIS

Figure 3.9-1
BLM Grazing Allotments and USFS Range Management Units

0 2.5 5 10 Miles
0 2.5 5 10 Kilometers
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Table 3.9-1 BLM Grazing Allotments and USFS Range Management Units Intersecting the CCPA

Allotment Name	Total Allotment Acreage[1]	Federal Acres in Allotment	Total Permitted AUMs in Allotment	Average Public Acres Per Permitted AUM
BLM Grazing Allotments				
55 Ranch	15,301	3,478	863	4
Allemand	53,458	8,695	1,976	4
Antelope Creek	2,630	120	18	7
Antelope Creek 2	58,374	4,509	1097	4
Boner	24,899	400	12	33
Box Creek	12,041	321	72	5
Box Creek 2	4,527	80	8	10
Box Creek 3	4,800	80	24	3
Coates 2	4,224	476	79	6
Cole Creek	66,832	5,600	933	6
Colter Draw	18,041	2,160	163	13
Converse 1	6,242	121	30	4
Converse 3	1,687	160	36	4
Cottonwood Creek 2	6,756	1,160	121	10
Death Call Draw	15,998	2,791	764	4
East Antelope Creek	2,188	40	8	5
East Fork Twentymile	3,242	40	5	8
Etchemendy	2,114	480	48	10
Farnsworth Draw	16,745	2,395	478	5
Fetterman Creek	48,617	1,200	244	5
Fetterman Creek 2	751	86	19	5
Flat Top	3,730	80	8	10
Henrie	7,977	2,001	121	17
Henry	21,859	3,158	822	4
Highland Flats	9,465	760	174	4
Highland Flats 2	5,394	248	47	5
Hornbuckle	13,527	1,240	375	3
Horner	2,611	80	13	6
Horse Creek	1,291	40	10	4
La Prele Creek 4	17,126	1,480	209	7
Lightning Creek	3,736	555	166	3
Little Lightning Creek	14,276	240	48	5
Middle Fork Shawnee Creek	10,689	431	96	5
Middle Fork Shawnee Creek 2	1,040	160	35	5
Mikes Draw	12,573	350	87	4
Monument Hill	9,646	2,159	656	3

Table 3.9-1 BLM Grazing Allotments and USFS Range Management Units Intersecting the CCPA

Allotment Name	Total Allotment Acreage[1]	Federal Acres in Allotment	Total Permitted AUMs in Allotment	Average Public Acres Per Permitted AUM
North Fork	10,308	6,003	637	9
North Stinking Water Creek	8,552	2,920	877	3
Park	4,005	160	35	5
Red Butte	45,454	2,751	382	7
Rice Reservoir	12,411	141	32	4
Sage Creek	10,569	37	7	5
Sand Creek	12,370	720	216	3
Sandy Draw	2,542	1,078	322	3
Sawmill Canyon	33,197	2,651	714	4
Seidel	1,757	80	13	6
Seven L	54,627	3,360	570	6
Shawnee Creek	2,133	160	16	10
Shawnee Creek 2	2,844	80	10	8
Simpson Draw	1,444	40	5	8
Skunk Creek	11,134	320	82	4
Smith	62,618	8,470	1,518	6
Staple Three	32,651	200	40	5
Stark	4,936	40	6	7
Turner Divide	1,551	240	72	3
Turner Flats	24,377	2,039	607	3
Twentymile Creek	19,414	1,330	250	5
Twentymile Creek 2	6,247	640	93	7
Twentymile Creek 3	4,534	320	42	8
Valentine	20,905	4,398	911	5
Watkins Draw	472	112	19	6
Walker Creek	32,988	1,960	316	6
BLM Total	928,447	87,624	17,657	5
USFS Range Management Units				
Bell	7,318	1,927	528	4
Betty Don	2,385	1,157	241	5
Calamity Gulch	18,700	4,544	442	10
Dilts	3,658	78	18	4
Downs	7,509	1,858	919	2
Fiddleback	70,765	14,178	10,727	1
Jacobs	10,251	8,582	1,333	6
Johnson	4,567	1,981	543	4
Ketelson	43,211	2,145	3,113	<1

Table 3.9-1 BLM Grazing Allotments and USFS Range Management Units Intersecting the CCPA

Allotment Name	Total Allotment Acreage[1]	Federal Acres in Allotment	Total Permitted AUMs in Allotment	Average Public Acres Per Permitted AUM
Manning	5,084	1,717	520	3
North Baker	2,834	932	264	4
Pellatz	1,703	1,179	264	4
Reed	3,352	2,229	572	4
Sheldon Draw	4,991	80	23	3
South Baker	2,574	944	261	4
Spracklem	3,258	2,435	728	3
Steinle	2,381	1,997	538	4
Stoddard	17,615	8,738	3,896	2
Tillard	17,451	4,424	1,280	3
Weiss	4,032	2,479	562	4
Wild Bill	230	165	90	2
USFS Total	233,869	63,769	26,862	2

[1] Includes acreage for the total allotment; some allotments may be partially outside of the CCPA.

Source: BLM 2014d; USFS 2016.

1

Table 3.9-2 Water Developments on BLM-managed Allotments

Allotment Name	Reservoirs	Springs	Water Wells
Allemand	-	-	1
Boner	-	-	1
Coates 2	1	-	-
Cole Creek	1	-	5
Henrie	1	-	-
Henry	-	-	1
Lightning Creek	-	-	1
Miles Draw	-	-	1
North Fork	-	-	1
North Stinking Water Creek	1	-	2
Sandy Draw	-	1	-
Seven L	7	-	-
Smith	-	-	2
Staple Three	1	-	1
Turner Flats	1	2	-
Twentymile Creek	1	-	1
Valentine	3	-	-
Total	**17**	**3**	**17**

Source: BLM 2014d.

2

3.9.2.2 USFS Range Management Units

Livestock operators graze cattle within the CCPA on the 21 USFS range management units (**Table 3.9-1**). These USFS units provide for a total of 26,862 AUMs. The TBNG LRMP (USFS 2002) and the Thunder Basin Grazing Association Grazing Agreement #TBGA-2012 include guidance and direction for livestock grazing management. LRMP standards and guidelines include ensuring healthy livestock, managing livestock to maintain or improve vegetation communities in and along riparian corridors, and providing adequate periods of rest within allotments.

Management Categories

The CCPA overlaps with two geographic areas identified within the TBNG LRMP, Highlight Bill and Broken Hills. The Highlight Bill geographic area contains approximately 38,000 acres and is managed as rangeland with broad resource emphasis. This allows for low to high levels of livestock developments, rangeland improvements, and vegetation manipulation, and most authorizations are for year-round grazing (USFS 2002). The Broken Hills geographic area contains approximately 26,000 acres and is managed as rangelands with diverse natural-appearing landscapes. This area limits developments that would support livestock grazing and emphasizes biodiversity and sustainable ecological processes and functions.

Within both the Highlight Bill and Broken Hills geographic areas, the TBNG LRMP states the directive of resting one to ten percent of the rangeland annually for the purpose of meeting goals set for the management of fish, wildlife, and vegetation (USFS 2002). The LRMP also establishes goals for managing vegetation by setting objectives for structural and seral stage desired conditions of existing vegetation communities. Based on inventoried pastures within the TBNG, approximately 75 percent of the vegetation communities in the CCPA qualify as early to late-intermediate seral structure. Threats to livestock grazing operations on USFS-administered allotments are the same as those described for grazing allotments administered by the BLM.

Rangeland Improvements

Rangeland improvements on USFS-administered allotments include a combination of 58 known water developments including improvements to artesian springs as well as construction of dams, water wells, and windmills. Most of these are within the Highlight Bill geographic area where management goals are more conducive to improvement projects. **Table 3.9-3** lists the existing water developments within USFS-administered allotments.

Table 3.9-3 Water Developments within USFS-administered Allotments

Allotment Name	Artesian Wells	Dams	Wells	Windmills
Bell	-	1	-	-
Calamity Gulch	-	2	-	-
Fiddleback	3	24	1	5
Jacobs	4	10	-	3
Spracklen	3	-	-	-
Steinle	-	-	-	1
Tillard	-	-	1	-
Total	**10**	**37**	**2**	**9**

Source: USFS 2014b. USFS TBNG Livestock Grazing Allotment Data.

3.10 Recreation

The CCPA, the analysis area for recreation, offers a natural setting, which includes a variety of natural panoramic landscapes spanning from open prairies and sagebrush steppe communities to the Rochelle Hills and the enclosed landscapes found along the North Platte River. These landscapes provide a setting for a variety of outdoor recreational activities. The main recreational activities, self-reported in statewide surveys, available within the CCPA include scenic drives, visiting historical sites, wildlife watching, fishing, hunting, hiking or backpacking, camping, and horseback riding. Additional attractions include the TBNG and the historic Bozeman Trail as well as OHV use. Data for the number of hunters and their success rates were provided by the WGFD.

The Converse County Conservation District listed recreational opportunities as one of the most important natural resource priorities for the county. Survey results outlined in the Converse County Conservation District's Long Range and Natural RMP indicated that 30 percent of all respondents placed recreation and access for recreation among the most important issues faced by the community over the next decade.

These survey results are corroborated by increased recreational spending throughout Converse County, which has increased 7.2 percent since 2000, with the highest annual increase of 4.3 percent reported for 2013. The total amount of money spent on destination travel in Converse County has increased from 22.0 million dollars to 54.2 million dollars and accounts for all travel dollars spent during the 13-year period (Dean Runyan Associates 2014). Beyond the economic value, outdoor recreation opportunities provide improvement to the quality of life for those residents living in the vicinity of the CCPA. See Section 3.11.12 for a detailed discussion regarding non-market values.

3.10.1 BLM-administered Lands

In accordance with FLPMA, BLM manages public lands for multiple uses, including recreation. As detailed in the BLM Manual 8320 (BLM 2011f) and BLM Handbook H-8320-1 (BLM 2014f), BLM recreation management classifies land as Extensive Recreation Management Areas or as SRMAs. Guidance in BLM Manual 8320 establishes the commitment to incorporating the framework of outcome-focused management into the recreation management program. Outcome-focused management is a method of managing recreation that focuses on the positive outcomes from engaging in recreational experiences. This approach gives BLM a framework within which to manage recreation on public lands and provide outcomes that benefit individuals, communities, economies, and the environment. BLM Manual 8320, Planning for Recreation and Visitor Services (BLM 2011f) and BLM Handbook H-8320-1 (BLM 2014f) also provide policy, direction, and guidance on managing recreational resources as part of the land use planning process. Manual 8320 addresses the management of recreational settings to provide opportunities that allow visitors and local communities to achieve desired recreational benefits.

There are no backcountry byways or developed recreation sites within the CCPA. NHTs (including the Oregon, California, Mormon and Pony Express; see **Figure 3.2-1**) are managed as SRMAs in the CCPA to provide opportunities for visitors to view and study trail remains and to learn about the history of the area, to achieve a greater respect for cultural resources and better understanding of the pioneer experience. Other targeted benefits that may be derived by local communities include enhanced preservation of these trails and their settings, a sense of ownership and stewardship for cultural remains, and economic values linked to heritage tourism. Heritage tourism is defined as traveling to experience the places, artifacts, and activities that authentically represent the stories and people of the past (Federal Heritage Tourism Summit 2002). Heritage tourism includes commercial and noncommercial use along the NHTs and the Bozeman Trail.

BLM-administered land within the CCPA that is not managed as a SRMA or a special designation is managed as an Extensive Recreation Management Area, which is open to dispersed recreational use with minimal regulatory constraints; however, the RMP does include decisions that protect recreational values within the Sand Hills Management Area, the Bozeman Trail, and on BLM-administered lands

along the North Platte River. The objectives set for the CFO Extensive Recreation Management Area include visitor health and safety, the reduction of user conflicts, and resource protection. These objectives are to be realized utilizing environmental education programs to increase awareness and create a sense of public stewardship. BLM's accessible acreage within the CCPA is 43,792 acres (state accessible acreage is unknown). Dispersed recreation on this acreage includes, but is not limited to, sightseeing, touring, photography, wildlife viewing, floating, mountain biking, camping, fishing, and hunting. Portions of the North Platte River also fall within the CCPA boundary. The majority of the recreational activities include big game hunting as well as boating and fishing along the North Platte River.

OHV use is a popular method of exploring public lands within the CCPA. It also provides access for non-motorized dispersed recreational use. Although exceptions do exist, OHV regulations apply to resource uses on public lands including non-recreational uses such as agricultural management activities, geo-physical exploration, silvicultural practices and numerous land management activities.

Legal OHV access in the CCPA is common despite marginal access due to the dispersed land pattern. The existing county road network and the WGFD Walk-In programs provide some access to these lands for recreational purposes. WGFD walk-in areas are not open for OHV access. Access to public lands also can be granted by private landowners who control access to much of the area.

The natural setting commonly associated with public lands enhances the quality of existing motorized and non-motorized recreational opportunities such as hunting, fishing, and driving for pleasure even in areas with minimal access.

Public lands may be designated as open, limited, or closed. The BLM OHV established designations are as follows:

- Open to OHV Use
- Limited to Designated Roads and Trails
- Limited to Existing Roads and Trails
- Closed to OHV Use

The majority of public lands in the CCPA are designated as limited to existing roads and trails. Furthermore, 996 acres, or 0.07 percent of the CCPA, has been designated as closed to OHV use. The Sand Hills Management Area totals 20,090 acres, of which 2,006 acres (10 percent) are located within the boundary of the CCPA (**Figure 3.5-1**). This acreage is designated as limited to designated roads and trails. Surface ownership within the Sand Hills Management Area primarily is administered by the BLM. While there is no legal or reasonable public access, the area is highly valued for its hunting opportunities. Access to public lands is granted almost exclusively by paid professional guide services. Within the management area, 28 miles of primitive roads are open to motorized use, 12 miles of primitive roads are limited to authorized use only, and 8 miles of existing travel routes are closed.

3.10.2 USFS-administered Lands

Recreation in the TBNG is managed by the USFS under Forest Planning Regulation 36 CFR 219.21 and the TBNG LRMP. Forest Planning Regulation 36 CFR 219.21 provides standards for the development and consideration of relevant social and economic information, analyses and range of uses, values, products, and services. This regulation further requires evaluation of resources using the Recreation Opportunity Spectrum and provides oversight for developed recreational facilities, OHV-use opportunities, and scenic integrity objectives.

There are no inventoried trails systems or developed campgrounds on USFS-administered lands within the CCPA, but opportunities for hiking, hunting, and camping exist. Mountain biking and warm-water

fishing opportunities also are available, as is wildlife viewing, partly a consequence of the large concentration of golden eagles found in the region. Elk viewing and hunting provide additional recreational opportunities. Most of the recreation within the TBNG occurs in semi-primitive motorized areas.

On USFS-administered lands within the CCPA, the Recreation Opportunity Spectrum offers a framework for defining classes of recreational settings, opportunities and experiences. The majority of the USFS-administered land in the CCPA (91 percent) is designated as roaded natural, while the remainder is designated as rural (USFS 2014d). **Table 3.10-1** provides descriptions for each of these designations.

Table 3.10-1 Recreation Opportunity Spectrum Definitions

Designation	Definition
Roaded Natural	Characterized by predominately natural-appearing environments with moderate evidence of the sights and sounds of people. Such evidence usually is harmonious with the natural environment. Interaction between users may be moderate to high, with evidence of other users prevalent. Resource modification and utilization practices are evident but compatible with the natural environment. Conventional motorized use is allowed and incorporated into construction standards and design of facilities.
Rural	Rural areas are characterized by a natural environment that has been substantially modified by development of structures, vegetative manipulation, or pastoral agricultural development. Resource modification and utilization practices may be used to enhance specific recreational activities and to maintain vegetative cover and soils. Sights and sounds of humans are readily evident, and the interaction between users is often moderate to high. A considerable number of facilities are designed for use by a large number of people. Facilities are often provided for special activities. Moderate user densities are present away from developed sites. Facilities for intensified motorized use and parking are available.

Source: USFS 2014d.

3.10.3 Fishing and Boating Opportunities

The North Platte River provides multiple recreational activities within the CCPA. Approximately 22 miles of the North Platte River transect the CCPA. Common recreational activities include boating and fishing. Popular species of fish that provide recreational opportunities are trout, walleye, and catfish. The North Platte River transitions from cold water species such as trout to mainly warm water species such catfish near the town of Glenrock. Approximately 4 miles of the North Platte River within the CCPA have been designated as a blue ribbon stream and portions of LaPrele Creek have been designated as a red ribbon stream. Streams that are designated as blue ribbon support at least 600 pounds of sport fish per mile and those designated as red ribbon streams support between 300 and 600 pounds of sport fish per mile (WGFD 2006). There are no developed landing sites or WGFD access areas within the CCPA; however, there are numerous landing sites and access areas both upstream and downstream from the CCPA that allow recreational access to North Platte waters that flow through the CCPA. The Bixby Public Access Area is a designated recreation area within the cumulative impact study area (CISA) just outside of the CCPA along the North Platte River (**Figure 3.5-4**). The WGFD did not have estimates of recreational use along the North Platte within or near the CCPA (WGFD 2015a).

3.10.4 Big Game and Small Game Hunting

Hunting throughout the CCPA on federal, state, and private lands is common for mule deer, pronghorn, and to a lesser extent, elk. Some private landowners in the CCPA receive supplemental income from providing hunting and fishing opportunities. In 2001, following evaluation as a trial project, the Walk-in Area program was implemented as a permanent program by the WGFD. The Walk-in Area program allows the WGFD to assist landowners who support wildlife and maintain public hunting and fishing opportunities. The WGFD leases hunting or fishing rights on private land tracts. Participating landowners receive monetary compensation based on the size of the tract of land enrolled in the program. There are Walk-in Area access properties within the CCPA (AECOM 2012a).

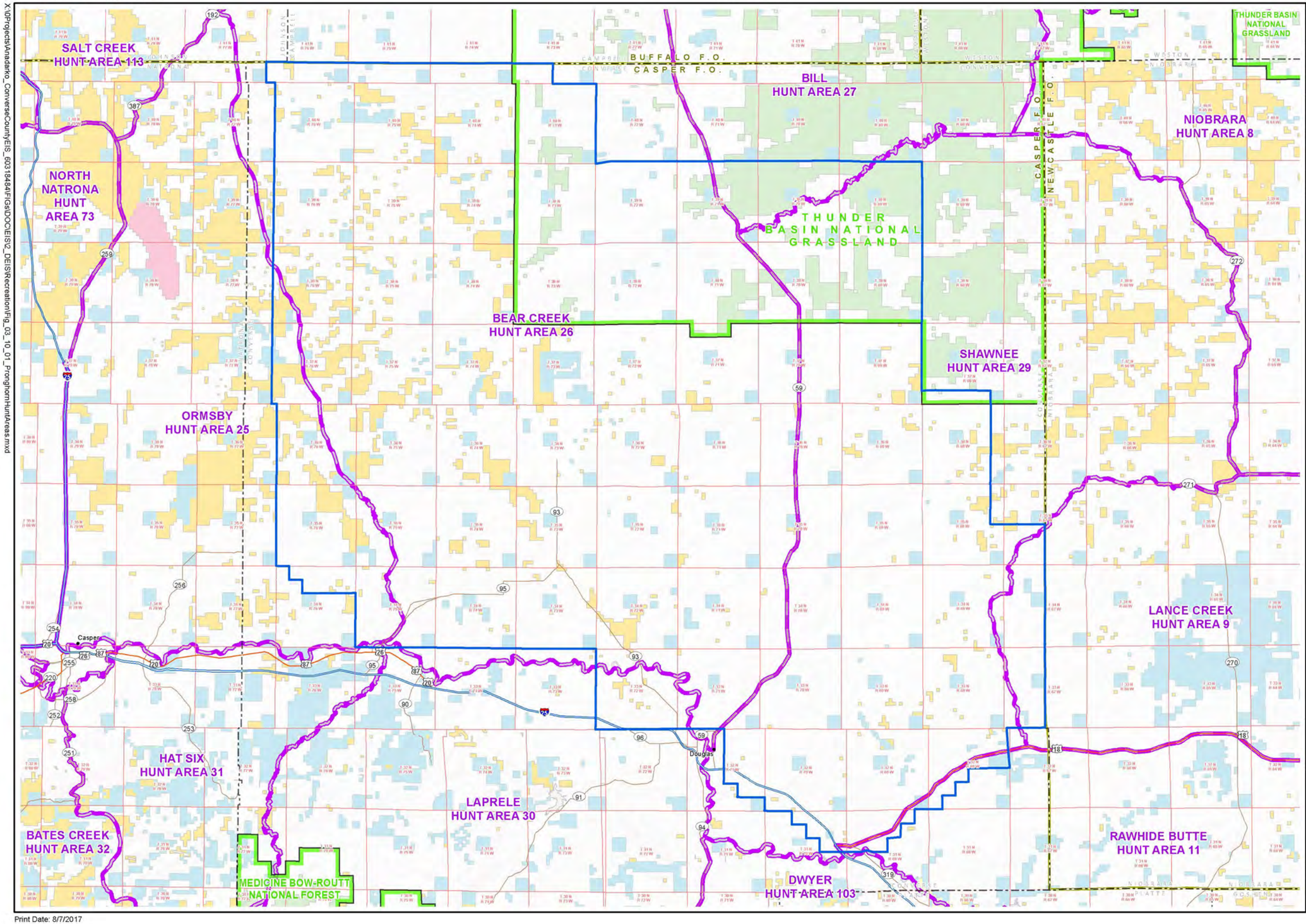
Commercial big game outfitting provides another source of supplementary income to many of the local ranchers. Many private landowners have entered into agreements with professional guide services or have established their own business. Qualified professional outfitters are licensed and granted the right to utilize Wyoming State Lands by the Wyoming Board of Outfitters and Professional Guides. All licensed Big Game Outfitters are eligible to apply for Special Recreation Permits granted by the BLM or Special Use Permits by the USFS that authorize the permit holders to conduct business on federal lands. Management objectives for these types of activities are defined in the land use planning documents and include increased public access to federal lands for recreationalists. Revenues collected from Special Recreation Permit fees are maintained at the field office level and are used to enhance public recreation opportunities. There were 18 commercial outfitters authorized to operate in CCPA as of June 2016. The majority of these outfitters are located on private ranches and guide antelope hunts on federal and private lands.

Prior to 2011, the WGFD observed a trend toward a reduction in private land available for public hunting (AECOM 2012a). No detailed analysis was conducted, but the decline was noted in the numbers of deer and pronghorn licenses unsold or still available after the license draw. Also, a reduction in the mule deer population may have caused landowners and outfitters to reduce the numbers of hunters on private guided hunts to ensure good success rates. At that time, the WGFD reduced out-of-state deer licenses to some degree in response to the mule deer decline (AECOM 2012a). Recent WGFD data suggests that declines in deer and pronghorn hunter and harvest numbers have stabilized and increased in most hunt areas.

The CCPA overlaps with seven pronghorn hunt areas, six mule deer hunt areas, and five elk hunt areas. The seven pronghorn hunt areas that transect the CCPA include the Bear Creek, Bill, Lance Creek, Laprele, Ormsby, Rawhide Butte, and Shawnee hunt areas (**Figure 3.10-1**). The Bear Creek hunt area overlaps a large portion of the western half of the CCPA, while the Shawnee hunt area overlaps approximately the eastern third of the CCPA. The remaining 5 units overlap with smaller portions along the edges of the CCPA.

Table 3.10-2 provides pronghorn hunting statistics from 2009 through 2016. The number of hunters in the Bear Creek hunt area rose to a peak in 2011 before declining in 2016 to levels 55 percent lower than those reported in 2009. However, in the Shawnee hunt area, the number of hunters and subsequent pronghorn harvest rose dramatically from 2009 to 2010 before declining sharply to 2013 levels that were 45 percent lower than those in 2009. Hunter and harvest numbers have rebounded since 2013.

The six mule deer hunt areas transected by the CCPA include the Douglas, Lusk, Rochelle Hills, South Converse, Southeast Wyoming, and Twenty Mile hunt areas (**Figure 3.10-2**). The Douglas hunt area lies within a large portion of the western half of the CCPA, while the Rochelle Hills and Twenty Mile hunt areas are within the northeastern portion and the southeastern portion of the CCPA, respectively. The remaining three units overlap with smaller portions along the eastern and southern edges of the CCPA.



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Source: WGFD 2014a.

CONVERSE COUNTY OIL AND GAS EIS

Figure 3.10-1

Pronghorn Hunt Areas

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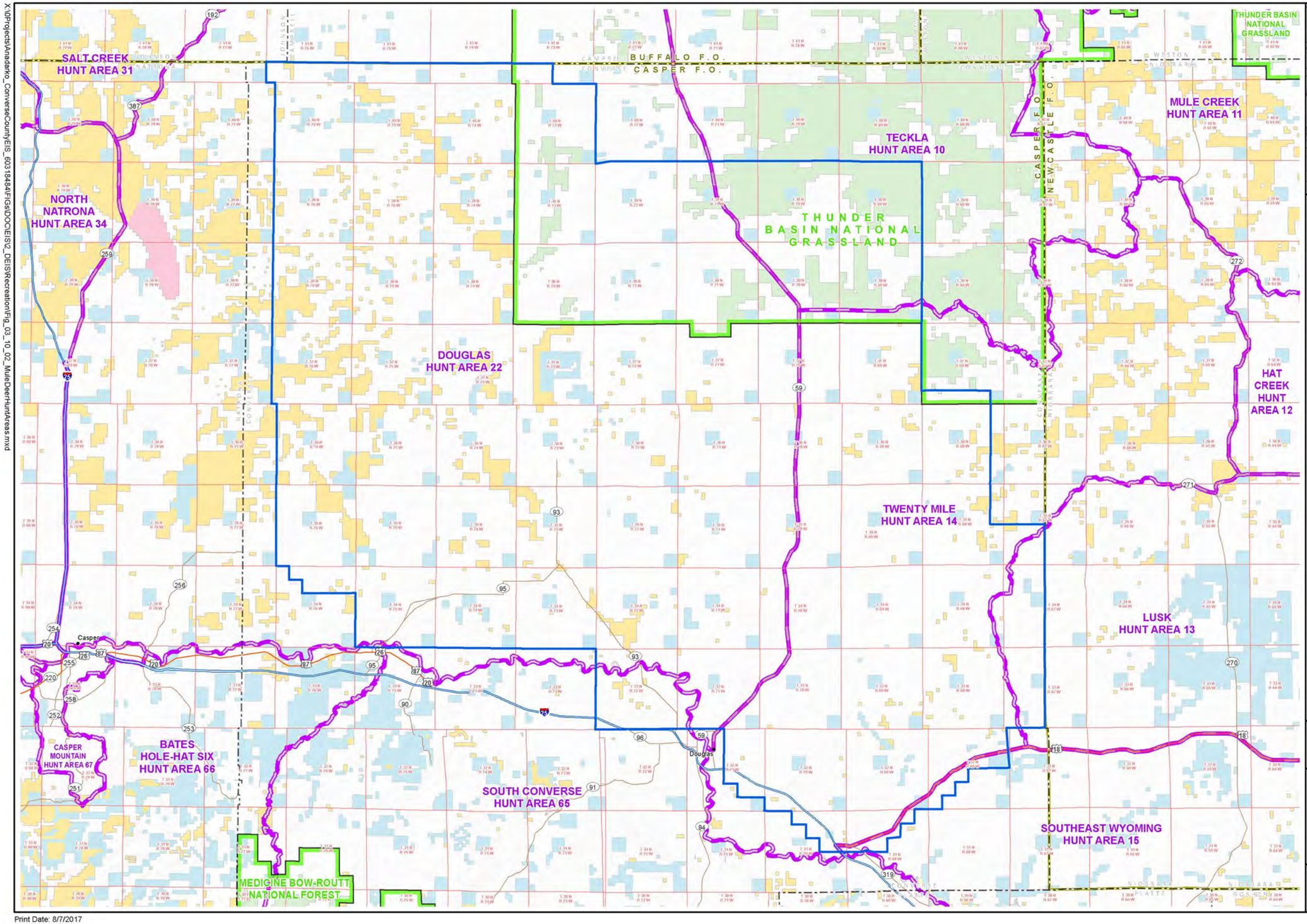

Project Boundary
BLM Field Office Boundary
USFS Administrative Boundary
Mule Deer Hunt Area

Surface Ownership

Bureau of Land Management
US Forest Service
State
Private
Bureau of Reclamation
DOD/USACE

Source: WGFD 2014a.

CONVERSE COUNTY OIL AND GAS EIS

Figure 3.10-2

Mule Deer Hunt Areas

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Print Date: 8/7/2017

Table 3.10-2 Pronghorn Hunting Statistics

Game Management Area/Year	Total Pronghorn Harvest	Total Hunters	Hunter Days/Harvest
Bear Creek (Hunt Area 26)			
2016	901	868	2.2
2015	984	1,062	4.8
2014	989	1,103	3.2
2013	1,463	1,663	3.3
2012	2,039	2,385	3.5
2011	2,235	2,444	3.6
2010	2,149	2,295	3.4
2009	1,798	1,938	3.6
Shawnee (Hunt Area 29)			
2016	676	683	3.1
2015	494	533	4.0
2014	297	627	4.7
2013	762	588	3.9
2012	1,110	1,272	3.9
2011	1,423	1,637	3.9
2010	1,846	2,042	3.9
2009	1,033	1,069	3.6

Source: WGFD 2017e.

As detailed in **Table 3.10-3**, mule deer hunter and harvest numbers began to show consistent declines in the Douglas, Rochelle Hills, and Twenty Mile hunt areas starting around 2011 and 2012. The most dramatic decrease was observed in the Douglas hunt area where harvest numbers decreased 80 percent from 2009 to 2015; however, recent data suggests that hunter and harvest numbers are rising through all three hunt areas. The five elk hunt areas that transect the CCPA include the Laramie Peaks, Lost Springs, Pine Ridge, Rawhide, and Rochelle Hills areas (**Figure 3.10-3**). The Lost Springs area occupies a large portion of the central and southeastern portion of the CCPA. The Pine Ridge area overlaps with the western third of the CCPA and the Rochelle Hills area is located in the northeast corner. The remaining two units overlap with smaller areas along the southern portion of the CCPA.

Table 3.10-4 shows elk hunting statistics from 2009 through 2016. Hunter numbers have steadily increased in the Pine Ridge hunt area, while declining in the Lost Springs hunt area during the 2009 to 2013 timeframe. Hunter numbers have rebounded from 2014 to 2016. The number of hunters in the Rochelle Hills hunt area peaked in 2012 before declining substantially in 2013 to levels relatively consistent with 2009; however, data from 2014 to 2016 details increases in both harvest and hunter numbers.

Table 3.10-3 Mule Deer Hunting Statistics

Game Management Area/Year	Total Mule Deer Harvest	Total Hunters	Hunter Days/Harvest
Douglas (Hunt Area 22)			
2016	213	247	4.0
2015	174	246	4.6
2014	254	359	5.1
2013	323	491	6.9
2012	451	546	4.5
2011	838	655	5.2
2010	820	969	4.6
2009	890	1,004	4.2
Rochelle Hills (Hunt Area 10)			
2016	63	85	4.8
2015	63	88	4.5
2014	103	275	9.4
2013	120	384	14.9
2012	123	343	9.5
2011	168	380	8.5
2010	154	372	8.8
2009[1]	191	376	6.1
Twenty Mile (Hunt Area 14)			
2016	180	281	6.9
2015	117	194	6.1
2014	145	254	7.3
2013	135	280	7.5
2012	227	360	6.4
2011	245	469	8.3
2010	154	372	8.8
2009	414	549	5.3

[1] Includes Dull Center Hunt Area.

Source: WGFD 2017e.

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NON-HERD UNIT HUNT AREA 129

NON-HERD UNIT HUNT AREA 129

BUFFALO F.O.

CASPER F.O.

THUNDER BASIN NATIONAL GRASSLAND

ROCHELLE HILLS HUNT AREA 113

THUNDER BASIN NATIONAL GRASSLAND

CASPER F.O.

NEWCASTLE F.O.

BUFFALO CREEK HUNT AREA 120

PINE RIDGE HUNT AREA 122

LOST SPRINGS HUNT AREA 126

Casper

Douglas

MUDDY MOUNTAIN HUNT AREA 19

LARAMIE PEAK HUNT AREA 7

RAWHIDE HUNT AREA 3

MEDICINE BOW-ROUTT NATIONAL FOREST

MONTANA
WYOMING
UTAH
COLORADO

Project Boundary
BLM Field Office Boundary
USFS Administrative Boundary
Elk Hunt Area

Surface Ownership

Bureau of Land Management
US Forest Service
State
Private
Bureau of Reclamation
DOD/USACE

Source: WGFD 2014a.

CONVERSE COUNTY OIL AND GAS EIS

Figure 3.10-3

Elk Hunt Areas

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Table 3.10-4 Elk Hunting Statistics

Game Management Area/Year	Total Elk Harvest	Total Hunters	Hunter Days/Harvest
Lost Springs (Hunt Area 126)			
2016	114	335	18.2
2015	119	290	11.5
2014	88	321	17.7
2013	58	170	19.3
2012	76	190	17.6
2011	76	221	16.9
2010	197	43	31.9
2009	347	1,124	20.0
Pine Ridge (Hunt Area 743)			
2016	126	143	4.2
2015	113	134	4.4
2014	107	136	5.9
2013	95	126	6.3
2012	51	71	6.9
2011	50	64	5.7
2010	45	71	10.0
2009	40	56	6.3
Rochelle Hills (Hunt Area 344)			
2016	49	52	2.2
2015	143	167	5.2
2014	75	98	9.6
2013	21	23	3.0
2012	65	89	6.0
2011	52	71	5.4
2010	66	72	5.4
2009	24	25	12.4

Source: WGFD 2017e.

Small game and upland birds also are commonly hunted within the CCPA. The CCPA is almost entirely within Management Area 3 (**Figure 3.10-4**). The most commonly hunted species within Management Area 3, as determined by harvest totals, are pheasant, mourning dove, gray partridge, sharp-tailed grouse, and blue grouse. Other species hunted within Management Area 3 include chukar, gray partridge, cottontail rabbit, snowshoe hare, and squirrel. The number of hunters of small game and upland birds has remained mostly static, with the exception of a sharp decline in 2013. Hunter numbers rebounded in 2014 and 2015. **Table 3.10-5** provides small game, upland game bird, and mourning dove hunting statistics from 2010 through 2013.

Table 3.10-5 Small Game, Upland Game Bird, and Mourning Dove Hunting Statistics

Management Area/Year	Total Harvest[1]	Total Hunters	Hunter Days/Harvest
Management Area 3			
2016[2]	NA	NA	NA
2015	28,050	4,895	1.6
2014	14,873	4,175	1.3
2013	14,455	3,993	1.1
2012	20,826	5,327	1.3
2011	21,191	5,554	1.2
2010	20,065	5,002	1.1

[1] Harvest totals also include pheasant, chukar, gray partridge, sharp-tailed grouse, ruffed grouse, blue grouse, cottontail rabbit, snowshoe hare, squirrel, and mourning dove.

[2] Data for 2016 not available.

Source: WGFD 2017e.

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THUNDER BASIN NATIONAL GRASSLAND

BUFFALO F.O.

CASPER F.O.

CASPER F.O.

NEWCASTLE F.O.

THUNDER BASIN NATIONAL GRASSLAND

MANAGEMENT AREA 3

MANAGEMENT AREA 5

MEDICINE BOW-ROUTT NATIONAL FOREST

Casper

Douglas

MONTANA

WYOMING

UTAH

COLORADO

Project Boundary

BLM Field Office Boundary

USFS Administrative Boundary

Small Game/Upland Bird Managememnt Area

Surface Ownership

Bureau of Land Management

US Forest Service

State

Private

Bureau of Reclamation

DOD/USACE

Source: WGFD 2010c.

CONVERSE COUNTY OIL AND GAS EIS

Figure 3.10-4
Small Game and Upland Bird Management Areas

0 2.5 5 10 Miles

0 2.5 5 10 Kilometers

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3.11 Socioeconomics and Environmental Justice

3.11.1 Introduction

The socioeconomic conditions in areas and communities that could be affected by the Project due to development of up to 5,000 new wells over a 10-year period in Converse County, Wyoming are described in terms of economic, population and housing conditions, local government and school district infrastructure, key public services, fiscal conditions, and the social setting. Minority, tribal, and low-income populations also are addressed in the context of potential environmental justice considerations.

Active oil and gas exploration and development activity occurs in Converse County and in neighboring Campbell County. As of November 2014, 18 drilling rigs were operating in Converse County, 13 rigs were drilling in Campbell County, and one rig was active in Natrona County (Baker Hughes 2014). Substantial infrastructure, such as roads, gathering systems, and ancillary production and product transportation facilities has been constructed to support this development, and additional infrastructure is planned or under construction. The recent and ongoing oil and gas activity and its related social and economic effects are part of the socioeconomic baseline conditions described in this section. Additional information and insights into regional socioeconomic conditions is available from the Task 1C Current Social and Economic Conditions report prepared as part of the BLM Powder River Basin Coal Review (AECOM 2012b). Further detail regarding existing infrastructure is provided in Chapter 2.0, Section 3.5 (Land Use), and Section 3.13 (Transportation).

Socioeconomic conditions can be dynamic during periods of active oil and gas exploration and development. Energy companies respond to real and anticipated changes in market prices, as evidenced by the dramatic fall in energy prices in December 2014. As such, local governments and other service providers continually respond to changes in demands and the availability of production and activity related revenues, and the labor market responds to job opportunities and availability that can affect individual households decisions regarding commuting, residency, and local population. The timing, magnitude, and direction of such changes are uncertain, and this uncertainty poses challenges for the socioeconomic assessment in terms of characterizing baseline conditions and assessing the potential socioeconomic effects of the alternatives.

This discussion of the affected environment for socioeconomics and environmental justice draws on information from numerous public sources, much of which is reported and/or updated periodically; although most secondary data is published a year or more after actual events have occurred. Such frequent data releases and revisions of previously published data pose challenges with respect to describing the affected environment. Given the continual data releases, CEQ guidance to rely on best available information for NEPA must be balanced with the data analysis and report preparation time needed to complete an assessment, provided that material changes occurring after that cut-off are considered. Most of the economic, demographic, and fiscal information used to describe the affected environment are current through mid-2014. In many instances the quantitative data was augmented by qualitative information gained through observation, media releases, and interviews with local officials and service providers conducted in 2014. Information obtained from these diverse sources allows a more accurate assessment of socioeconomic conditions, particularly in a dynamic context such as that occurring in Converse County, where available secondary data may not fully reflect evolving socioeconomic conditions due to reporting lags. In the case of Converse County, oil and gas development activity continued through 2014, but the pace of such development then dropped dramatically as oil and gas prices declined. The slowdown resulted in substantial reductions in employment, demand for housing and some public services, retail sales, and local traffic levels. Some effects of these changes were considered in the impact assessment; however, the housing and public infrastructure assessments were conducted at the peak of the development in 2014 and do not reflect effects of the subsequent slowdown in development.

3.11.2 Socioeconomic Analysis Area

Figure 3.11-1 displays the regional map used for socioeconomic analysis. The CCPA is located entirely within Converse County, and Converse County government provides public services within the CCPA and along the various access routes. The assessment area for socioeconomics includes Converse County, Casper, nearby communities in Natrona County, and the communities of Wright and Gillette in Campbell County. This area encompasses the current locations of most oil and gas service firms and construction contractors that would be expected to support the Project as well as the primary labor pool and largest inventory of temporary and conventional housing for workers that would be directly or indirectly employed by the Project. This area also hosts the consumer retail and service industry base that likely would capture much of the changes in consumer and business demand for goods and services triggered by Project development.

Many of the direct effects of development and operation for the Project would be expected to occur in Converse County, particularly in and near the municipalities and communities of Douglas, Glenrock, Rolling Hills, Bill, and to a lesser degree, Lost Springs and Orin. Converse County has experienced substantial population growth in recent years and hosts many temporary residents associated with ongoing oil and gas development and related infrastructure/facility construction projects.

Converse County and the surrounding counties and municipalities provide services to workers and companies. The county itself, Converse County School Districts #1 and #2, and selected special districts presently receive ad valorem taxes, certain fees, and other revenues generated by oil and gas development and production in the county. The county also would receive sales and use taxes from expenditures by oil and gas service companies and on employee expenditures within the county, as well as ad valorem taxes on oil and gas-related commercial and residential properties.

Indirect socioeconomic effects from the Project including work force residency, commercial and industrial activity, and related effects including housing and local government service demand also would occur in Natrona County, principally in the communities of Casper, Evansville, Bar Nunn, and Mills, and to a lesser extent in Campbell County, principally in Gillette and Wright.

Local oil and gas workers currently living in the communities of Edgerton and Midwest in Natrona County; Glendo and Wheatland in Platte County; Lusk in Niobrara County; Kaycee and Buffalo in Johnson County; Newcastle and Upton in Weston County; and Moorcroft and Pine Haven in Crook County, may commute to work in oil and gas-related activities within the CCPA. While some non-local oil and gas workers may seek temporary housing in these communities in conjunction with the Project, most would be expected to seek temporary housing in Douglas, Glenrock, Wright, Gillette, and the Casper area due to the current and anticipated concentration of oil and gas service companies, proximity to the CCPA, and substantially larger inventory of housing/lodging and commercial infrastructure. Additionally, the travel distances and locations of these communities relative to the CCPA is such that the temporary population effects would tend to be more diffuse such that no one community likely would experience a large Project-related population influx.

The analysis area for direct environmental justice effects focuses on the CCPA and nearby communities in Converse County. Potentially affected communities in Campbell and Natrona counties are discussed in terms of the assessment of the potential for indirect environmental justice effects. The assessment also considers environmental justice effects on tribal resources (treaty-protected resources, cultural resources, and/or sacred sites) associated with the Native American groups known to have used the CCPA (Section 3.2.3). As noted in Section 3.2.3.1, the analysis area for resources of Native American concern is the CCPA plus their viewshed.

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Buffalo
Sundance
Moorcroft
Gillette
Upton
Newcastle
Wright
Kaycee
Midwest
Edgerton
Bill
Bar Nunn
Casper
Rolling Hills
Mills
Evansville
Glenrock
Douglas
Lost Springs
Orin
Lusk
Alcova
Glendo

BNSF
UP/BNSF Joint Line
UP

BIG HORN
WASHAKIE
JOHNSON
CAMPBELL
CROOK
WESTON
LAWRENCE
PENNINGTON
CUSTER
FALL RIVER
NATRONA
CONVERSE
NIOBRARA
PLATTE
GOSHEN
SIOUX
CARBON
ALBANY
FREMONT

MONTANA
WYOMING
UTAH
COLORADO
SOUTH DAKOTA
NEBRASKA

Project Boundary
Socioeconomic Assessment Area
Railroad
City/Town

Source: U.S. Census Bureau 2014c.

CONVERSE COUNTY OIL AND GAS EIS

Figure 3.11-1
Regional Map for Socioeconomics

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0 5 10 20 Kilometers
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3.11.3 Setting

This section provides a brief orientation to the geographic setting for the Project, the principal economic activities that occur in Converse County, and an introduction to the potentially affected communities. Additional detail on these subjects is provided in later sections.

Converse County is located in east-central Wyoming at the southern extent of the Powder River Basin (**Figure 3.3-1**). At 4,254.7 square miles in area, Converse County ranks eighth in size among Wyoming counties (Equality State Almanac 2010). With an estimated resident population of 14,313 in 2013, Converse County ranked 13th in terms of population among Wyoming counties (Census 2014b). Overall population density of the county was 3.3 persons per square mile; however, this was only 1.2 persons per square mile excluding Douglas and Glenrock. The population of the county is concentrated within a broad east-west corridor generally defined by the North Platte River and I-25 and nearby lands to the north and south. The area encompasses the major communities in the county as well as farms, ranches, and homes on smaller tracts in unincorporated areas and rural subdivisions.

Ranching and associated agriculture activities is the primary land use in the county and is a key sector in the regional economy along with oil and gas development and other energy development. Transportation, electrical energy generation, tourism, and outdoor recreation also are important elements of the Converse County economy.

Table 3.11-1 provides surface ownership information for Converse County. Approximately 76 percent of Converse County surface is in private ownership. Surface ownership information for Campbell and Natrona counties is not displayed because the CCPA is not located in either of these counties.

Table 3.11-1 Converse County Surface Ownership and Status

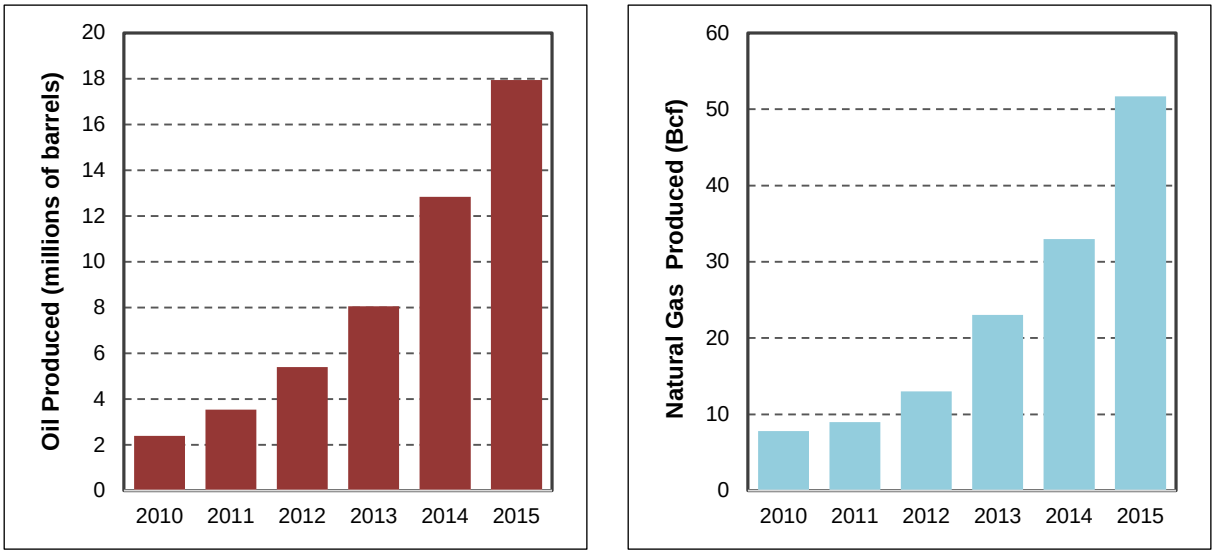
Ownership/Administration	Converse County	
	Acres	Percent
Federal (all agencies)		
Bureau of Land Management	130,048	4.74
Forest Service	259,264	9.45
Bureau of Reclamation	128	<0.01
Total Federal	389,440	14.20
State Government	260,659	9.50
Local Government	NA	NA
Other Lands	3,103	0.11
Private	2,089,284	76.18
Total	**2,742,486**	**100.00**

The CCPA encompasses 1,501,381 acres located wholly within Converse County. The bulk of the CCPA includes most of the northern part of the county and lies north of the I-25 corridor, with relatively small areas to the south of I-25 in the vicinity of Douglas. See Section 3.5 (Land Use) for additional information regarding land use, management, and administration in the CCPA.

The majority of the surface area within the CCPA (83 percent) is privately owned. Another 7 percent of the surface area is state owned and just over 10 percent is owned by the federal government (**Table 2.1-1**). In contrast to surface ownership, over 64 percent of the subsurface mineral estate is administered by the federal government, 23 percent is owned by the State, and 13 percent is privately

owned. Consequently, approximately 54 percent of the CCPA (812,189 acres) is comprised of federal mineral estate located beneath privately owned surface lands (i.e., split estate). These lands in split estate within the CCPA are among the estimated 11.6 million acres of private land in Wyoming that is in split estate (BLM 2015c). Surface and mineral ownership is shown in **Figure 1.1-1**, and the locations of existing oil and gas development and infrastructure are shown in **Figures 2.3-1** and **2.3-2**, respectively. In split estate situations, the surface rights and subsurface rights (such as the rights to develop minerals) are owned by different parties. In these situations, mineral rights are considered the dominant estate, meaning they take precedence over other rights associated with the property. However, the mineral owner must show due regard for the interests of the surface estate owner and occupy only those portions of the surface that are reasonably necessary to develop the mineral estate (BLM 2015c).

Substantial oil and gas resources are located in Converse County. From 2010 to 2015, Converse County oil and gas production increased dramatically (**Figure 3.11-2**). While the number of producing wells increased by one-third between 2010 and 2015 (from 983 wells to 1,309 wells), oil and gas production increased nearly seven-fold. Over this 5-year period, annual oil production increased from 2,399,432 to 17,942,061 barrels, while annual natural gas production increased from 6,665,768 to 51,693,511 million cubic feet (mcf). Since 2015, oil and gas development and production in Converse County has slowed as a result of low industry prices. The overall number of producing wells and monthly production have fallen. In July 2016, monthly oil production was 51 percent of that produced in May of 2015, and natural gas production was 27 percent lower for that corresponding period (WOGCC 2016a).



Source: WOGCC 2016a.

Figure 3.11-2 Annual Oil and Natural Gas Production in Converse County: 2010-2015

There are two major surface coal mines located near the CCPA to the northwest along the Converse/Campbell County line. Many of the employees of these mines live in Douglas and nearby areas and use company-provided bus transportation to work. Additionally, the Dave Johnston coal-fired power plant is located near Glenrock. Converse County also is an important domestic source of uranium and has emerged as a regional wind energy center. See Section 3.3 (Geology and Minerals) for a more detailed discussion of energy development in the CCPA and Converse County.

The City of Douglas, Converse County's largest community and county seat, is the governmental, commercial and health care center for the county, and has recently become the county's center for the expanding oil and natural gas development. Douglas has a number of hotels, motels, and recreational vehicle (RV) parks. As of November 2014, one new motel was under construction in Douglas, and another two were in the planning stage.

The Town of Glenrock and the nearby community of Rolling Hills are supported by the Dave Johnston power plant, nearby wind farms, the uranium mine, oil and gas workers and service companies, and local government offices and schools. Glenrock has limited temporary lodging and RV/camping capacity. The Town of Lost Springs is located about 30 miles east of Douglas on US 18/20.

The unincorporated community of Bill is 36 miles north of Douglas along Wyoming 59 and the Powder River Basin Joint Rail Line. Jointly owned by the Union Pacific and BNSF railroad companies, the joint line is the major railway serving the southern Powder River Basin, providing capacity to ship 400 million tons of coal per year. The joint rail line also ships oil from recently opened Black Thunder Terminal, and is poised to handle additional oil shipments as additional oil loadout facilities are built and come on line. Bill historically provided lodging for railroad crews and now hosts office and maintenance facilities for the two railroads. Commercial businesses in Bill include a hotel that now hosts both railroad and oil and gas workers.

The unincorporated community of Orin is 15 miles southeast of Douglas, just east of the intersection of I-25 and US 18/20. Founded in the late 1800s to support railroad operations, the community is located adjacent to the BNSF major coal haul routes out of the Powder River Basin. Commercial businesses in Orin include a truck stop/convenience store and a small trailer/RV park.

Natrona County is immediately west of Converse County. The Casper metropolitan area (approximately 50 miles west of Douglas along I-25) includes Casper, Bar Nunn, Evansville, and Mills. It has long been a major service center for oil and gas development throughout the state and is the second largest population center in the state; only Cheyenne, the state capital is larger. Numerous oil and gas service and construction companies have offices and yards located in the Casper area, which also is a regional commercial, professional services (e.g., engineering, legal and accounting) and medical service center for much of the state. The Casper metropolitan area has many hotels, motels, and apartments.

Campbell County is immediately north of Converse County. The City of Gillette (114 miles north of Douglas along Wyoming 59) is the county seat and regional service center for the coal mining and power generation industries in the Powder River Basin. Gillette hosts a number of oil and gas service and construction companies, and the city has numerous hotels, motels, RV and mobile home parks, and apartments. The Town of Wright (76 miles north of Douglas along Wyoming 59) is the nearest Campbell County community to the CCPA. Wright has three motels and a limited number of temporary RV sites.

3.11.4 Plans and Policies

3.11.4.1 Federal

The BLM Casper RMP (BLM 2007b) contains a number of goals for socioeconomic resources. These goals include providing opportunities to develop national energy resources and resources other than those that are energy-related; providing opportunities to sustain the cultural, social, and economic viability of local and regional communities; protecting public health and safety and environmental resources; and reducing potential risks associated with known hazards resulting from human activity. The BLM Casper RMP (BLM 2007b) does not identify specific objectives for socioeconomic resources; however, in addition to decisions and management actions pertaining to abandoned mines, formerly used defense sites, and the Casper airport, the RMP contains a number of decisions and management actions (specifically decisions 8001, 8006, 8007, and 8008) related to socioeconomic resources.

The TBNG LRMP (USFS 2001a) does not contain specific standards for socioeconomic resources; however, the LRMP states that "All goals and objectives (of the LRMP) fall under the overall mission of the Forest Service, which is to sustain the health, productivity, and diversity of the land to meet the needs of present and future generations" (USFS 2001a). Goal 2.b of the LRMP is to improve the capability of wilderness and protected areas to sustain a desired range of benefits and values. One of the rationales for the LRMP ROD is "Contributing to the economic diversity of neighboring communities by implementing a variety of natural resource programs that provide a sustainable output of multiple uses" (USFS 2002).

Federal policies associated with the management of public surface and mineral estate by the BLM and USFS provide for various payments to state and local governments to help those governments provide services such as firefighting, law enforcement, and search-and-rescue operations, as well as to fund construction of public schools and roads that can be impacted by development and use. Federal revenues earned and partially distributed back to local governments include bonus bids and annual rents associated with the leasing of mineral rights as well as royalties collected from the production of leased minerals. In addition to revenue sharing payments, local governments may receive payments associated with the Payments in Lieu of Taxes (PILT) program. The initial leases and bonus bids are paid for the right to explore and develop on federal lands. Royalties are paid on the value of mineral and energy resource production. The PILT program provides federal payments to local governments to help offset property taxes that are foregone due to non-taxable federal lands within their boundaries. PILT payments to counties are calculated using a formula based on the number of acres eligible for PILT payments, the county's population, prior payments from other specified federal land payment programs, state laws directing payments to specific government purposes, and the Consumer Price Index as calculated by the Bureau of Labor Statistics. Actual PILT payments frequently fall short of authorized amounts due to Congressional appropriation levels that only partially fund the program. PILT payments are not dependent on actual land use (i.e., would not change as a result of future oil and gas development); therefore, royalties would be the major source of future federal revenues associated with this Project.

3.11.4.2 County

The Converse County Land Use Plan, adopted by the Converse County Commissioners on April 7, 2015 (Converse County 2015a) places most of the CCPA within the Agricultural land use category, which includes mineral extraction as a defined use.

One objective of the Converse County Land Use Plan is to "establish a process for Converse County to coordinate with federal and state agencies' proposals that may affect the management of public land, private property rights, and natural resources, so that Converse County citizens may preserve their customs, culture, and economic stability while protecting their environment." (Converse County 2015a).

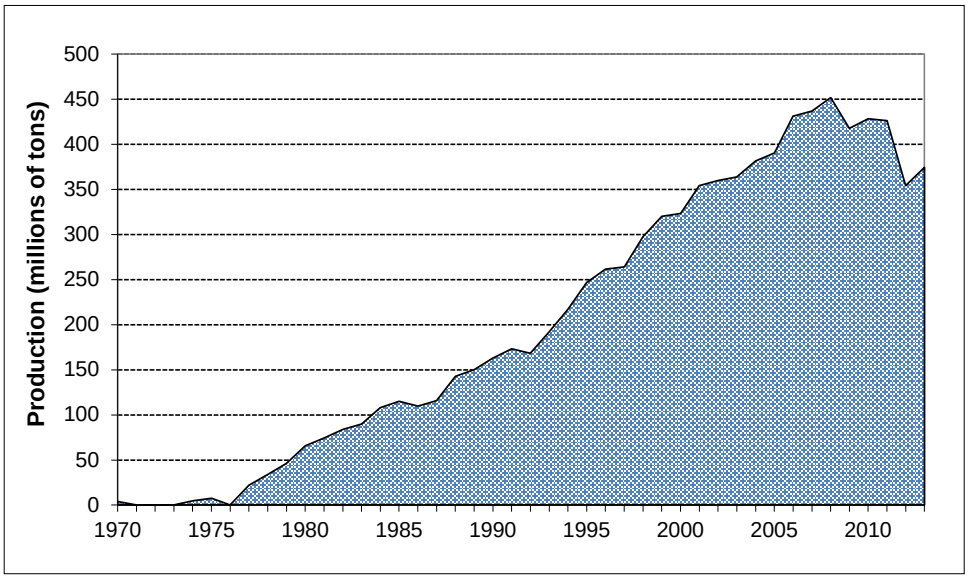
The Converse County Land Use Plan notes that "Federal and state managed lands make up approximately 24 percent of the total surface area of Converse County. However, over 60 percent of the subsurface minerals are federally managed. Thus, the County's economy is deeply affected and impacted by changes on federal and state managed lands. Local, state, and federal planning decisions may create benefits for a great many state and national citizens outside the county, but may transfer a disproportionate amount of the costs, impacts, and responsibilities to local communities and citizens. Through the land use planning process, Converse County commits to assuring that all natural resource planning decisions affecting the County shall be guided by the principles of maintaining and revitalizing various uses of federally managed and state managed lands. These planning decisions must consider impacts to Converse County's economy, custom, culture and historic use of government-managed and private property, and mitigate any negative impacts to the extent allowed by law. The County also commits to the assurance of private property rights, interests, and expectations; protection of the traditional economic structures which form the base for economic stability; and opening of new economic opportunities utilizing those natural resources within the County" (Converse County 2015a).

Converse County general land use policies as well as those related to energy and mineral resources can be found in the Converse County Land Use Plan (Converse County 2015a).

3.11.5 Local Economic Conditions

Energy development and production, including oil, natural gas, coal, and electric power generation and transmission, along with land ownership and use, play pivotal roles in the current social and economic conditions in the socioeconomic analysis area (i.e., including Converse, Natrona, and Campbell counties). Federal land and mineral estate plays an important role in the economy through federal coal, uranium, and oil and gas mineral leasing as well as through livestock grazing and hiking, hunting, camping, watching wildlife, scenic touring and other outdoor recreation use supported by public lands. Cattle ranching and outdoor recreation are important parts of the local economy, heritage, and culture. See Section 3.10 (Recreation) for additional discussion of outdoor recreation activities in and near the CCPA.

Energy development in the region has been ongoing for more than a century, with the first coal mine in the region developed near Glenrock in 1883 (Foulke et al. 2002). Although oil, gas, coal, and other mineral resources are found across much of Wyoming, the extensive surface-accessible coal resources located in Campbell County, majority of which are federally owned, set it apart from other domestic energy-producing areas. In the mid-1970s, Campbell County began its ascent to become the top coal-producing county in the nation, producing more than 450 million tons of coal in 2008, directly employing approximately 6,000 workers, and providing a critical economic and social foundation for the area. More recently coal production has dropped in response to the national economic recession and increases in renewable and natural gas fired electrical generating capacity (**Figure 3.11-3**).



Source: Wyoming State Inspector of Mines 2014.

Figure 3.11-3 Annual Coal Production in Converse and Campbell Counties: 1970–2013

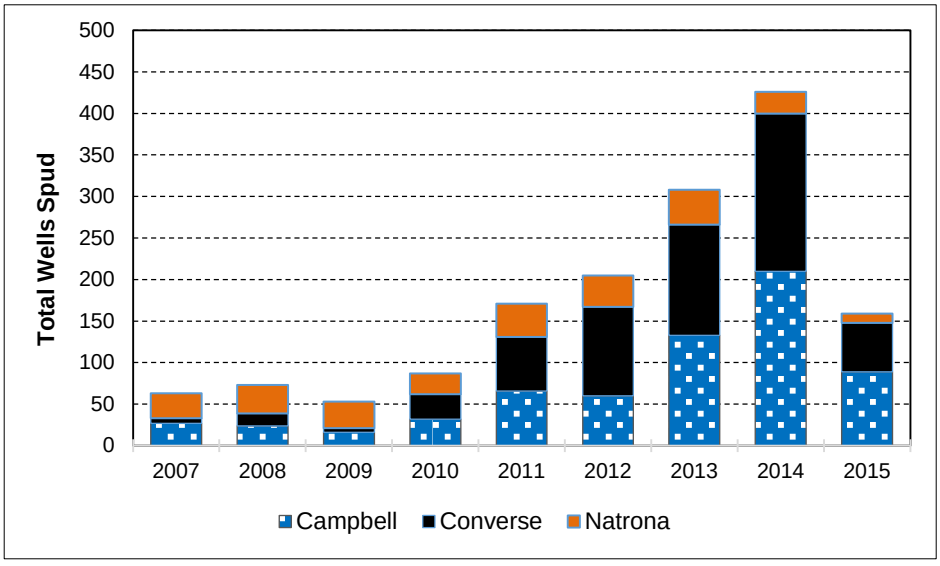
The abundance of coal and favorable mining economics in the region factored into the development of coal-fired power generation, including the Dave Johnston power plant near Glenrock, electrical transmission lines, and a rail network that serves as conduits for exporting energy out of the region. Energy development interest evolved as a number of wind energy projects, including three in Converse County, were built to capture another of the region's natural resources and capitalize on the availability of

transmission line capacity. Most recently, technological advances in the form of horizontal drilling and hydraulic fracturing precipitated the current thrust in oil development.

The region's diversified energy resource base has enabled it to experience 50 years of economic growth that largely has been void of the severe economic downturns that have followed mineral booms in many other parts of the western U.S. This period of extended growth, and the associated public sector revenues it generated, has been accompanied by substantial benefits including economic growth, employment opportunity, and infrastructure development for local governments across the state. At the same time, periods of rapid growth have stressed communities and their social structures, housing resources, and public infrastructure and service systems. As a result of the combined local and state efforts to accommodate energy-related growth, the three counties in the analysis area now have greater capacity to respond to growth in terms of community infrastructure and the existence of professional service systems.

3.11.5.1 Recent Oil and Gas Development in the Analysis Area

Oil and gas development has occurred in the three counties in the analysis area for some time, contributing to both the economic and social structure of the region. In recent years, that development has been characterized by two distinct elements: extensive coalbed natural gas development from relatively shallow formations in the later 1990s and early 2000s, and more recent interest in oil and gas from deeper tight-shale formations. The area of development interest for coalbed natural gas is defined by the location of coal deposits and initially was focused in Campbell County; however, it later expanded to Converse, Johnson and Sheridan counties. Expressed in terms of number of wells spudded, coalbed natural gas development peaked at more than 3,100 new wells in 2001 and has declined sharply over the ensuing 7 years. The unconventional oil-related plays gained momentum beginning in 2010, with more than 300 wells spudded in the analysis area in 2013 and 426 wells in 2014. In 2015, the combined number of wells spud in the analysis area dropped to 159, the fewest since 2010 (WOGCC 2016b, 2014b). The current play, targeted on deeper formations, is more focused in southern Campbell and northern Converse counties. **Figure 3.11-4** reflects the increase in oil and gas activity in the analysis area in recent years.

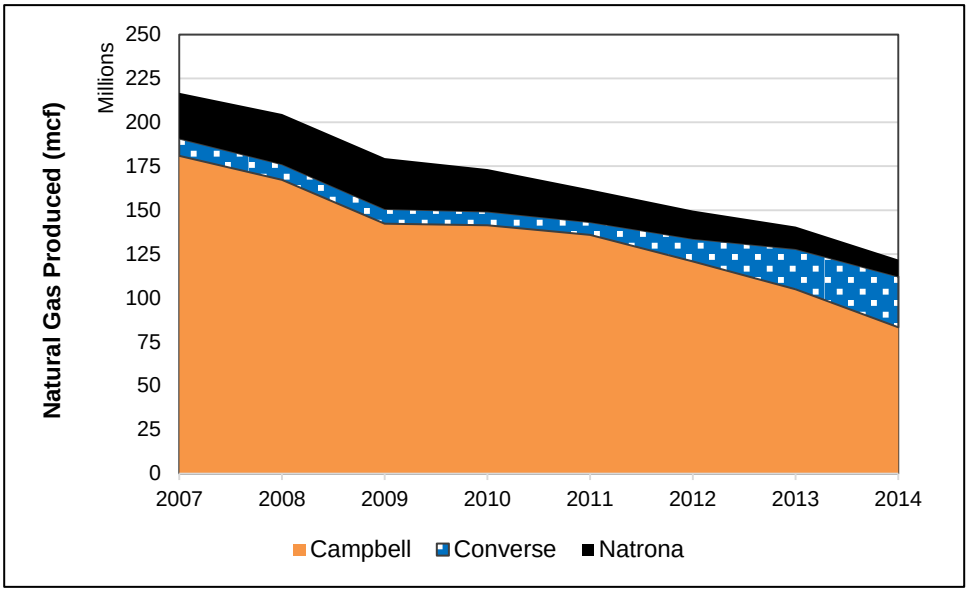


Source: WOGCC 2016b, 2014b.

Figure 3.11-4 Oil and Non-Coalbed Natural Gas Wells Spudded in the Analysis Area: 2007–2014

Besides the locational differences of active plays, development of the various formations differs in the nature, duration, level of development activity, and the productive life of wells. Whereas coalbed natural gas wells often could be completed in a matter of days with relatively small crews, horizontal oil and gas wells such as those that characterize recent and foreseeable development in the region often require weeks of effort and involve many more workers. With respect to production, coalbed natural gas wells have relatively short lives (typically 7 to 10 years) with production increasing over the first several years and then declining sharply. On the other hand, horizontal oil and gas wells often yield peak production within the first 6 months, decline rapidly, but then can continue producing for 20 years or longer.

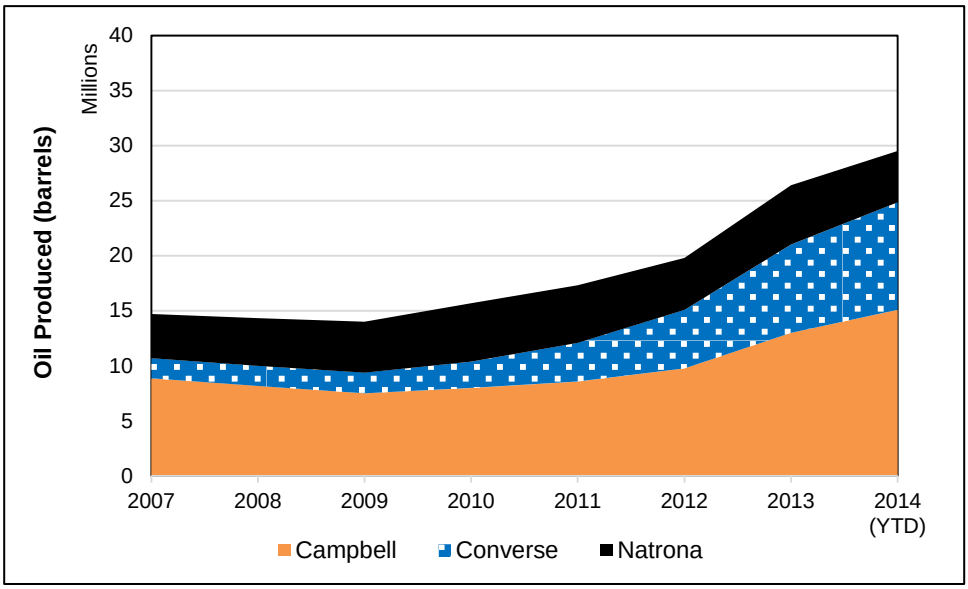
The combination of resources (oil and gas), drilling activity, and production characteristics of wells underlying recent production are important drivers of economic and fiscal trends in the analysis area. **Figure 3.11-5** depicts annual natural gas production in the analysis area from 2007 through November 2014. Although coalbed natural gas production in Converse County has been increasing, overall production across the region declined considerably between 2007 and 2014. These declines largely are attributable to the passing of the coalbed natural gas development "bubble" in Campbell County and annual production falling by more than 50 percent over this time period.



Source: WOGCC 2014c.

Figure 3.11-5 Annual Natural Gas Production in the Analysis Area: 2007–2014

Largely unaffected by past coalbed natural gas development, monthly oil production generally had declined in the analysis area from the mid-1980s through 2009. Relatively few new wells were drilled during that period, while older wells continued to produce but at declining rates. In 2010, annual oil production in the analysis area began rising, increasing by 90 percent between 2010 and 2014. The largest gains in oil production were in Converse County, while oil production from Natrona County declined (**Figure 3.11-6**). Oil production from the three-county analysis area in 2014 accounted for nearly one-half of the statewide total production in that year. In 2010, production from the analysis area had accounted for less than 30 percent of the statewide production. These recent increases in development and production foreshadow important economic and fiscal implications for the communities and local government.



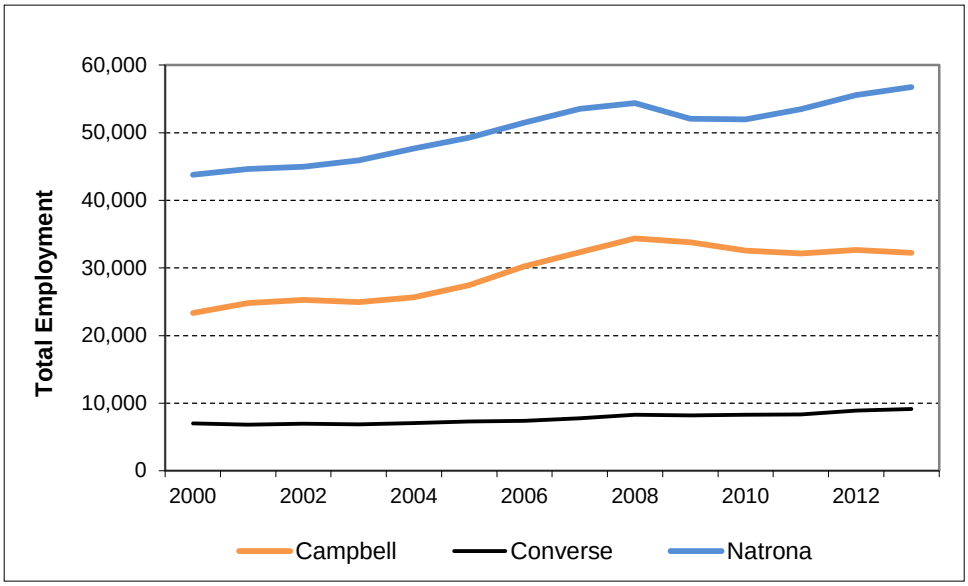
Source: WOGCC 2014c.

Figure 3.11-6 Oil Production in the Analysis Area: 2007–2014

3.11.5.2 Employment

Long-term economic growth has occurred in the analysis area since the mid-1980s, with minor contractions during the recent national recession and following the completion of major construction projects and periods of oil and gas and coal mining expansion. However, the region's diverse natural resources (e.g., coal mining, electrical generation, transportation, and agriculture) combined with the roles of Casper and Gillette as regional trade and service centers resulted in less severe "busts" during the periods of economic slowdown and contraction than those that occurred in other communities that were reliant on a single industry or mineral. During the period from 2000 to 2013, the three counties experienced a net gain of 24,708 jobs, even after accounting for the loss of 4,227 jobs during the recessionary years 2008 through 2010. The net job gains over the 13-year period were 9,034 jobs in Campbell County; 2,237 jobs in Converse County; and 13,437 jobs in Natrona County (**Figure 3.11-7**). Those gains represented net changes ranging from 32 percent in Converse County to 39 percent in Campbell County.

Information from the Wyoming Department of Workforce Services (WDWS) indicates that recent growth in total employment has continued despite reductions in coal mining and construction employment in Campbell County. Job losses in coal mining have been offset by gains in the support for the mining sub-sector (**Figure 3.11-8**). Most of the net gain has occurred in Natrona County, and more than 500 jobs have been added in Converse County (**Figure 3.11-9**). This data may not fully capture employment associated with contractors working in the area on a short-term basis that do not have local offices reporting to the WDWS. While the number of such workers is unknown and likely varies over time, they could contribute to temporary economic and social effects in nearby communities, including consumer spending and demand on some public facilities and services.

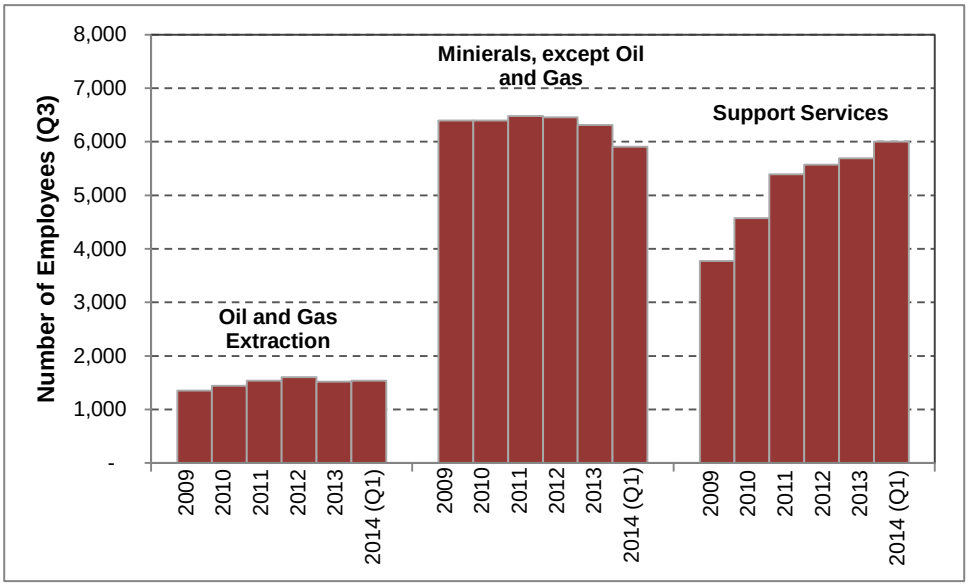


Source: U.S. Bureau of Economic Analysis 2014b.

Figure 3.11-7 Total Employment in the Analysis Area: 2000–2013

1

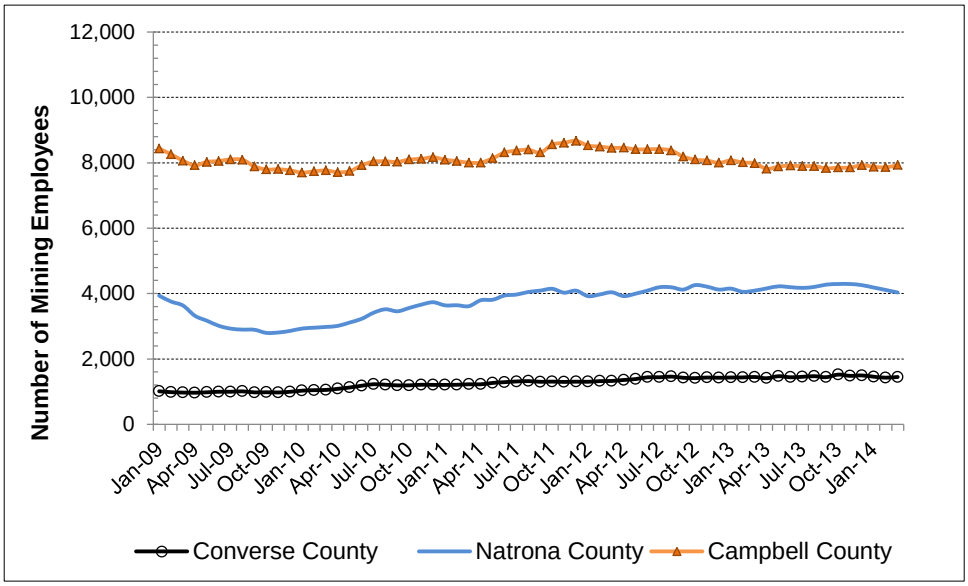
2



Source: Wyoming Department of Workforce Services 2014c.

Figure 3.11-8 Mining Sector Employment in the Analysis Area by Major Sub-Sector: 2009–2014 (1st Quarter)

3



Source: U.S. Bureau of Labor Statistics 2014a.

Figure 3.11-9 Mining Sector Employment in the Analysis Area: 2009–2014

The industrial distribution of employees covered by the state's unemployment insurance program provides another measure of the level of mineral development in the region. Employees in the mineral development industry accounted for nearly 18 percent of all employment in the three counties during the first quarter of 2014, and more than 23 percent of employees in Converse County. **Table 3.11-2** provides the number of employees and respective percentage shares by major industry, by county, and for the state. The role Casper plays as a regional trade and services center is demonstrated by the higher than average concentrations of jobs in the trade and health care industries.

There were 415 establishments located in the analysis area that were classified in the oil and gas extraction industry, or the broadly defined "support activities for mining" category (**Table 3.11-3**). These establishments represent 41 percent of all such establishments in Wyoming and do not include the many construction contractors, trucking firms, professional services, and other firms that support mineral development but are classified in other industries based on their primary lines of business. Together, the existence of these firms are indicative of an established capacity to support future oil and gas development in the region without the substantial investment and construction of service industry infrastructure that often accompanies initial development in new regions.

Although not obvious in the data reported in **Table 3.11-3**, local officials indicate increases in the number of active sand and gravel operations in Converse County. Such operations provide critical base material for well pad, road and bridge, and other commercial and industrial construction. These operations do not necessarily have permanent equipment installed and may not operate on a full time basis, but the increase in activity is another indication of an active oil and gas play.

Table 3.11-2 Distribution of Employment in the Analysis Area: 1st Quarter 2014

Industry Sector	Campbell County[1]		Converse County[1]		Natrona County[1]		Wyoming	
	Number of Employees	Percent of Total	Number of Employees	Percent of Total	Number of Employees	Percent of Total	Number of Employees	Percent of Total
Agriculture, Forestry, Fishing, and Hunting	(D)	--	114	2	113	<0.5	2,311	1
Mining	7,890	**29**	1,444	**23**	4,109	10	26,818	10
Utilities	367	1	(D)	--	143	<0.5	2,455	1
Construction	2,310	8	451	7	3,117	8	20,431	7
Manufacturing	541	2	171	3	1,768	4	9,578	3
Trade	4,007	15	506	8	7,532	**18**	37,861	14
Transportation and Warehousing	939	3	307	5	1,221	3	10,173	4
Health Care	969	4	289	5	5,825	**14**	23,947	9
Accommodations and Food Service	2,098	8	538	9	4,033	10	29,698	11
All Other Private [2]	3,176	12	831	13	7,999	19	43,981	16
Government	4,926	18	1,584	25	5,782	14	66,798	24
Total	**27,223**	**100**	**6,235**	**100**	**41,642**	**100**	**274,050**	**100**

[1] (D) = Data not disclosed due to federal regulations regarding confidentiality; shaded cells highlight sectors in the local economy that account for substantially higher shares of local employment than exists at the state level.

[2] All Other Private includes jobs in the postal service, information, finance and insurance, real estate and rental, professional and technical service, administrative and waster service, education services, arts, entertainment, and recreation, and other services.

Source: Wyoming Department of Workforce Services 2014b.

1

Table 3.11-3 Selected Economic Characteristics of the Oil and Gas Industry in the Analysis Area: 3rd Quarter 2013

	Converse County	Natrona County	Campbell County	Wyoming
Number of Employing Units				
Oil and gas extraction	7	40	31	242
Support activities for mining, including both coal mining and oil and gas[1]	48	138	151	768
Average weekly wage – mining	$1,478	$1,872	$1,636	$1,746
Average weekly wage – all non-mining private	$698	$816	$895	$750
Average weekly wage – all government	$804	$927	$862	$871

[1] Excludes many construction contractors, trucking firms, and professional services firms that are classified in other industries but also provide some support for oil and gas development.

Source: Wyoming Department of Workforce Services 2014a.

Compared to other local industries, employment in oil and gas development and coal mining tend to pay higher-than-average wages and salaries. In the first quarter of 2014, the average weekly wages in mining in the analysis area ranged from $1,478 (Converse County) to $1,872 (Natrona County). The statewide average for the same period was $1,746. The average weekly wages for the mining industry were as much as 1,293 percent higher in Natrona County than the average wage across all private non-mining sectors. The corresponding differential in Converse County was 112 percent higher. The average weekly wage differentials between the mining sector and average governmental wages ranged from 84 percent higher in Converse County to 102 percent higher in Natrona County. The high wages in the mining sector contribute to higher personal incomes for residents as well as consumer purchases supporting local trade and services establishments.

3.11.5.3 Local Agriculture Sector

The employment data presented in Section 3.11.5.3 provide insights and perspectives into the economic structure of the three counties in the analysis area. Although the economic importance of agriculture may not be reflected on a strict accounting basis, farming and ranching has played an important role in the settlement and economic development of the Mountain States region, and it continues to be viewed as an economic and social cornerstone of many local communities. Agriculture also is important from a land use perspective due to the high percentage of surface area that is privately held. **Table 3.11-4** characterizes the local agriculture industry using information from the 2012 Census of Agriculture (U.S. Department of Agriculture [USDA] 2014).

Agricultural pursuits provide livelihoods for many households, support local government and public education by contributing to the local tax base, and indirectly support other local businesses through purchases of farm equipment, fuel, veterinary services, and other goods and services. It also is not uncommon for households dependent on agriculture to derive income from multiple sources (e.g., one member engaged in farming/ranching and another working in education, government, or mining). In fact, the volatility of farm income over time suggests that having an “off-the-ranch” income may be economically imperative for some owners, particularly when agricultural production and income are adversely affected by extended drought.

The National Agricultural Statistics Service reported a total of 1,551 ranches and farms in the three counties in 2012, with 410 of these based in Converse County. Together, these operations encompass more than 7.0 million acres, more than 2.44 million acres of which are in Converse County. Many of the

ranches in the region are large; there are 574 ranches of at least 1,000 acres. The average (mean) size of agricultural operations in Converse County is nearly 6,000 acres, with a median size of 596 acres. There are a total of 655 farms of less than 180 acres in the 3 counties, including 97 in Converse County. By comparison, the average and median sizes for farms and ranches in Natrona and Campbell County are both lower.

Table 3.11-4 Selected Characteristics Of The Local Agriculture Sector

Parameter	Converse County	Natrona County	Campbell County
Number of Agricultural Operations			
Total number: 2012	410	397	744
Change in total number: 2007 to 2012	-25	-16	111
Number with 1,000 acres or more	165	113	296
Land Area in Agricultural Operations (acres)			
Total land: 2012	2,447,448	1,691,017	2,878,017
Total cropland	60,858	43,818	140,702
Average size: 2012	5,969	4,259	3,868
Median size: 2012	596	160	300
Other Statistics: 2012			
Farming/ranching as primary occupation (percent)	57.8	49.4	36.4
Inventory of cattle, calves, sheep and lambs (head)	113,755	73,388	107,267
Aggregate market value of products sold	$48,588,000	$42,923,000	$67,160,000
Total farm labor and proprietor's income	$8,945,000	$7,792,000	$8,067,000

Source: USDA 2014.

Nearly 58 percent of farmers and ranchers in Converse County consider agriculture their primary occupation. In Natrona and Campbell counties, more than half of the agricultural operations have principal operators who consider something other than farming and ranching their primary occupation. The overwhelming majority of the agriculture land base surrounding the CCPA is used for grazing, with only 245,378 acres (or 3.5 percent) of all agricultural lands, used to raise crops. More than half of the total cropland in the analysis area is located in Campbell County, and approximately one-quarter of the total cropland is in Converse County. In 2012, local ranchers and farmers reported a total inventory of 294,410 cattle, calves, sheep, and lambs. Cattle and calves accounted for two-thirds of the total. However, ranchers and farmers in Converse County reported nearly an equal number of cattle/calves and sheep/lambs (59,177 and 54,578, respectively). Operators in the two other counties reported substantially more cattle than sheep.

Energy costs, including gasoline, diesel, propane and electricity, are among the major production expenses for farmers and ranchers. These costs have risen sharply in recent years, both in terms of direct commodity costs and indirect transportation and shipping costs. Energy costs have contributed to the rising costs of fertilizers, other chemical products, and feed. Rising feed costs is in part a reflection of shifts in production patterns and markets related to the interest in ethanol production.

Many local ranchers use grazing on public lands to help sustain their operation. The CCPA encompasses part or all of 83 grazing allotments on public lands. Together these allotments provide more than 44,000 AUMs (see Section 3.9, Range Resources).

The combined revenues derived from sales of livestock, crops, and other products in 2012 were $158.7 million; $48.6 million of that total was reported by agricultural operations based in Converse County. Those revenues were augmented by receipts from participation in various governmental programs, as well as imputed and miscellaneous income.

After accounting for production expenses and the value of inventory changes, local farmers, ranchers, and their workers realized combined income of $24.8 million. Despite the differences in the number of agricultural operations and the land area involved in each of the three counties, the income of farm labor and proprietors was relatively comparable in all three counties, ranging from $7.7 million in Natrona County to $8.9 million in Converse County.

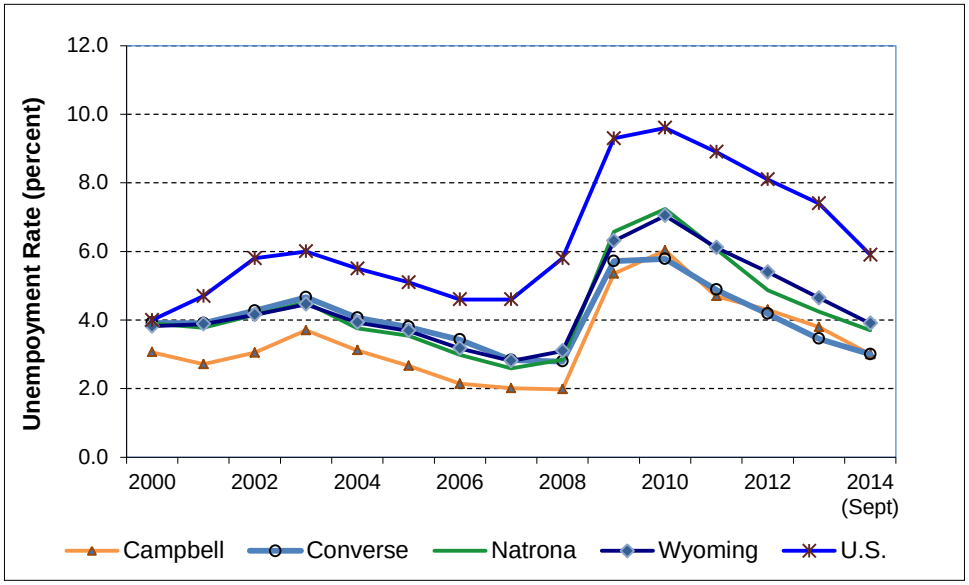
In recent times, agriculture has faced challenges beyond those related to markets and production. Such challenges include changes in federal land management affecting grazing, changes in consumer attitudes and consumption patterns, and the effects of drought. Energy resource development also can pose challenges for ranchers and farmers such as land use and transportation access issues associated with split estate, pressures or opportunities to sell land at prices above those supportable as an ongoing agricultural enterprise, and opportunities to receive surface use payments from oil and gas companies.

3.11.5.4 Labor Market Conditions

Although not immune to the effects of national recession or economic cycles, a byproduct of Wyoming's economic dependency on energy and mineral resource development is a dynamic labor market that can be generally characterized by unemployment rates below the national average. This is particularly true when considered in combination with the ready mobility of workers in the oil and gas and construction industries and the state's relatively small population. Available labor can be quickly absorbed by increased demand, and many unemployed workers are relatively quick to move in order to take advantage of job opportunities elsewhere. During the national recession that ended in 2010, local unemployment climbed but still remained three-to-four percentage points below the national average (**Figure 3.11-10**). Combined with rising unconventional oil and gas development in the analysis area and the Bakken Shale play in eastern Montana and western North Dakota (approximately 400 miles northeast of Douglas),the broader economic recovery precipitated dramatic declines in local unemployment in central Wyoming as workers pursued high paying jobs to the north (**Figures 3.11-10** and **3.11-11**). In September 2014, local unemployment rates were 3.0 percent in Converse and Campbell counties, and 3.7 percent in Natrona County. Unemployment rates in the 2.5 to 3.0 percent range correspond to levels that many economists consider as full employment, the situation when all eligible job seekers are employed.

In September 2014, more than 500 unfilled job openings were posted with the Wyoming Workforce Services office in Converse County, with an even larger number posted in Natrona County. The scarcity of job hunters and competition for labor resulted in shortages of labor to meet local needs, particularly for entry level and lower paying positions. The competition for and shortage of workers impinges on the ability of employers to retain and recruit workers to sustain existing operations and expand to meet new opportunities. This also results in upward pressures on wages and salaries. Shortages of construction labor are reportedly slowing progress on many commercial and public sector construction projects, and both public and private sector employers in Douglas have reported having difficulty in hiring and retaining employees.

The strength of the local labor market is further evidenced by the fact that the declines in unemployment occurred concurrently with expansion of the local labor force, particularly in Converse and Natrona counties (**Table 3.11-5** and **Figure 3.11-12**). Between 2010 and September 2014, the net total labor force in the region expanded by 3,018 individuals, despite declines in Campbell County.



Source: U.S. Bureau of Labor Statistics 2014a.

Figure 3.11-10 Average Annual Unemployment Rates: 2000–2014 (September)

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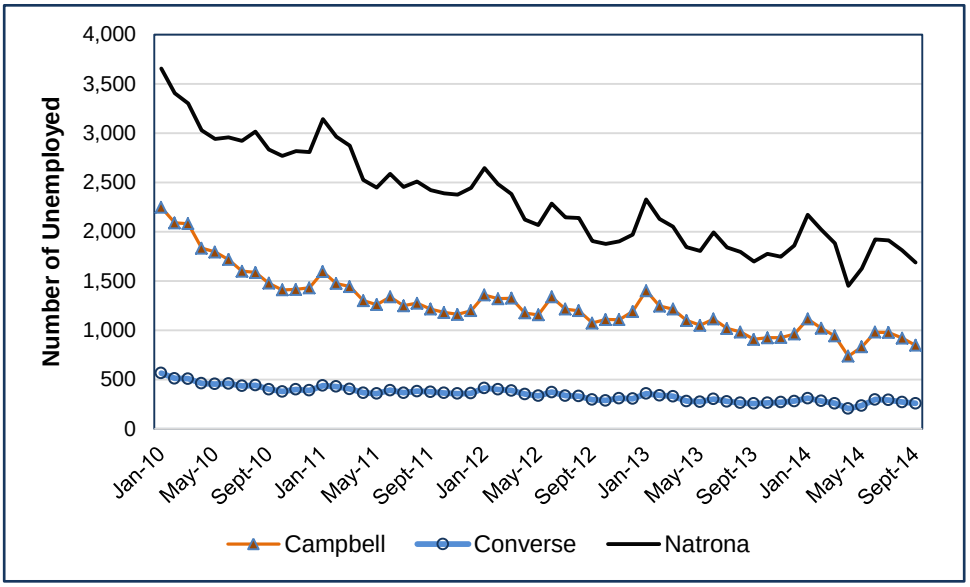


Source: U.S. Bureau of Labor Statistics 2014a.

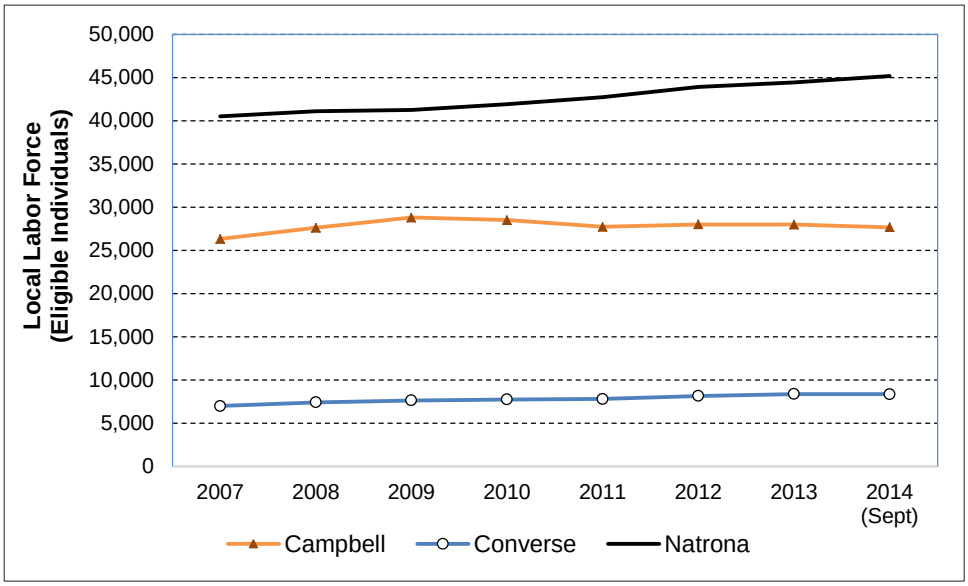
Figure 3.11-11 Monthly Unemployed in the Analysis Area: January 2010–September 2014

3

Table 3.11-5 Local Labor Force in Analysis Area by County: 2010–2014

Year	Converse County	Natrona County	Campbell County
2010	7,747	41,913	28,504
2011	7,808	42,742	27,723
2012	8,160	43,900	28,007
2013	8,374	44,434	27,986
2014 (Sept)	8,358	45,187	27,637
Net Change: 2010-2014	611	3,274	-867
Net Change (percent)	7.9	7.8	-3.0

Source: U.S. Bureau of Labor Statistics 2014b.



Source: U.S. Bureau of Labor Statistics 2014a.

Figure 3.11-12 Local Labor Force in Analysis Area: 2007–2014

This dynamic of the current labor market implies that the labor shortages are likely to prompt additional labor immigration to the region to satisfy existing demand. Nonetheless, a lack of skilled labor may constrain development activity in the short term. Further expansion of oil and gas development activity in the region likely would trigger even more labor migration over the long term.

3.11.5.5 Personal Income

Total personal income in the analysis area (in nominal dollars) was estimated at $7.96 billion in 2013, which is the last year for which data are available. The total was an increase of 17 percent compared to 2010, and approximately 30 percent over the $6.0 billion accruing to area residents in 2007 (**Table 3.11-6**). Accounting for inflation over those periods would reduce the net changes to 12 percent compared to 2010 and 17 percent compared to 2007. The net increases occurred despite a single-year decrease of more than $700 million between 2008 and 2009 during the national recession

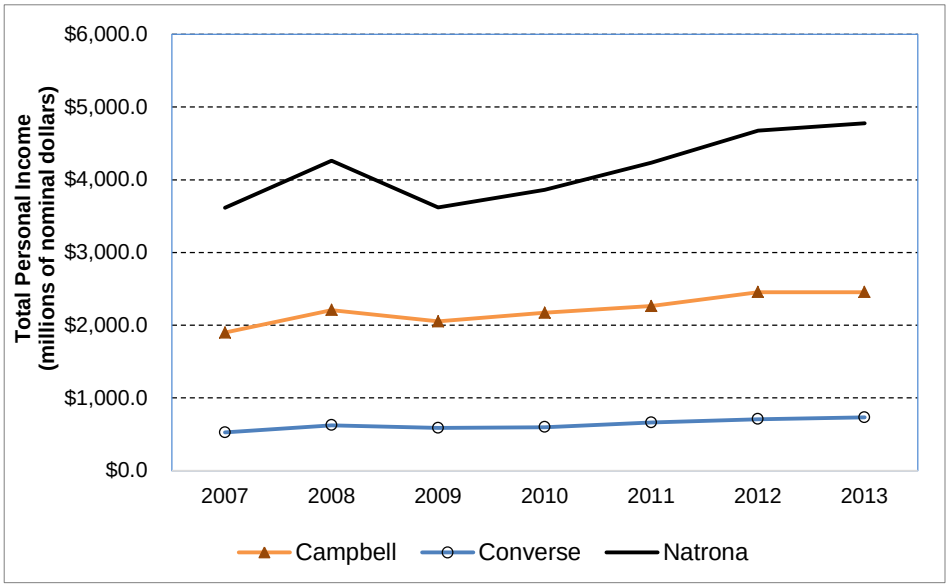
(**Figure 3.11-13**). Along with the upward pressure of compensation rates, the upswing in oil and gas development activity and the resulting stimulus for local construction and transportation industries have contributed to gains in personal income.

Table 3.11-6 Total Personal Income in Analysis Area: 2007–2013

Year	Campbell County	Converse County	Natrona County
2007	$1,898.0	$525.9	$3,613.3
2008	$2,207.5	$624.3	$4,262.7
2009	$2,052.0	$585.9	$3,621.5
2010	$2,171.5	$596.8	$3,859.3
2011	$2,262.1	$661.7	$4,237.4
2012	$2,453.9	$708.7	$4,676.0
2013	$2,455.5	$732.9	$4,776.0

Note: Personal income in millions of nominal dollars.

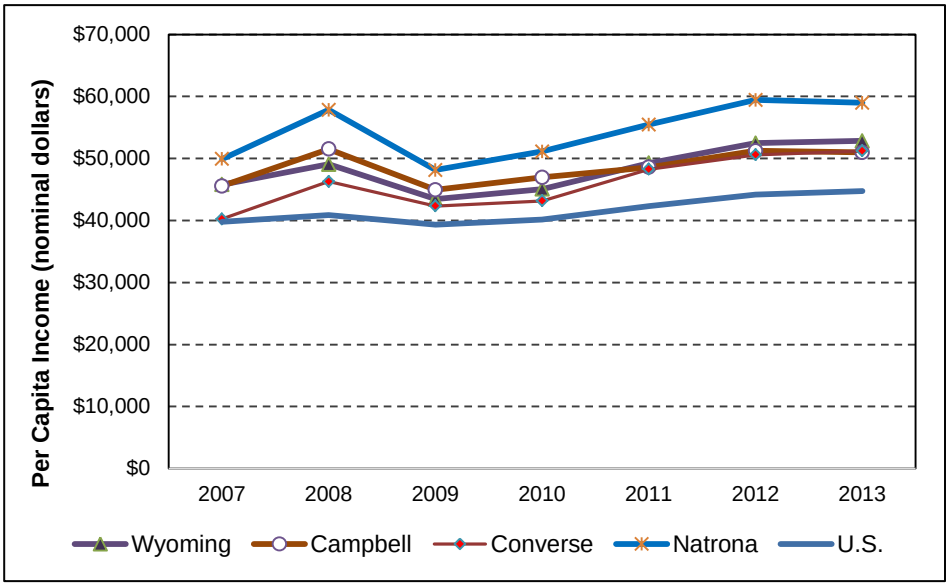
Source: U.S. Bureau of Economic Analysis 2014b.



Source: U.S. Bureau of Economic Analysis 2014b.

Figure 3.11-13 Total Personal Income in Analysis Area by County: 2007–2013

Residents in the analysis area generally realize higher income on a per capita basis than many other residents of the state and the nation as a whole. In 2012, per capita income in the analysis area ranged from $48,872 in Campbell County to $57,522 in Natrona County. Statewide per capita income for the same period was $50,567, and the national average was $43,735. Per capita income in all three counties and the state as a whole declined between 2008 and 2009 (**Figure 3.11-14**). More recent gains have largely offset those declines in Natrona County and contributed to a net nominal increase of more than $4,000 per capita in Converse County. In 2013, Campbell, Converse, and Natrona counties ranked eleventh, tenth, and third highest, respectively, among the 23 counties in Wyoming in terms of per capita income.



Source: U.S. Bureau of Economic Analysis 2014b.

Figure 3.11-14 Per Capita Income: 2007–2013

Real per capita income between 2007 and 2013 (i.e., after accounting for inflation during the period) effectively was unchanged in Campbell County, while that in Natrona and Converse counties had increased by approximately 5 and 13 percent, respectively. Real per capita incomes were derived using nominal income data published by the U.S. Bureau of Economic Analysis (2014b) and Consumer Price Index data published by the U.S. Bureau of Labor Statistics (2015a).

Household income distributions vary across the analysis area (**Table 3.11-7**). In general, the percentages of households in Converse and Natrona counties with incomes of less than $50,000 were comparable to the statewide averages, as were the shares of households in Natrona County with incomes of $75,000 or more. The shares of Converse County households with incomes between $75,000 and $149,999 were considerably higher than the statewide average. The share of households in Campbell County with incomes below $50,000 was considerably below the statewide average, while that with incomes of $75,000 or more was substantially above the statewide average. Median household incomes in Converse and Campbell counties were both above the statewide median income.

Table 3.11-7 Annual Income: All Households (2014 dollars)

Income Range	Percent of Households			
	Converse County	Natrona County	Campbell County	Wyoming
Less than $25,000	18.4	18.8	11.4	19.4
$25,000 to $49,999	24.0	25.0	16.9	23.6
$50,000 to $74,999	16.3	20.5	19.7	19.4
$75,000 to $99,999	16.6	13.3	16.3	14.1
$100,000 to $149,999	18.2	14.2	23.3	15.7
$150,000 or more	6.5	7.2	12.4	7.8
Median Household Income	$61,820	$56,759	$78,609	$58,252

Source: U.S. Census Bureau 2015.

Important differences in the structural composition of income, including the relative contributions of income from major sources and the role of commuting in regional income, are not apparent in trends and differences in per capita income in the CCPA. The high levels of labor force participation and employment result in current earnings accounting for higher shares of income than occurs at a statewide level (**Table 3.11-8**). A corollary difference is that non-labor income such as dividends, withdrawals from 401(K) accounts, and personal current transfers account for smaller shares of personal income. This may be indicative of the strong labor market encouraging older residents to remain in or re-enter the work force.

Work force commuting plays an important role in regional income, affecting both the geographic distribution of income and per capita incomes reported for individual counties. Temporary migration and commuting for work in another county result in outflows of labor earnings from the county in which the job is based. Commuting between two counties typically occurs in both directions; therefore, the U.S. Bureau of Economic Analysis reports the net adjustment for residence, with the adjustments based on income tax records and records provided by employers.

Table 3.11-8 Source of Personal Income by Major Category: 2013

Personal Income Category	Percent of Personal Income			
	Converse County	Natrona County	Campbell County	Wyoming
Net Current Earnings	65	63	72	62
Dividends, Interest and Rents	22	26	20	26
Personal Current Transfers	13	11	8	13

Source: U.S. Bureau of Economic Analysis 2014b.

As shown in **Table 3.11-9**, residency adjustments affect a substantial portion of the personal income in the analysis area. In Converse County, a net inflow in excess of $71 million occurred in 2013, which is equivalent to more than 15 percent of the total labor earnings paid by Converse County establishments in that year. A substantial portion of the inflow is thought to be attributable to residents of the Douglas area who work at coalmines in southern Campbell County. The net outflows and inflows in Natrona County are virtually comparable at approximately $100 million, yielding a net outflow of $5.5 million. In Campbell County the predominant flow of more than $200 million was outward in 2013. The net flows were not necessarily just between the three counties in the region, but also could involve other nearby

counties in Wyoming, Montana, South Dakota, or other states to the extent that they are associated with energy or construction workers who reside in the area during extended work shifts but maintain a permanent residence elsewhere.

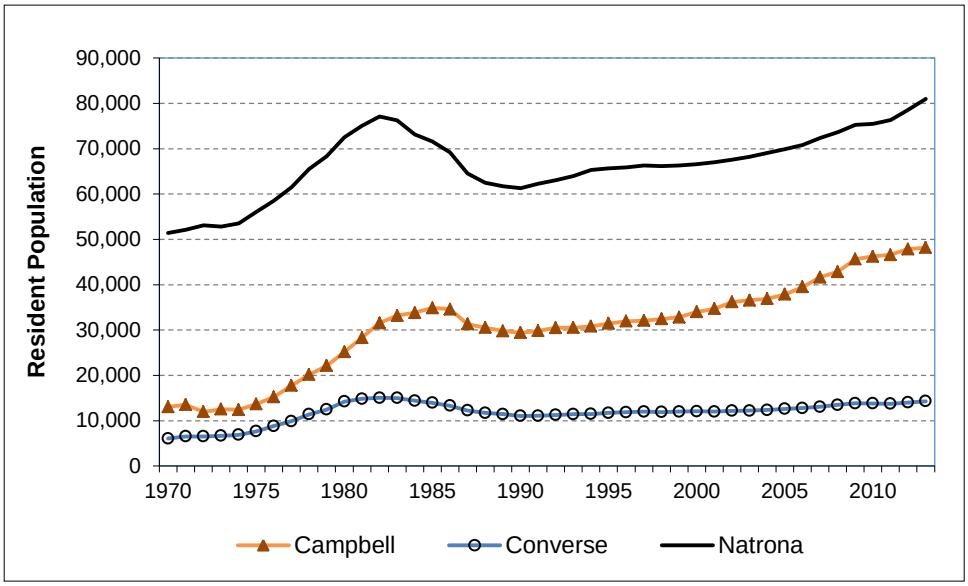
Table 3.11-9 Net Residence Adjusted Income as a Share of Total Labor Earnings: 2013

County	Earnings (thousands)				
	Place Of Work Labor Earnings (A)	Inflows Of Earnings (B)	Outflow Of Earnings (C)	Net Residence Adjusted Earning (B–C)	Net Residence Adjusted/Labor Earnings ((B-C)/D)
Converse	$464,735	$126,757	($55,145)	$71,612	15.4%
Natrona	$3,434,755	$101,506	($106,970)	($5,464)	-0.2%
Campbell	$2,252,704	$29,407	($233,331)	($203,924)	-9.1%

Source: U.S. Bureau of Economic Analysis 2014a.

3.11.6 Population and Demographics

Population change in the analysis area over the past 40 to 50 years has been driven largely by the energy development described in Section 3.11.5. A surge in energy development in Campbell, Converse, and Natrona counties resulted in rapid growth that peaked in the mid-1980s. The peak was followed by a period of population decline as oil prices fell, and construction at area coal mines and power plants was completed. Population growth resumed in all three counties in the early 1990s and accelerated in the mid-2000s period, particularly in Campbell County in conjunction with the coalbed natural gas mini-boom, expansion in coal mining, and power plant construction. The national recession from late 2007 into 2010 ushered in a period of little growth, but population growth resumed in all three counties during 2012. Over the 43-year period of 1970 through 2013, the population in Campbell County increased 269 percent, Converse County grew by 136 percent, and Natrona County grew by 58 percent. **Figure 3.11-15** displays population estimates for Campbell, Converse, and Natrona counties from 1970 through 2013. **Table 3.11-10** provides a summary of the annual resident population estimates reported by the EAD for Campbell, Converse, and Natrona counties as well as their incorporated municipalities from 2000 through 2013.



Source: EAD 2014a; U.S. Bureau of Economic Analysis 2013.

Figure 3.11-15 Population by County: 1970–2013

Resident population in the analysis area increased substantially between 2000 and 2013. The population in Converse County increased by 18 percent during this period, with the majority of the increase occurring in Douglas. The population in Natrona County increased by 22 percent, with the population of Casper, the largest community within the analysis area, increasing by 9,586 residents or 19 percent. The population in Campbell County increased by 42 percent, with most of that increase occurring in the City of Gillette, which grew by 10,858 residents. The City of Gillette Planning Department prepares its own population estimates, based on annexations, demolitions, average vacancy rates, and certificates of occupancy. Gillette estimated that its January 1, 2012 population was 30,121, in contrast to the EAD estimate of 31,442, which was a July 1, 2012 estimate (City of Gillette 2013).

Local officials and service providers in communities experiencing rapid growth related to energy development commonly observe that the Census estimates do not reflect temporary workers residing in local motels, RV parks and temporary worker housing facilities. This is particularly true in oil and gas development where rig crews, completion crews, and pipeline crews are formed in other parts of the state or country and may work in the area for weeks or months at a time, returning to their place of residence during their days off. These workers typically do not establish formal residence in counties or communities where they are working, yet they often comprise a substantial population that must be served with county and community infrastructure and services.

Table 3.11-10 Estimated Population for Counties and Communities: July 1, 2000–July 1, 2013

	Converse County					Campbell County				Natrona County							
Year	Total	Douglas	Glenrock	Rolling Hills	Balance of County	Total	Gillette	Wright	Balance of County	Total	Bar Nunn	Casper	Edgerton	Evansville	Midwest	Mills	Balance of County
2000	**12,083**	5,316	2,257	440	4,070	**33,979**	20,939	1,362	11,678	**66,603**	980	50,042	168	2,251	384	3,195	9,583
2001	**11,996**	5,284	2,239	430	4,043	**34,699**	21,449	1,387	11,863	**66,978**	1,096	50,187	170	2,263	383	3,195	9,684
2002	**12,196**	5,374	2,275	431	4,116	**36,193**	22,435	1,443	12,315	**67,554**	1,216	50,480	171	2,282	383	3,207	9,815
2003	**12,232**	5,395	2,281	426	4,130	**36,586**	22,742	1,454	12,390	**68,246**	1,336	50,863	173	2,304	384	3,224	9,962
2004	**12,350**	5,449	2,303	424	4,174	**36,907**	23,002	1,463	12,442	**69,035**	1,459	51,315	176	2,330	386	3,247	10,122
2005	**12,595**	5,560	2,348	427	4,260	**37,888**	23,670	1,498	12,720	**69,922**	1,583	51,844	179	2,359	387	3,273	10,297
2006	**12,801**	5,654	2,385	428	4,334	**39,497**	24,728	1,558	13,211	**70,806**	1,706	52,370	181	2,387	389	3,298	10,475
2007	**13,071**	5,776	2,436	431	4,428	**41,651**	26,128	1,640	13,883	**72,365**	1,848	53,392	186	2,440	395	3,357	10,747
2008	**13,486**	5,960	2,513	439	4,574	**42,846**	26,931	1,684	14,231	**73,682**	1,986	54,235	190	2,485	399	3,404	10,983
2009	**13,839**	6,121	2,577	444	4,697	**45,650**	28,742	1,791	15,117	**75,238**	2,131	55,255	194	2,537	405	3,462	11,254
2010	**13,817**	6,116	2,571	437	4,693	**46,224**	29,940	1,807	14,477	**75,463**	2,206	55,282	195	2,624	403	3,455	11,298
2011	**13,712**	6,095	2,547	434	4,636	**46,575**	30,425	1,808	14,342	**76,374**	2,245	56,173	193	2,756	400	3,412	11,195
2012	**14,006**	6,280	2,587	442	4,697	**47,882**	31,442	1,855	14,585	**78,665**	2,418	57,933	197	2,811	409	3,461	11,436
2013	**14,313**	6,469	2,637	450	4,757	**48,176**	31,797	1,852	14,527	**80,973**	2,646	59,628	201	2,850	418	3,568	11,662
Increase	**2,230**	**1,153**	**380**	**10**	**687**	**14,497**	**10,858**	**490**	**2,849**	**14,370**	**1,666**	**9,586**	**33**	**599**	**34**	**373**	**2,079**
Percent Increase	**18**	**22**	**17**	**2**	**17**	**42**	**52**	**36**	**24**	**22**	**170**	**19**	**20**	**27**	**9**	**12**	**22**

Source: EAD 2014a; U.S. Census Bureau 2014b.

In 2013, the three counties in the analysis area had a combined resident population of 143,462. Between 2010 and 2013, total net immigration (i.e., more people moving into an area than moving out) of 4,849 residents occurred in the three counties. Such immigration accounted for the most of the population growth in Converse and Natrona counties. **Table 3.11-11** provides a summary of the components of recent population change in the analysis area, contrasted with the components of statewide change. As shown, natural increase (i.e., the number of births compared to the number of deaths) accounted for the overwhelming share of population growth in Campbell County, and more than 60 percent of the net change statewide.

Table 3.11-11 Components of Population Change for the Analysis Area: 2010–2013

Geographic Area	Total Population Change	Natural Increase	Net Migration	Percent Net Migration
Converse County	480	220	272	56.7
Natrona County	5,523	1,243	4,210	76.2
Campbell County	2,043	1,659	367	18.0
Three-county Total	**8,046**	**3,122**	**4,849**	**60.3**
Remainder of the state	10,986	6,766	4,079	37.1
Wyoming	19,032	9,888	8,928	46.9

Source: U.S. Census Bureau 2014a.

Table 3.11-12 provides a summary of the Census Bureau median age, sex, household size, and family household data for Campbell, Converse, and Natrona counties from 2000 and 2010. During 2010, there were slightly more males than females in both counties. In 2010, the average age of the Campbell County population was approximately 5 years younger than the State of Wyoming as a whole, while the average age of the Natrona County population was the same as the statewide average, and the Converse County population average was approximately 2 years older. The 2010 average household sizes in Campbell and Converse counties were slightly larger than the statewide average, while the Natrona County average was slightly smaller than the state as a whole.

Table 3.11-12 Selected Demographic and Household Characteristics: 2000 and 2010

Year / Location	Male (percent)	Female (percent)	Median Age (years)	Under 18 Years (percent)	Average Household Size (persons)	Family Households (percent)
2000						
Campbell	51.4	48.6	32.2	31.0	2.73	73.8
Converse	49.8	50.2	37.5	28.5	2.55	72.6
Natrona	49.4	50.6	36.4	26.0	2.42	66.2
Wyoming	50.3	49.7	36.2	26.1	2.48	67.4
2010						
Campbell	52.6	47.4	31.9	28.1	2.66	69.5
Converse	50.7	49.3	39.0	25.4	2.42	68.0
Natrona	50.3	49.7	36.8	23.9	2.41	64.4
Wyoming	51.0	49.0	36.8	24.0	2.42	64.6

Source: U.S. Census Bureau 2011a, 2001.

Table 3.11-13 provides the EAD population forecasts for Converse, Natrona, and Campbell counties and their municipalities through 2025. The population in Campbell County and its municipalities is forecast to grow by 33 percent between 2010 and 2025, while the population in Converse and Natrona counties is forecast to grow at slower rates of 20.1 and 12.9 percent, respectively. The combined population is forecast to climb to 163,150 by 2025, which would be an increase of more than 27,700 (20 percent) compared to the 2010 population. Although the most current forecasts available, these estimates were prepared prior to the upswing in oil development interest in Converse County and southern Campbell County.

Table 3.11-13 Forecasted Population: 2010–2025

Location	Population				
	2010	2015	2020	2025	2010 to 2025 Change
Converse County					
Glenrock	2,576	2,803	2,970	3,093	517
Douglas	6,120	6,658	7,057	7,349	1,229
Rolling Hills	440	479	507	528	88
Balance of County	4,697	5,110	5,416	5,640	943
Converse County Total	***13,833***	***15,050***	***15,950***	***16,610***	***2,777***
Natrona County					
Casper	55,316	57,933	60,477	62,457	7,141
Bar Nunn	2,213	2,318	2,419	2,499	286
Evansville	2,544	2,664	2,781	2,872	328
Mills	3,461	3,625	3,784	3,908	447
Balance of County	11,916	12,480	13,029	13,454	1,538
Natrona County Total	***75,450***	***79,020***	***82,490***	***85,190***	***9,740***
Campbell County					
Gillette	29,087	32,654	35,869	38,681	9,594
Wright	1,807	2,029	2,228	2,403	596
Balance of County	15,239	17,107	18,793	20,266	5,027
Campbell County Total	***46,133***	***51,790***	***56,890***	***61,350***	***15,217***
Three-county Total	**135,416**	**145,860**	**155,330**	**163,150**	**27,734**

Source: EAD 2011.

Douglas also prepares population forecasts. The most recent forecast, prepared in conjunction with the 2013 Douglas Master Plan, contained population forecasts for three growth scenarios. Under those scenarios, the population of Douglas ranged from 6,472 to 6,596 in 2015 compared to 6,658 in the EAD forecast and between 6,715 and 7,274 in 2020 compared to 7,057 in the EAD forecast (City of Douglas 2014a).

3.11.7 Housing

This section describes conventional and temporary housing resources and conditions in the analysis area as of mid-2014. Conventional housing includes single and multi-family homes and mobile homes. Temporary housing resources include motels, hotels, and RV parks.

3.11.7.1 Conventional Housing

Table 3.11-14 provides a summary of the 2000 and 2010 U.S. Census housing counts for the analysis area. The increase in housing stock that occurred in communities in the area during that period reflects the population increases discussed in Section 3.11.6. The combined housing stock of the three-county region expanded by 10,326 units, or 21 percent, during the decade. However, more than half of that total is located in Campbell County.

In Converse County, the housing stock in Douglas grew by almost 17 percent, representing more than half of the overall housing stock increase of 734 units in Converse County. A substantial portion of this growth occurred in 2007 and 2008. In Natrona County, the housing stock in Casper grew by 12 percent or 2,664 units. The housing stock in Bar Nunn grew by 124.5 percent or 422 units. In Campbell County, the majority of the increase in housing stock occurred in the City of Gillette, which grew by just over 53 percent. Some of the housing increase in Gillette was accomplished through annexation of areas adjacent to the city.

Table 3.11-14 Housing Units: 2000–2010

Location	Number of Units		2000–2010 Change	
	2000	2010	Number of Units	Percent
Converse				
Douglas	2,385	2,788	403	16.9
Glenrock	1,131	1,201	70	6.2
Balance of County	2,153	2,414	261	12.1
Converse County Total	***5,669***	***6,403***	***734***	***12.9***
Natrona				
Casper	21,872	24,536	2,664	12.2
Bar Nunn	339	761	422	124.5
Evansville	918	1,109	191	20.8
Mills	1,272	1,654	382	30.0
Balance of County	5,481	5,747	266	4.9
Natrona County Total	***29,882***	***33,807***	***3,925***	***13.1***
Campbell				
Gillette	7,931	12,153	4,222	53.2
Wright	544	813	269	49.4
Balance of County	4,813	5,989	1,176	24.4
Campbell County Total	***13,288***	***18,955***	***5,667***	***42.6***
Three-county Total	**48,839**	**59,165**	**10,326**	**21.1**
State of Wyoming	**223,854**	**261,868**	**38,014**	**17.0**

Source: U.S. Census Bureau 2011a, 2001.

Residential Building Permits

Building permit activity provides information regarding recent increases in housing stock and an indication of the capacities of a community and the local construction industry to respond to an increase in housing demand. As shown in **Table 3.11-15**, Converse County issued 523 residential building permits between 2005 and 2013, Natrona County issued 4,446 permits, and Campbell County issued

3,271 permits. During the period from 2011 to 2013, the counties issued a total of 152 residential building permits in Converse County, 1,512 in Natrona County, and 502 Campbell County.

Table 3.11-15 Residential Building Permits: 2005–2013

Year	Residential Building Permits (number)		
	Converse County	Natrona County	Campbell County
2005	58	444	273
2006	34	423	479
2007	115	429	1,002
2008	103	419	349
2009	38	412	349
2010	23	807	317
2011	47	402	201
2012	54	507	179
2013	51	603	122
2005–2013 TOTAL	**523**	**4,446**	**3,271**

Source: EAD 2014b.

Mobile Home Parks

Mobile homes are an important element of the local housing stock. While many mobile homes are located on individual lots/parcels, many are located in mobile home parks. **Table 3.11-16** provides a summary of the number of mobile home parks and pads in Converse, Natrona, and Campbell counties as reported in the Nationwide Directory of Mobile Home Communities (MHPS 2014). Although this directory does not include all mobile home parks, it is thought to cover the majority of all such parks and pads/sites. Nearly half of the total pads are located in and near Gillette, 15 percent (524 pads) are located in Douglas, and more than 380 pads are located in Wright. While mobile home pads represent a substantial portion of the housing resource, little availability was reported during the fall of 2014, particularly in Converse County (Chaffin 2014).

Homes for Sale

Average sales price for homes in Converse County during 2013 was $204,742, which was a 9 percent increase over 2012 average sales prices. The average sales price in Natrona County in 2013 was $217,761, and in Campbell County it was $238,489. Average sales prices in in Natrona and Campbell counties each represented a less than one percent increase over 2012 prices. The average home sales price in Wyoming as a whole in 2013 was $281,345, which was a 5.6 percent increase over 2012 (Wyoming Community Development Authority 2015).

As is the case for mobile home pads, the housing market was extremely tight across the region during 2014, and housing prices remained high. **Table 3.11-17** provides a summary of the market area and listing prices of the homes listed on Realtor.com during December 2014. The vast majority of the listings are located in Casper and Gillette. Only 106 units were listed in Converse County, and not all of those were available for immediate occupancy. The total number represented just slightly over 1 percent of the total housing inventory. Although this total did not include houses listed for sale by owners, some homes that were under construction or awaiting a buyer before initiating construction were included. Median prices for homes listed for sale in the analysis area during December 2014 ranged from $277,300 in Douglas to $183,700 in Wright.

Table 3.11-16 Mobile Home Parks: 2014

Location	Number of Mobile Home Parks	Total Number of Pads/Sites
Converse County		
Douglas	8	524
Glenrock	1	n/a
Rolling Hills	0	0
Natrona County		
Casper	24	782
Bar Nunn	0	0
Evansville	2	198
Mills	0	0
Campbell County		
Gillette	18	1,604
Wright	1	382
Total	**54**	**3,490**

Source: MHPS 2014.

Table 3.11-17 Houses Listed for Sale in Analysis Area Communities: June 2014

Community	Number of Units Listed for Sale	Median Price of Listed Homes
Converse County		
Douglas	87	$277,300
Glenrock	18	$190,400
Rolling Hills	1	$185,000
Natrona County		
Casper	242	$248,800
Evansville	20	$235,950
Bar Nunn	25	$245,500
Mills	8	$216,900
Campbell County		
Gillette	268	$234,500
Wright	10	$183,700
Total Units Listed	**679**	

Source: Realtor.com 2014.

The scarcity and rising cost of housing was cited as contributing to staff recruiting challenges for the local school district, hospital, the City of Douglas, and Converse County during the peak period of development. Housing availability, selection, and location were cited as contributing to difficulties in employee recruitment and retention.

Rental Housing

Table 3.11-18 provides a summary of the semiannual rental housing vacancies for Converse, Natrona, and Campbell counties from December 2010 through June 2014. These rates are based on a survey of rental property managers by the Wyoming Community Development Authority. According to the Wyoming Community Development Authority surveys, approximately 1.9 percent of rental units (14 units) were vacant in Converse County in June 2014, approximately 2.7 percent (160 units) were vacant in Natrona County, and approximately 3.2 percent (120 units) were vacant in Campbell County. Converse County officials reported few vacancies and a tight rental market in both May and December of 2014 (Blanchard 2014; Blanton 2014; Chaffin 2014; Kindt 2014; Morell 2014; Willox 2014). Although Gillette has a relatively large number of apartments, including some built to accommodate the recent construction of the Dry Fork power plant, the vacancy survey done by the City of Gillette estimated a 1.3 percent vacancy rate for apartments and other buildings in the second quarter of 2014 and a 6.3 percent vacancy rate in mobile and manufactured homes (City of Gillette 2014a; Surface 2014).

Table 3.11-18 Rental Housing Vacancy: 2010–2013

Period	Vacancy Rates (percent) and Number of Units[1]					
	Converse County		Natrona County		Campbell County	
	Rate	Units	Rate	Units	Rate	Units
December 2010	5.1	31	4.6	214	8.0	271
June 2011	2.1	14	3.7	176	8.0	256
December 2011	2.1	13	7.4	340	7.2	262
June 2012	2.4	17	2.1	106	5.5	231
December 2012	3.0	22	2.1	91	9.8	363
June 2013	2.2	17	3.6	202	9.3	372
December 2013	1.7	16	3.5	196	6.2	224
June 2014	1.9	14	2.7	160	3.2	120

[1] The reported vacancies are based on a survey of rental property managers. The survey response varies over time and may not capture units rented by individual owners; therefore, the number of vacant units reported does not represent all vacant rental units in the county.

Source: Wyoming Community Development Authority 2015.

Table 3.11-19 provides a summary of the fourth quarter 2013 average monthly rents for apartments, mobile home lots, mobile homes, and houses in Converse, Natrona, and Campbell counties as well as the state as a whole. At that time, average monthly apartment and house rents were substantially higher than the statewide average except for Campbell County apartment rents, which were only slightly higher. Mobile home rents were substantially above the statewide average in Converse and Campbell counties but lower in Natrona County. Mobile home lot rents were substantially higher than the statewide average in Campbell County.

Table 3.11-19 Average Monthly Rents: 4th Quarter 2013

Location	Average Monthly Rent			
	Apartments	Houses	Mobile Homes	Mobile Home Lots
Converse County	$802	$1,142	$833	$203
Natrona County	$806	$1,174	$606	$305
Campbell County	$707	$1,170	$899	$430
Wyoming	$691	$1,011	$711	$302

Source: Wyoming Community Development Authority 2015.

The strong demand for rental housing was viewed locally as the primary factor driving the increase in rental rates, which resulted in the displacement of some current residents, including some seniors whose incomes had not kept pace with the rising costs or were on fixed incomes.

Comparative Housing Cost

Housing costs in the analysis area (expressed in terms of a cost of living index) have been above the statewide average for the 3-year period from 2012 through 2014 (**Table 3.11-20**). Housing costs in Campbell and Natrona counties ranged between 104 and 107 during the period. In Converse County, the housing cost index rose from 106 in 2012 to 118 in 2014. The change is not a direct measure of the changes in housing costs, but rather, indicative that local housing costs had risen from 6 percent (106-100) in 2012 to 18 percent (118-100) above the statewide average (i.e., 100 percent) in 2014. The rising differential is indicative of increased demand in Converse County. Campbell and Natrona counties consistently ranked fourth and fifth highest in terms of comparative rankings to the rest of the state, while Converse County rose from fourth to second highest. In 2014, Teton County recorded the highest housing costs index value at 157.

Table 3.11-20 Wyoming Comparative Cost of Living Index for Housing: 4th Quarter 2012 to 4th Quarter 2014

Period	Converse County		Natrona County		Campbell County	
	Index Value[1]	Statewide Rank[2]	Index Value[1]	Statewide Rank[2]	Index Value[1]	Statewide Rank[2]
4th Quarter 2012	106	4th (tie)	104	5th	106	4th (tie)
4th Quarter 2013	109	3rd	105	5th	107	4th
4th Quarter 2014	118	2nd	106	5th	107	4th

[1] Statewide average = 100. The index value represents the local costs of living compared to the statewide average. Therefore, changes in the value are not a direct measure of changes in housing costs.

[2] The statewide rank is based on a total of 24 county/sub-county entities.

Source: EAD 2015.

Comparative cost burden provides another perspective on housing costs and affordability. A common guideline is that gross housing costs should be below 30 percent of gross household income. Estimates prepared by the Wyoming Community Development Authority in 2015 as part of its annual housing needs assessment for Wyoming reported higher percentage shares of households in all three counties with cost burdens of less than 30 percent compared to the statewide average (**Table 3.11-21**). These estimates are based on the 2010-2014 American Community Survey (U.S. Census Bureau 2017) likely

reflected some of the increased housing costs in Converse County associated with oil and gas development in the analysis area. The estimated number of households in Converse County with housing cost burdens of 31 to 50 percent also was below the statewide average, whereas the percentage shares of such households in Natrona and Campbell counties exceeded the statewide average.

Table 3.11-21 Housing Cost Burden: 2014

Cost Burden (percent)	Percent of Households			
	Converse County	Natrona County	Campbell County	State of Wyoming
Less than 30	77.9	73.1	77.8	72.1
31 to 50	10.6	15.7	14.7	14.4
Above 50	6.0	8.6	6.4	9.8
Not Determined	5.5	2.7	1.1	3.7

Source: Wyoming Community Development Authority 2015.

3.11.7.2 Temporary Housing

Temporary housing resources include motels, hotels, and RV parks. **Table 3.11-22** provides a summary of temporary housing resources in Campbell, Converse, and Natrona counties during 2014.

Table 3.11-22 Temporary Housing Resources: 2014

Location	Hotels and Motels		Recreational Vehicle Parks	
	Establishments	Rooms	Parks	Pads
Converse County				
Douglas	9	459	5	122
Glenrock	3	52	2	60
Bill	1	101 (1)	0	0
Natrona County				
Casper	26	2,254	5 (2)	173
Bar Nunn	0	0	1	74
Evansville	5	419	1	50
Mills	1	10	0	0
Campbell County				
Gillette	20	1,469	4	1,815
Wright	3	117	1	76
Total	**67**	**4,881**	**19**	**2,370**

[1] 70 rooms are reserved for Burlington Northern/Santa Fe (BNSF) Railroad crews.

[2] Does not include Casper Mountain Parks.

Source: Wyoming Travel and Tourism 2014, contacts with lodging proprietors.

In 2014, temporary housing resources in Converse County included a total of 612 hotel/motel rooms and 182 RV pads. There were 2,683 hotel/motel rooms and 297 RV pads in the Casper area of Natrona County and 1,586 hotel/motel rooms and 1,891 RV pads in Campbell County. Additionally, a new mid-

size hotel (approximately 100 rooms) was under construction in Douglas, four hotels/motels were in development in Casper, and several other hotels and motels were under consideration for Gillette and Wright (Blanchard 2014; Chaffin 2014; Lehman 2014; Surface 2014).

According to local sources, occupancy of hotels/motels and RV parks in the Douglas, Glenrock, and Casper areas was high during 2014 due to the large number of temporary oil and gas workers in the area (Blanton 2014; Kindt 2014; McCreight 2014; Morell 2014; Neverve 2014; Sonesen 2014; Wyoming Lodging and Restaurant Association 2013). In Douglas, demand for RV park spaces prompted the administrators for the Wyoming State Fair to allow extended stays in RV park spaces at the fairgrounds and relocated some extended stay RVs to temporary quarters near the Douglas race track during the fair.

Motel and RV park occupancy rates in the analysis area typically are higher in the summer and fall and lower in the winter and spring. Occupancy rates generally are lower in Casper and Gillette than in Converse County. Casper has an estimated occupancy rate of approximately 70 percent during the workweek in summer months. Weekend occupancy can be higher due to sporting events and conventions (McCreight 2014; Morell 2014; Wyoming Lodging and Restaurant Association 2013).

Residential and Lodging Development Plans

The housing shortages, low vacancy rates, and high temporary lodging occupancy rates in the communities in the analysis area have generated new construction and development initiatives in many communities. Douglas approved two new hotels and a new approximately 50-unit extended-stay RV park (Chaffin 2014). A development company proposed a 1,500-acre annexation to the city, which would include plans for up to 1,800 homes as well as commercial, recreational, and other amenities (Douglas Budget 2014a).

Casper approved a 228-unit market rate apartment complex, the 134-unit third phase of a multi-family rental project, a 36-unit apartment complex that includes some low-income units, and the rehabilitation of an existing apartment complex that includes 50 to 60 low-income units. The city also approved five single-family developments with a total of over 400 lots and several additional large tracts for future development. Four hotel/motel projects with a total of 300 to 400 units were under construction in the city (City of Casper 2013a; Collins 2014).

During 2013, Gillette approved permits for 129 housing units and issued 140 permits for certificates of occupancy. By the end of the second quarter of 2014, Gillette had an additional 83 units that were eligible for a building permit and a number of subdivisions with a total of 648 units in the review process. Additionally, five motel chains had contacted the planning department about potential construction of new motels (City of Gillette 2014a; Surface 2014).

3.11.8 Public Infrastructure and Services

This section describes the 2014 availability and capacities of key public infrastructure and services for two geographies: the area within and along access roads to the proposed CCPA and the area in the socioeconomic and environmental justice analysis area, which includes counties and communities where oil and gas service workers may reside.

3.11.8.1 Converse County Project Area

Converse County and several special districts and volunteer organizations provide a limited range of services in the unincorporated area of the county that includes the CCPA. These services primarily include law enforcement, emergency response (fire and emergency medical), road maintenance, and weed and pest control.

Law enforcement services in the CCPA are provided by the Converse County Sheriff's Department.

Fire suppression in the CCPA is provided by the Douglas Volunteer Fire Department, which responds to structure fires; the Glenrock Fire Department; and the Converse County Rural Fire Control Association, which responds to grass and wildland fires. Converse County is divided into nine rural fire protection zones. The Rural Fire Control Association is staffed by volunteers who live in the zones and fire equipment (primarily wildland attack trucks) is stationed at different locations within the zones.

Ambulance response for medical emergencies in the CCPA is provided by the ambulance service from Memorial Hospital of Converse County. Wyoming Life Flight, based at Wyoming Medical Center in Casper, can provide medivac emergency response and transport to the CCPA.

Converse County provides road maintenance and weed and pest control services on and along county roads within and providing access to the CCPA.

3.11.8.2 Counties and Communities

This section describes essential public infrastructure and services in the study area, and where available, describes the capacity of those systems to accommodate additional demand.

Law Enforcement

Law enforcement services within the analysis area are provided by the Wyoming Highway Patrol; the Converse, Natrona, and Campbell county sheriff's departments; and the Douglas, Glenrock, Casper, Evansville, Mills, and Gillette police departments.

Wyoming Highway Patrol officers are assigned to divisions in Douglas, Casper, and Gillette. **Table 3.11-23** provides a summary of the 2013 staffing for county and municipal law enforcement agencies within the analysis area.

Converse County

The Converse County Sheriff's Office had a 2013 staffing level of 42, including 33 sworn officers and nine civilian employees. The Sheriff's Office also provides dispatch services and operates the Converse County Detention Center, which is a 34-bed facility that is the oldest jail in the state. Fall 2014 detention center occupancy averaged 28 to 30 detainees; however, an additional 10 to 15 detainees were routinely housed in the Platte County Detention Center in Wheatland or in treatment facilities. The Converse County Commissioners funded a transport officer position for the 2014–2015 fiscal year to facilitate detainee transfers. The detention center administrator observed an increase in detainee's length of stay in the detention center due to the more serious nature of offenses (Stoneking 2014).

The Converse County Commission and the City of Douglas are in the process of developing a new justice center at the old airport site in the southeastern portion of Douglas. The center is anticipated to be built in two phases. The first phase would include administrative and other offices for the Sheriff and Douglas Police departments, new county detention facilities, and a joint dispatch center that would provide dispatch services for the two departments and countywide emergency services. The second phase would include the district, circuit, and Douglas municipal courts as well as offices for prosecuting and county attorneys (Becker 2014; Converse County Board of Commissioners 2014e; Willox 2014).

Table 3.11-23 Law Enforcement Personnel Per 1,000 Population and Index Crimes Per Officer: 2013

County/Agency	Employees			Officers Per 1,000 Population	Index Crimes Per Officer
	Total	Officers	Civilian		
Converse County					
Sheriff	42	33	9	2.3	1.9
Douglas	22	14	8	2.2	15.5
Glenrock	12	7	5	2.7	5.3
Converse County Total	76	55	22	3.8	5.9
Natrona County					
Sheriff[1]	162	120	42	1.2	1.9
Casper	146	98	48	1.7	21.7
Evansville	12	10	2	3.5	4.9
Mills	15	12	3	3.4	11.5
Natrona County Total	335	240	95	3.0	10.6
Campbell County					
Sheriff	61	46	15	1.0	5.2
Gillette	83	53	30	1.7	20.0
Wright	NA	NA	NA	NA	NA
Campbell County Total	144	99	45	2.0	13.2

[1] From Natrona County employee data from 2013.

Source: Wyoming Office of Attorney General 2014.

The Converse County Sheriff's Office experienced increased demand associated with the influx of workers and increased traffic associated with the oil and gas development occurring in the county during 2014. As a result of the increased oil and gas development, the sheriff's office responded to increasing numbers of calls for heavy truck accidents, traffic management, and illegal dumping. Increases in calls for service averaged approximately 20 to 25 percent annually during the 3-year period ending in 2013. Crashes on public roadways (i.e., federal and state highways and county roads) increased by 39 percent between 2010 and 2013, from 392 to 546 total crashes (Carpenter 2014). The sheriff's office also experienced increases in the number of crimes reported and investigated. Primary factors contributing to the increase included oil and gas and other industrial development and construction activity, general population growth, and changes in enforcement patterns. In response to the increased demands, the county increased the sheriff's office staff, including adding two deputies in 2014 (the transport officer described above and a weights and measures officer for county roads) and one investigator in 2013 (Becker 2014; Douglas Budget 2014b).

The Douglas Police Department had a 2013 staff level of 22, including 14 sworn officers and 8 civilian personnel. In 2014, the number of officers was increased to 17 and the police department foresaw the need to add one or two additional officers to accommodate the increase in law enforcement calls associated with the increased temporary worker population (City of Douglas 2014a).

The Glenrock Police Department employed 12 personnel in 2013, including 7 sworn officers and 5 administrative staff. The Glenrock Dispatch Center provides 24-hour emergency dispatch of law enforcement, fire, medical services, and animal control to Glenrock, Rolling Hills, and the remainder of western Converse County (Glenrock Police Department 2014b).

Natrona County

The Natrona County Sheriff's Office employed a total of 162 employees in 2013; of those, 120 were sworn officers and 42 were civilian personnel. The sheriff's office has resident deputies at Alcova Lake, Casper Mountain, and Midwest, and also provides law enforcement services for the Town of Bar Nunn on a contract basis. The Natrona County Sheriff's Office operates the Natrona County Detention Center, which has capacity to accommodate 476 detainees (Natrona County Sheriff's Department 2014a). Recent detention center occupancy has averaged between 250 and 300 detainees (Holbrook 2014).

The Casper Public Safety Communications Center is a 24-hour, 365-day-a-year operation and is responsible for answering 9-1-1 emergency calls that originate from within Natrona County. The Casper center primarily dispatches calls for service for the Casper Police Department, Natrona County Sheriff's Office, Mills and Evansville police departments, Natrona County Fire District, and the Wyoming Medical Center medical services units. Additionally, the Center dispatches for the Mills, Bar Nunn, and Evansville fire departments as well as Salt Creek Emergency Services (Midwest/Edgerton). The Casper Public Safety Communications Center employed 19 full-time dispatchers and five part-time dispatchers in 2014. All dispatchers receive training in Emergency Medical Dispatching as well (Casper Public Safety Communications Center 2014).

The Casper Police Department had 146 employees during 2013, including 98 sworn officers and 48 civilian staff. The Evansville Police Department had 12 employees, including 10 sworn officers and 2 administrative staff, and the Mills Police Department had 15 employees, including 12 sworn officers and 3 administrative staff.

Campbell County

The Campbell County Sheriff's Office is headquartered in Gillette and provides law enforcement, detention, court security, and animal control services for the county. The sheriff's office maintains a substation in the Town of Wright and provides law enforcement services for Wright under a contract between the town and the county. In 2013, the Campbell County Sheriff's Office had 46 sworn officers, including 5 deputies in Wright. The Campbell County Sheriff's Office operates a dispatch center, staffed by 11 communications employees on a round-the-clock basis. The dispatch center also provides dispatch services for the Campbell County Fire Department and Campbell County Emergency Medical Services.

Originally constructed in 1985, the Campbell County Detention Center has undergone several expansions, the most recent of which increased the maximum housing capacity at the facility to 306 detainees. The expansion included a 16-bed juvenile detention facility and kitchen and laundry facilities capable of serving 500 detainees. The detention center was staffed by 57 detention officers and 11 civilian staff during 2014 (Campbell County Sheriff's Office 2014e). Average daily occupancy during 2013 was 137 detainees; by late June 2014, average daily occupancy was 163, with a peak day of 191 detainees (Cheairs 2014).

The Gillette Police Department, the third-largest department in the state in terms of number of officers, has primary responsibility for law enforcement within the city's corporate limits (AECOM 2012b). The 2013 staffing level of the Gillette Policy Department was 83, including 53 sworn officers and 30 civilian employees.

3.11.8.3 Emergency Response (Fire and Emergency Medical)

Fire suppression, emergency medical services (EMS), and ambulance services within the analysis area are provided by a variety of agencies and organizations using paid and volunteer staff.

Fire Suppression Services

Table 3.11-24 provides a summary of the public fire suppression agencies within the analysis area, along with information about agency staffing.

Table 3.11-24 Public Fire Protection Agencies Within the Study Area

	Number of Fire Stations	Fire Fighters (number)		EMS Services (number)		
		Full/Part Time Paid	Volunteer	EMS Services	Basic EMTs	Advanced EMTs
Converse County						
Converse County Rural Fire Control Association	1	0	105	No	0	0
Douglas Volunteer Fire Department	1	0	45	Yes	14	2
Glenrock/Converse County Volunteer Fire Department	2	0	40	No	3	0
Converse County Total	4	0	190		17	2
Campbell County						
Campbell County Fire Department	10	30	150	No	0	0
Gillette/Campbell County Airport Fire Department	1	4	0	No	0	0
Campbell County Total	11	34	150		0	0
Natrona County						
Bar Nunn Volunteer Fire Department	1	0	24	Yes	11	0
Casper Fire Department	5	76	0	Yes	71	38
Casper Mountain Fire Department	1	0	40	No	0	0
Evansville Fire Department	1	16	34	Yes	21	11
Mills Volunteer Fire Department	1	9	12	Yes	5	11
Natrona County Fire Protection District	2	19	0	Yes	9	9
Natrona County International Airport Fire Department	1	10	0	N	1	0
Salt Creek Emergency Services Stations 16 and 17 (Edgerton)	2	0	21	Yes	12	0
Natrona County Total	14	130	131		130	69
Three-county Total	29	164	471		147	71[1]

EMT = emergency medical technician.

Source: Wyoming State Fire Marshal 2014.

Converse County fire protection agencies are exclusively staffed by volunteers. The Douglas Volunteer Fire Department typically has 45 volunteers and is the lead responder for structure fires in Douglas and throughout Converse County. The Douglas Volunteer Fire Department has identified a future need for satellite fire stations on the east and west sides of Douglas (City of Douglas 2014a).

The Glenrock Volunteer Fire Department had 40 volunteers during 2012. The Converse County Rural Fire Control Association, which has nine zones that cover all rural areas of Converse County, responds to wildland and grass fires. Each zone has a fire warden and limited fire suppression equipment. The Converse County Rural Fire Control Association is staffed by 105 volunteers (Reed 2014).

The Natrona County Fire Protection District and Casper Fire Department have paid staff only. Other Natrona County protection agencies are staffed by a combination of paid and volunteer staff. The Campbell County Fire Department is governed by a Joint Powers Fire Board representing the City of Gillette, the Town of Wright, and Campbell County. The department provides fire, rescue, EMS, and hazardous materials response services from 10 fire stations and 11 wildland support stations. Campbell County Fire Department Station 1 in Gillette is staffed 24 hours per day. In 2013, the Campbell County Fire Department had approximately 30 paid staff and 150 volunteers. The Wright Station has both paid staff (two) and volunteers (Shank 2014). The Campbell County Sheriff's Department provides dispatch services for the fire department (Campbell County Fire Department 2014d; Izatt 2014).

Emergency Medical Services

Ambulance response for medical emergencies in the CCPA and along access routes from the south and east are provided by the Memorial Hospital of Converse County Ambulance Service. Ambulance response to medical emergencies along proposed CCPA access routes in Natrona and Campbell counties are provided by the Wyoming Medical Center in Casper and by Campbell County Memorial Hospital EMS, with ambulance stations in Wright and Gillette.

The Memorial Hospital of Converse County Ambulance Service provides emergency medical response and ambulance services from its Douglas and Glenrock stations. The ambulance service operates six ambulances countywide; three ambulance units are stationed in Douglas at the Memorial Hospital of Converse County along with a staff crew and a back-up crew. All ambulances in Douglas are staffed with an EMT and a paramedic. The Glenrock ambulance station has two ambulances (AECOM 2012b; Memorial Hospital of Converse County 2014b).

The Wyoming Medical Center in Casper also provides ambulance and EMT services across central Wyoming, responding to more than 10,000 calls for service and transports over 7,000 patients each year (Wyoming Medical Center 2014a). In the event of serious injuries, helicopter-based medivac and emergency transport services are available via Life Flight dispatched from the Wyoming Medical Center.

In 2014, Campbell County Memorial Hospital EMS had a staff of 48, including: 16 EMT–paramedics, 7 EMT–intermediates, 21 EMT–basic attendants, 1 EMT–paramedic/registered nurse, 1 EMT/registered nurse, 1 EMT/pharmacist, and 1 registered nurse (Campbell County Memorial Hospital 2014a).

3.11.8.4 Water Supply and Treatment

This section covers municipal water systems administered by municipalities, water and sewer districts, and regional joint powers boards within the socioeconomic analysis area. See Section 3.16, Water Resources, for a more detailed discussion of the affected environment for surface water and groundwater resources. **Table 3.11-25** provides a summary of the water systems within the analysis area, their system and treated water storage capacities, and peak daily use.

Table 3.11-25 Water System Capacities and Utilization: 2013

Community	Population Served	System Delivery Capacity (mgd)[1]	Treated Water Storage Capacity (million gallons)	Peak Daily Usage (mgd)
Douglas	6,120	5.6	6.1	1.7
Glenrock	2,550	3.5	2.05	1.7
Casper (Central Wyoming Regional Water System)	62,000 (56,000 in Casper)	39.0	26.0	29.2
Bar Nunn (Wardwell Water and Sewer District)	3,857		Receives water from the Central Wyoming Regional Water System	
Evansville[2]	2,500	0.002	3.0	0.8
Mills	3,300	3.2	5.0	1.55
Gillette	>37,000	14.4	22	13.35
Wright	>2,500	1.9	1.5	1.3

[1] mgd = million gallons per day.

[2] 2007 data.

Source: Wyoming Water Development Commission 2013a.

Douglas

The Douglas water system served a population of 6,120 in 2013, including 2,076 residential households and 275 commercial service connections within the City of Douglas and an additional 33 residential households and 19 commercial connections in unincorporated areas outside the city. The system relies on water from a spring, a well, and from the North Platte River during May through September. The Douglas water system has total treated storage capacity of 6.1 million gallons, functional treated storage of 4 million gallons, and maximum water delivery capacity of 5.6 mgd. However, seasonal restrictions on the groundwater well and limitations on the treatment plant has resulted in a reliable system delivery capacity of 3.8 mgd during certain times of the year. The water system had an average daily demand of 1.7 mgd in 2012 and experienced a peak use of approximately 3.6 mgd in July 2012.

The Douglas water system has the capacity to accommodate some growth, although improvements to the transmission and distribution systems would be required at some point. The water department sells bulk water for use in oil and gas development, and these sales could be reduced or discontinued to accommodate more residential growth. Another option considered by the water department to substantially reduce peak demands on the treated water system would be through the development of a raw water distribution system to selected areas of the city that would support the distribution of raw water for seasonal irrigation purposes. Douglas plans to submit an application to the Wyoming Water Development Commission for a Level II water study to identify possible locations for a new well (City of Douglas 2014a; Newton 2014; Wyoming Water Development Commission 2013b).

Glenrock

Glenrock provided water services to a population of approximately 2,550 in 2013. The water system capacity is 3.5 mgd, and 2013 peak daily use was 1.7 mgd. The town has 2.05 million gallons of storage capacity (Wyoming Water Development Commission 2013). Although the town has adequate water supply to accommodate a population of up to 10,000, the conveyance system from the source to the town is constrained, and additional transmission capacity would be required when the town reaches a population of 3,000 (Andrews 2014).

Casper

The Casper municipal water system receives water from the Central Wyoming Regional Water System, which is managed by a joint powers board that includes representatives from Casper and other Natrona County local governments (Central Wyoming Regional Water System 2014). In the mid-1990s, the Central Wyoming Regional Water System was formed to serve the water supply needs of all the communities in the greater Casper area. The system obtains water from a series of wells, augmented by water pumped from the North Platte River during periods of peak summer demand (Gollnitz et al. 2006). While normally adequate to accommodate existing demand with some unused capacity, peak flows on the North Platte River have resulted in periods when the wellfields were shut down because the high river flows threatened the integrity of the wells, and the subsequent drop in stored water resulted in lawn watering restrictions (Casper Star Tribune 2010).

The Casper water system served a population of 62,000 in 2013, including 56,000 residents of Casper. Total 2013 system delivery capacity was 39 mgd, and treated water storage capacity was 26 million gallons. Peak 2013 water use was 29.2 mgd (Wyoming Water Development Commission 2013a).

The Wardwell Water and Sewer District, which serves Bar Nunn, also receives its water from the Central Wyoming Regional Water System. The Evansville water system served 2,500 residents in 2007. The treated water storage capacity was 3 million gallons, and peak use was 0.8 mgd (Wyoming Water Development Commission 2013a). Mills served 3,300 residents in 2013. System capacity was 3.2 mgd, treated water storage was 5 million gallons, and peak use was 1.55 mgd (Wyoming Water Development Commission 2013a).

Gillette

The City of Gillette provides water services in the city and to some portions of the surrounding Gillette Urban Service Area. The Gillette Water Division produces and distributes potable water to Gillette's residents, businesses, public facilities, and parks. In 2013, peak water production was 11.3 mgd, delivery capacity was 14.4 mgd, total treated water storage was 22 million gallons, and peak use was 13.35 mgd (Wyoming Water Development Commission 2013a).

To better serve recent population growth and accommodate anticipated growth in Gillette and other areas of northeast Wyoming, Gillette and Campbell County entered into the Gillette Regional Water Supply System Joint Powers Agreement in December 2010. The primary purpose of the Gillette Regional Water Supply Project was to provide a new water supply, install regional extensions to serve local water districts, and make improvements to internal distribution systems of participating water districts. The Gillette Regional Water Supply Project is intended to serve regional needs for the next 30 years, based on a design regional population of approximately 57,000 (the population of Gillette and the immediate regional area surrounding Gillette currently exceeds 37,000) (City of Gillette 2014b).

Wright

Water supply and treatment services in and near Wright are provided by the Wright Water and Sewer District. Currently, the district provides water to over 2,500 residents. The 2013 water system capacity was 1.9 mgd, total treated water storage was 1.5 million gallons, and peak water use was 1.3 mgd (Wyoming Water Development Commission 2013a). The recently completed 20-year plan for the district water and wastewater systems is to develop capacity to serve 5,000 residents. The district has state permits for two additional wells and plans to construct a second storage tank. These improvements will provide water system capacity to serve the target population of 5,000 residents (AECOM 2014b).

3.11.8.5 Wastewater Treatment

The Douglas wastewater system has a treatment capacity of approximately 1.5 mgd. In 2011, the system averaged from approximately 0.6 mgd in January to almost 0.8 mgd in August (City of Douglas

2014a). The Douglas Public Works Department treats some wastewater from oil and gas temporary living facilities (Newton 2014).

The Town of Glenrock provides wastewater treatment services to over 2,500 residents. With recently completed upgrades to the lagoon system, the wastewater utility could accommodate a population of 3,300 (Andrews 2014).

The Sam Hobbs Regional Wastewater Treatment Facility, which treats the effluent from approximately 67,000 people in Casper and the surrounding communities, has a design capacity of 10 mgd. From 2010 to 2012, the facility had an average daily flow of approximately 7 mgd (City of Casper 2013b) approximately 70 percent of design capacity. The facility may require up to $29 million in upgrades within the next decade to meet USEPA discharge standards (Casper Star Tribune 2014a).

The Gillette Wastewater Division collects and treats the sewage produced by the citizens and businesses of Gillette. The Gillette wastewater system served approximately 30,000 residents and associated commercial, industrial, and municipal demand in 2013. Improvements to the wastewater treatment plant completed in 2007 increased the plant capacity from 3.85 mgd to 5.12 mgd. These improvements should allow the system to accommodate approximately 35,000 people (Mulder 2012).

Wastewater collection and treatment services in Wright are provided by the Wright Water and Sewer District. In 2013, the district provides wastewater services to over 2,500 residents. The district recently completed renovation and expansion of the wastewater lagoon system, which now provides capacity to accommodate the target population of 5,000 residents (Kingan 2012).

3.11.8.6 Solid Waste Disposal

The City of Douglas operates a landfill for both municipal solid waste and construction/demolition waste. Upon completion of a transfer station, Douglas will begin transporting municipal solid waste to the Casper Regional Landfill for disposal. The Douglas landfill will continue to accept construction/demolition waste until the city council approves development of a new cell at the landfill (Newton 2014).

Glenrock and all Natrona County municipalities within the analysis area transport municipal solid waste to the Casper Regional Landfill for disposal. Municipal solid waste is collected by a variety of municipal and private trash haulers and transported to transfer stations or hauled directly to the Casper Regional Landfill. The City of Casper is permitted to operate the regional landfill on a 1,750-acre site. Phase I of the landfill included 88 acres with an estimated capacity of 11,920,000 cubic yards and has an estimated lifespan of 50 years. Five future cells also have estimated life spans of 50 years (Inberg-Miller Engineers 2009).

All Campbell County municipalities and unincorporated areas transport their municipal solid waste and construction/demolition waste to the Campbell County landfill west of Gillette. The landfill also is licensed to accept drilling mud and oil-contaminated waste. As of 2014, the Campbell County landfill had capacity for another 45 years at current fill rates and was in the process of becoming a regional landfill so that it could accept waste from surrounding counties (Giffin 2014).

3.11.8.7 Converse County Road and Bridge Department

This section addresses the operations of the Converse County Road and Bridge Department. The Natrona County and Campbell County road and bridge departments are not addressed because they are unlikely to be substantially affected by development and operation of the Project. See Section 3.13, Transportation, for a broader discussion of transportation.

The Converse County Road and Bridge Department had 20 employees as of November of 2014, including 15 equipment operators. Two of the employees were hired in response to the increased

demand, and the department increased its working week to include mandatory overtime every other Friday (Converse County 2015b).

In 2014, Converse County had 650 miles of roads, including 130 miles of paved roads and 520 miles of gravel or dirt roads. Most county roads were designed for agricultural use. Some county roads have accommodated prior oil and gas exploration and uranium mining, but in general, these roads were not designed to accommodate the traffic volumes or truck weights associated with the recent levels of oil and gas development (McWilliams 2014). Volumes of traffic (primarily heavy truck traffic) have increased dramatically on county roads that provide access to well pads and ancillary facilities such as disposal sites, oil load out facilities, and gas plants. For example, traffic on the Bill Haul Road increased from an average of fewer than 10 vehicles per day in 2008 to over 1,000 vehicles per day for the period counted in 2013. Even after wells are drilled and completed, hauling of oil and produced water generates high truck traffic volumes on county roads. Dust also is a major problem on unpaved county roads.

The high volumes of heavy truck traffic substantially displace the gravel on county roads, necessitating more frequent replacement on more miles of road at substantial cost to the county. Rig moves and increased volumes of heavy truck traffic, coupled with the use of roads when muddy, has resulted in filled-in cattle guards, damages to barrow pits, and requirements for more frequent maintenance. The county also has needed to replace many culverts as a result of overweight loads. The county tries to blade roads that serve oil and gas development every several weeks. Prior to the development, some roads were bladed only once or twice per year.

The county has reconstructed and paved many miles of roads to accommodate the increased volume of heavy trucks associated with oil and gas development. Road construction and maintenance is funded through a combination of county funds and revenues from companies obtained through road use agreements. Converse County Road and Bridge Department expenditures have increased from $2.2 million in fiscal year 2009 to a budgeted $25.8 million in fiscal year 2015. Road use agreements typically are negotiated for roads leading to high traffic facilities. They require companies to fund or improve some roads, perform maintenance activities to county standards, and return roads to original condition.

The proliferation of gravel pits in the county, developed primarily to support well pad, access road, and other oil and gas infrastructure demand, has generated additional heavy truck traffic on county roads that previously had seen relatively little traffic. Some of the affected roads are located south of I-25, outside of the CCPA.

The county also has expended considerable funds to substantially improve roads leading to new oil and gas facilities such as rail transfer facilities and gas plants, and they typically negotiate road use agreements with the operators of these facilities.

Converse County requires permits for oversize/overweight vehicles. The County Commissioners funded a weights and measures enforcement officer for the sheriff's department starting in early 2015. Some oil and gas companies have provided gravel for improving roads to a few locations, and some companies blade certain county roads in winter.

Although Converse County has increased road expenditures, staff, and equipment, the Road and Bridge Department was still unable to keep up with road maintenance demand during 2014 (McWilliams 2014; Willox 2014).

3.11.8.8 Health Care

Hospitals and health clinics serve as the foundation for health care in the analysis area. Each county has a hospital located in the county seat. Services provided reflect the service area population for each

facility, fiscal resources, and distances to other healthcare facilities. Individual and group medical and dental practices partner with these institutions to meet the healthcare needs of the community.

Hospitals and clinics located within the analysis area include:

- Memorial Hospital of Converse County in Douglas and associated clinics located in Douglas and Glenrock;
- Glenrock Hospital District Glenrock Clinic;
- Wyoming Medical Center and clinics located in Casper;
- Mountain View Regional Hospital located in Casper;
- Campbell County Memorial Hospital and associated clinics in Gillette; and
- Campbell County Memorial Hospital clinic located in Wright.

Other specialized private medical clinics and practices are located in Gillette, Douglas, and Casper.

Memorial Hospital of Converse County

The Memorial Hospital of Converse County is a 25-bed critical access, acute care hospital with 2 ICU beds, 2 labor/post-partum suites, and 4 nursery cradles. All other rooms are semi-private. All attending physicians at the hospital are board-certified. Memorial Hospital of Converse County opened a medical office building in March of 2014 that houses doctors and providers, a wellness clinic, and an urgent care clinic. The average inpatient daily census for 2013 was 6.5 patients. During the summer of 2014 the average daily census increased to 9.5. The hospital added several hospitalists (on-staff physicians specializing in the care of hospitalized patients) and other physicians to the staff in response to increased demand from oil and gas development in the county. During 2014, the Memorial Hospital of Converse County experienced a substantial increase in visits to its emergency room and urgent care facility, which was attributed to the population associated with oil and gas development and the fact that temporary oil and gas workers typically do not have local primary care physicians (Dugger 2014; Memorial Hospital of Converse County 2014a, 2013).

The Oregon Trail Rural Health Clinic located in Glenrock, Wyoming, is an extension of Memorial Hospital of Converse County. In addition to healthcare providers, the clinic also is home to Glenrock EMS services, offering advanced cardiac life support, trauma support, and other EMS services (Memorial Hospital of Converse County 2014b).

Glenrock Health Center

The Glenrock Health Center is a certified Rural Health Clinic staffed by full-time physician assistants, registered nurses, local dentists, and a lab/X-ray technician, all on-site on a rotating basis. The Glenrock Health Center only provides outpatient services (i.e., there are no inpatient beds). Minor to moderate injuries are stabilized and transferred to an inpatient facility if needed (Glenrock Health Center 2014a).

Wyoming Medical Center

The Wyoming Medical Center in Casper is a Joint Commission Accredited regional medical center and Level 2 Trauma Center with over 200 beds, 150 physicians on staff, and 194 other physicians with admission and practice privileges at the hospital. The center offers a complete range of health care services including 75 medical specialties, complete emergency facilities, surgical accommodations, and rehabilitative services (Wyoming Medical Center 2014c). The average daily inpatient census for fiscal year 2014 was 90.5 patients (Cepeda 2014). In 2013, Wyoming Medical Center served 8,941 inpatients and had 37,657 emergency room visits (Wyoming Medical Center 2014a). The center provides a Life Flight helicopter and fixed-wing medivac and transport services (Wyoming Medical Center 2014b). A

$42.5 million, 100,000-square-foot expansion of the McMurry West Tower, which houses an orthopedic/spine surgical floor; a new labor and delivery area; private patient suites; waiting and admitting rooms; a wellness center; and a number of other facilities opened in September of 2014 (Wyoming Medical Center 2014d).

Casper has two urgent-care facilities, several outpatient/day surgical centers, and a private, physician-owned hospital called Mountain View Regional Hospital (Wyoming Medical Center 2014c). A new private hospital, Summit Medical Center, is scheduled to open in Casper in early 2015 with 16 private rooms, four operating rooms and radiological services (Casper Star Tribune 2014b).

Campbell County Memorial Hospital and Clinics

The Campbell County Memorial Hospital in Gillette operates a 90-bed acute-care hospital, the 150-bed Pioneer Manor Long-term Care Facility, an ambulatory surgical center, and 14 specialty clinics. Hospital inpatient services include medical, surgical, emergency room, an intensive care unit, Wyoming Orthopedic and Rehabilitation Institute, maternal child, and hospice. The average daily inpatient census at the Campbell County Memorial Hospital for fiscal year 2014 was 25 patients (Long 2014). Outpatient services include behavioral health services, cancer care, cardiopulmonary services, home healthcare, laboratory, pediatric specialty clinic, and a variety of other clinics and services.

The Campbell County Memorial Hospital completed a 3-year, $68 million expansion project that included a surgical service department; main lobby and administration areas; extensive interior remodeling; a 3.5-level, 273-space parking structure; and an unfinished second floor to accommodate future growth. Future expansion plans include the construction of a new long-term care facility, renovation and expansion of radiology services, and construction of additional physician clinic space (Campbell County Memorial Hospital 2014b).

Wright Walk-In Clinic

Campbell County Memorial Hospital also operates the Wright Walk-in Clinic, which provides family health care services, laboratory, x-ray, physical therapy, visiting physician, and counseling services to the Town of Wright and the surrounding area of Campbell County (Campbell County Memorial Hospital 2014c).

3.11.8.9 Social Services

The Wyoming Department of Family Services offers human services in four main program areas: public assistance (i.e., nutrition support and home heating help), child support enforcement, juvenile services, and protective services. Wyoming Department of Family Services offices are located in Douglas, Glenrock, Casper, and Gillette. The Glenrock office is staffed on a regularly scheduled basis from the Douglas office.

Wyoming Department of Family Services receives its funding from the State of Wyoming and the federal government. The total operating budget for fiscal year 2015-2016 was $295 million. Of that, $171 million was provided by the state general fund. Another $114 million was from federal sources, and $10 million was from special revenue funding.

Public assistance caseloads in Converse County decreased from 2011 through 2014, in large part due to the availability of jobs. For example, the Supplemental Nutritional Assistance Program caseloads at the Douglas and Glenrock offices for the month of August decreased by 24 percent between 2011 and 2014, from 327 households to 251 households (Herb 2014).

Converse Social Services intakes (reports of abuse and neglect for children and adults, and juvenile probation referrals) for 2013 were 3 percent higher than 2010 intakes, and 2012 intakes were 16 percent higher than 2010 intakes; however, other social services program caseloads have declined since 2010.

For example, the number of substantiated child/adult abuse or neglect allegations fell from 83 in 2010 to 28 in 2013; the number of open Department of Family Services cases fell from 1,037 to 966, and the number of placements (i.e., the average monthly number of children in placement due to abuse/neglect or juvenile probation) fell from 48 to 35. However, the latter category may have been affected by the national requirement to place children with relatives rather than in foster care. Although the number of ongoing social services cases in Converse County decreased, the number of cases involving drugs increased substantially (Lebsack 2014).

3.11.9 Public Schools

School districts in the analysis area serve students associated with energy and mineral development in Campbell, Converse, and Natrona counties. These school districts, the Wyoming School Foundation Program, and the Wyoming School Finance Department (WSFD) derive revenues from taxes on the mineral and energy industries. These state programs are intended to provide Wyoming school districts a guaranteed level of funding and adequate educational facilities, regardless of the local tax base.

3.11.9.1 Overview and District Summaries

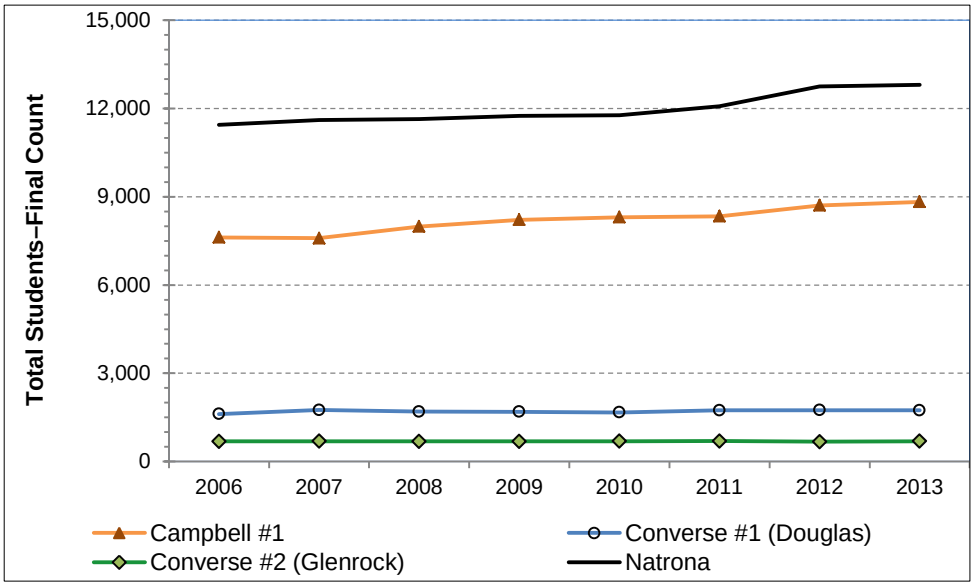
Four school districts serve the analysis area: Converse County School District #1 (Converse #1) is based in Douglas and serves the eastern portion of Converse County, Converse County School District #2 (Converse #2) is based in Glenrock and serves the western portion of Converse County, Natrona County School District #1 (Natrona #1) is based in Casper and serves all of Natrona County, and Campbell County School District #1 (Campbell #1) is based in Gillette and serves all of Campbell County. Public school enrollment across the analysis area generally mirrored economic trends in recent years, climbing during periods of oil and gas development, rising coal production, and power plant, pipeline, and wind farm construction but moderating during the national economic recession between 2007 and 2010.

Table 3.11-26 and **Figure 3.11-16** provide an overview of the school districts in terms of the number of schools in operation and recent enrollment trends. Of the four districts, Natrona #1 is the largest in terms of enrollment with 12,796 students in the fall of 2013. Campbell #1 had 8,826 students, while Converse #1 and Converse #2 registered 1,742 and 690 students, respectively. District-wide enrollment in Campbell County climbed by 16 percent in the 8-year period from the 2006/2007 to the 2013/2014 school year. Converse #1 and Natrona #1 also saw increases in enrollment, while enrollment in Converse #2 remained relatively constant. All four districts have opened one or more new schools in recent years. Although fall school enrollments for the 2014/2015 school year were not available at the time of this assessment, Converse County #2 enrollment remained relatively flat while Converse #1 enrollment increased by approximately 30 students. Superintendents of both Converse County school districts report modest enrollment gains associated with the current oil and gas development, but also report a high degree of transiency and incidence of special and remedial education needs among those students (Espeland 2014; Hughes 2014).

Table 3.11-26 Selected Characteristics of Public School Districts in Analysis Area

School District	District Office Location	Number of Schools in Operation	Total Staff 2012/2013 (Full-Time Equivalent)	Student Enrollment			
				2006/2007 School Year	2013/2014 School Year	Change	Percent Change
Converse #1	Douglas	10	357.6	1,617	1,742	125	8
Converse #2	Glenrock	5	136.2	687	690	3	0
Natrona #1	Casper	35	2,130.5	11,445	12,796	1,351	12
Campbell #1	Gillette	21	1,571.8	7,617	8,826	1,209	16

Source: Wyoming Department of Education 2014a,b.



Source: Wyoming Department of Education 2014a.

Figure 3.11-16 Total Fall Enrollment for Public School Districts

Converse County School District #1

Converse #1 covers Douglas, Shawnee, and the remainder of eastern Converse County. The district operates five schools in Douglas, organized as follows: primary (kindergarten through grade 2), two intermediate schools (grades 2 through 5), middle (grades 6 through 8), and high school (grades 9 through 12). One of the intermediate schools was completed in 2012, allowing some reconfiguration of classes to alleviate pressures at the primary and intermediate schools due to high enrollments. The district also has five rural kindergarten through grade 8 schools, including the newer Walker Creek School. These schools are used on an as-needed basis (AECOM 2012b; WSFD 2014).

The City of Douglas currently relies on school district facilities to support indoor community recreation, although Converse County is assessing the feasibility of constructing and operating a separate community recreation center. For a number of years, the community has paid an optional 1.0-mill property tax (a mill is $0.001 [i.e., 1/1000 of dollar] and is applied to the assessed valuation to derive the amount of taxes levied) to operate recreation programs and facilities.

Converse County School District #2

Converse #2 operates four schools in the Town of Glenrock and a remote school south of Glenrock (the Boxelder School) in the western part of the county. The schools in Glenrock include an elementary school (kindergarten through grade 4), an intermediate school (grades 5 and 6), a middle school (grades 7 and 8), and a high school (grades 9 through 12). The Boxelder School is used on an as-needed basis. Total district enrollment was 690 in the fall of 2013.

School facilities had been underutilized due to declining enrollment associated with demographic changes and cutbacks in local mining and utility employment. To address this issue, the district built a new elementary school in 2008 and closed an older, larger school that was in need of major maintenance. The district plans to maintain and upgrade the other schools as funding permits (AECOM 2012b; WSFD 2014).

Community use of schools in Converse #2 is concentrated in the intermediate/middle school building, which had previously been used as the high school. The facility houses an indoor swimming pool that doubles as a public pool and an auditorium that is used for town meetings and social gatherings.

Natrona County School District #1

Natrona #1 provides public primary and secondary education services throughout Natrona County. The district is the second largest in the state in terms of enrollment; only Laramie County School District #1 based in Cheyenne has more students. The district operates two traditional high schools and an alternative high school in Casper. Additionally, the district operates one K-12 school, five junior high/middle schools, and 26 elementary schools. Eight of the elementary schools are located in smaller communities outside of Casper. Over the past decade, total enrollment in the district has climbed by 1,250.

Natrona #1 is in the midst of a multi-year capital facilities improvement program, which as presently outlined by the WSFD includes: four new elementary schools, several of which would replace existing schools; a new high school and major renovation of another; a new alternative high school; and a new elementary/middle/high school (WSFD 2013).

Campbell County School District #1

Campbell #1 provides public primary and secondary education services throughout Campbell County. This district operates 2 high school campuses in Gillette under a single administration, 1 junior-senior high school in Wright, 2 junior high schools in Gillette, 15 elementary schools (including 6 in the outlying rural areas of the county), and 1 alternative high school in Gillette. The district is in the final stages of a multi-year capital facilities program, which included completion of four elementary schools and major renovations of several others. The school district also joined with Campbell County and the City of Gillette in the completion of a major new recreation center (AECOM 2012b; WSFD 2013).

Campbell #1 experienced a decade-long decline in total enrollment between 1993 and 2003. However, while the elementary grades were declining, high school enrollment increased. Those patterns have since changed, with a net gain of more than 1,100 elementary-aged students and an influx of 260 students in grades 6 through 8 during the past decade.

Campbell #1 has an extensive vocational technical program focused on educating and training students for jobs in the energy and related industries in the county. Related industries include diesel mechanics and computer and robotics mechanics, as well as operation of computer assisted milling machines. This vocational program provides local industries with a pool of entry-level employees in critical trades and helps stabilize the community by providing employment opportunities for local youth.

Campbell #1 anticipated continued enrollment growth prior to the recent fall in energy prices. According to a capacity study published in 2013, the district faced shortages in elementary and middle school capacity. To address these needs, the district planned construction of three additional elementary schools to replace existing facilities and to be sized to facilitate reconfiguration of grades by school to help optimize capacity to serve the anticipated growth in enrollment. A new high school also was planned, as was a new facility to house the alternative high school (WSFD 2013).

3.11.9.2 School District Fiscal Conditions

The Wyoming School Foundation Program (Title 21, Chapter 13 of Wyoming Statutes) is intended to provide local school districts a solid funding basis for operations, irrespective of differences in the local revenue-generating capacities of the individual districts. Revenue for school funding comes from taxes on minerals production, real estate, taxable personal property, and various other local, state, and federal program funds and grants. The Wyoming School Foundation Program is a statewide school finance system that guides operating revenues and expenditures for public educational services delivered at the

local level. The system is structured to achieve equalization in educational opportunities across the state. The northeastern part of the state plays an important role in the system due to its large energy and minerals-related tax base. Campbell County alone accounted for more than 24 percent of the state's entire assessed valuation in 2012/2013. Property tax revenues are derived from a mandated levy. Revenues from a district that are in excess of authorized operating expenditures for that district flow to the state to support education in districts with fewer resources.

Public education funding also functions under the rules, policies, and procedures of the WSFD (Title 21, Chapter 15, of Wyoming Statutes). The WSFD was originally established as the Wyoming School Facilities Commission during the 2002 Legislative session with a charge to oversee all aspects of construction and maintenance of school facilities and physical plants. Its mission is to provide adequate educational facilities for all children in Wyoming, mirroring the mission of the Wyoming School Foundation Program, which focuses on operations. The impetus for establishing the WSFD was a 2001 State Supreme Court decision (the State of Wyoming et al., v. Campbell County School District et al., Wyoming 19, 19, P.3d 518) requiring the legislature and school districts to remedy facilities in immediate need and inadequate condition. As a result of that court decision, school facility capacity, basic design, and condition are subject to review and approval by the WSFD. The ongoing reviews prioritize statewide construction plans, and in some cases, result in directives for districts with surplus capacity to consolidate/close facilities. Construction is now funded through a statewide tax or from other revenues imposed equally on all taxpayers rather than from locally derived revenues. As noted in Section 3.11.9.1, all four districts have opened new schools and have substantial capital improvement priority projects approved by the WSFD for funding over the next 4 to 5 years.

Tables 3.11-27 and **3.11-28**, as well as **Figure 3.11-17** provide an overview of selected financial characteristics of the school districts in the analysis area. The total assessed valuation of real and personal property and mineral production within the districts for the 2013/2014 school year ranged from $328.1 million in Converse #2, which has had relatively modest mineral or energy production in recent years, to over $5.5 billion in Campbell #1, a large portion of which is attributable to coal and oil production. Increases in oil production and commodity prices in recent years contributed to increases in assessed valuation of more than $1.0 billion in Campbell #1 and $564 million in Converse #1; the latter representing more than a tripling of the district valuation compared to that for the 2006/2007 school year.

Table 3.11-27 Overview of Public Education Finance by School District

District	District Assessed Valuation (millions of nominal dollars)			Percent Change
	2006/2007	2013/2014	Change	
Converse #1	276.4	840.8	564.4	204
Converse #2	181.0	328.1	147.1	81
Natrona #1	944.1	1,255.3	311.2	33
Campbell #1	4,553.1	5,559.4	1,006.3	22

Source: Wyoming Department of Education 2014a.

Table 3.11-28 Financial Characteristics of Public School Districts in Analysis Area

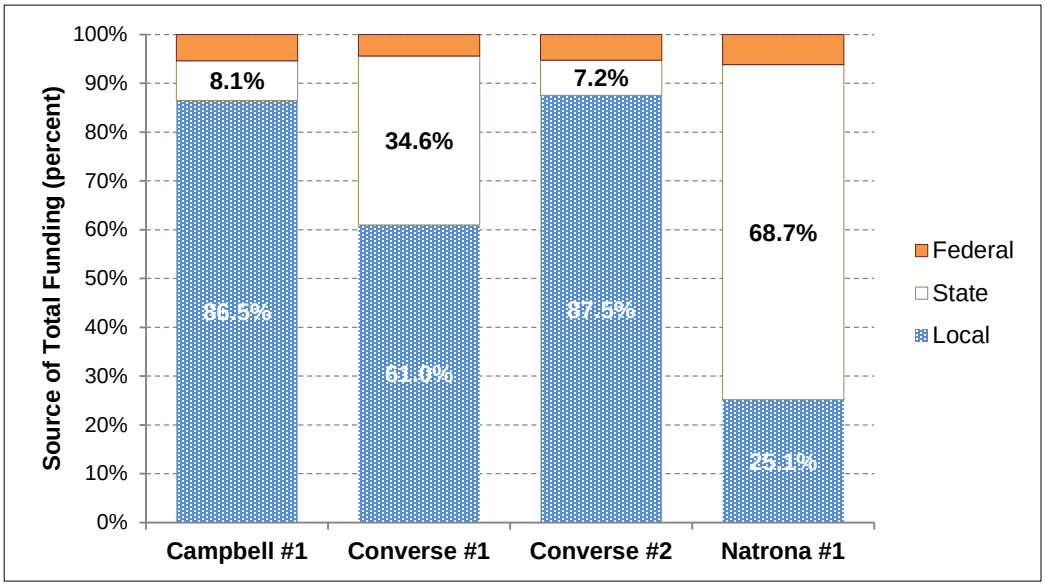
Parameter	Converse #1	Converse #2	Natrona #1	Campbell #1
General Fund Expenditures 2012/2013 (millions)	$27.3	$10.3	$166.8	$121.0
Operating Costs / Average Daily Membership	$17,092	$17,639	$15,349	$16,324
Bonded Debt	$ 0.0	$ 0.0	$ 0.0	$ 0.0
Percent of Students Transported	56	33	43	56
Recapture (sent to the State)	$0.0	$0.0	$0.0	-$61.6 million

Source: Wyoming Department of Education 2014b,c.

Despite the substantial differences in the local tax base among the districts, all enjoy a relative degree of parity with respect to their budgets, at least on a per-student basis. This reflects the function of the state's funding equalization program. As shown in **Table 3.11-28**, the overall expenditures of the districts tend to parallel their enrollments, ranging from Converse #2 at $10.3 million to Natrona #1 at $166.8 million. Per-student operating costs on an average daily membership basis, which reflects enrollment and attendance, ranges from $15,349 to $17,639 and is relatively comparable among districts. Those differences reflect the local cost of living (particularly housing), number of small schools, percent of students transported by a district bus system, and other factors that affect the cost of operation for a district.

None of the four districts currently have any outstanding bonded debt, largely a reflection of the role played by the WSFD with respect to new school construction. Since its inception, the WSFD has provided nearly $2.6 billion in funding to maintain, improve, and build schools in Wyoming. The vast majority of the revenue supporting that program has been derived from mineral development. Such revenues also provide major support for the Wyoming School Foundation Program, effectively augmenting locally derived resources to achieve funding equalization. As noted above, per-student operating costs are relatively comparable across the districts; however, the sources of revenues to fund those costs vary dramatically (**Figure 3.11-17**). As shown, locally derived revenues in resource-rich Campbell #1 and Converse #1 account for more than 86 percent of district total revenues, but only account for 25 percent in Natrona #1. State revenues offset the differences, using other revenues derived from mineral production including more than $61 million in revenues derived in Campbell County that were in excess of the allowable funding.

The Wyoming School Foundation Program does provide local school districts a degree of assurance regarding funding to offer public education across the state. However, the level of approved funding tends to be heavily weighted to the previous year's enrollment and past increases in the cost of living. Consequently, districts that experience extraordinary year-to-year increases in enrollment and escalating salary costs in response to added staffing and the rising cost of living, often in conjunction with rapid changes in oil and gas development or industrial construction projects, may face budgetary constraints until/unless supplemental funding is approved. However, even when supplemental funding is available it tends to lag behind the increased costs that such districts incur. Such is the case in Converse #1 where local housing costs have risen dramatically due to strong demand and limited availability, which has necessitated higher salaries in order to recruit and retain teachers and other staff. Even then, some staff must commute from the Casper area. School staff incur other rising costs tied to energy development as well. For instance, day care costs in Douglas rose substantially during the 2013/2014 school year in response to labor shortages and rising rental expenses due to the demand for commercial and industrial space (Espeland 2014).



Source: Wyoming Department of Education 2014a.

Figure 3.11-17 Revenue Sources for Public School Districts

3.11.10 Local Government Fiscal Conditions

Federal mineral royalties, combined with state and local taxes levied on mineral production, are major sources of public revenue in Wyoming. Taxes, fees, and charges levied on real estate improvements, retail trade, and other economic activity supported by energy development provide additional sources of revenue to support public facilities and services. Through revenue-sharing and intergovernmental transfer mechanisms, these revenues benefit the jurisdiction within which the activity occurs as well as federal treasury, state coffers, school districts, and local governments across the state. This section describes the most important public sector revenue streams associated with mineral development in the area through recent trends and characterizes public sector fiscal conditions for selected county and municipal governments in the analysis area.

3.11.10.1 Key Public Sector Revenues

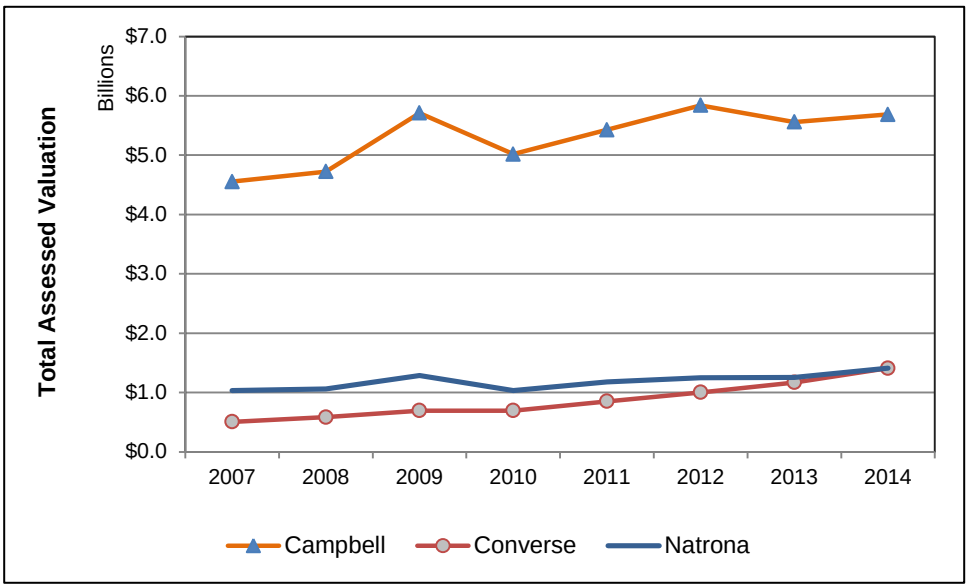
The four primary sources of revenue that accrue in conjunction with mineral development are ad valorem excise taxes (applicable to improvements, real estate, and value of production), federal mineral royalties (only applicable to federal mineral interests), state severance taxes (applicable to the value of production), and state and local sales and use taxes (applicable to value of most purchased goods and services by companies and employees). Each of these is discussed in further detail below.

Ad Valorem (Property Taxes)

Oil and natural gas, coal, and other minerals produced in Wyoming, regardless of ownership, are subject to ad valorem taxation by local taxing entities and a statewide levy to support public education. Although all privately owned real estate and improvements are subject to taxation, they are assessed at fractional rates (e.g., 9.5 percent of fair value for residential property) in comparison to the 100 percent valuation applied to mineral production.

Each of the three counties in the analysis area has seen gains in assessed valuation between 2007 and 2014 (**Figure 3.11-18**). The gains in Converse County during this period exceeded $902 million (178 percent), largely due to increased valuation attributable to rising oil production. As a result of those

gains, Converse County's valuation topped $1.0 billion for the first time in 2012, reaching $1.4 billion in 2014 and essentially equaling the valuation of neighboring Natrona County.



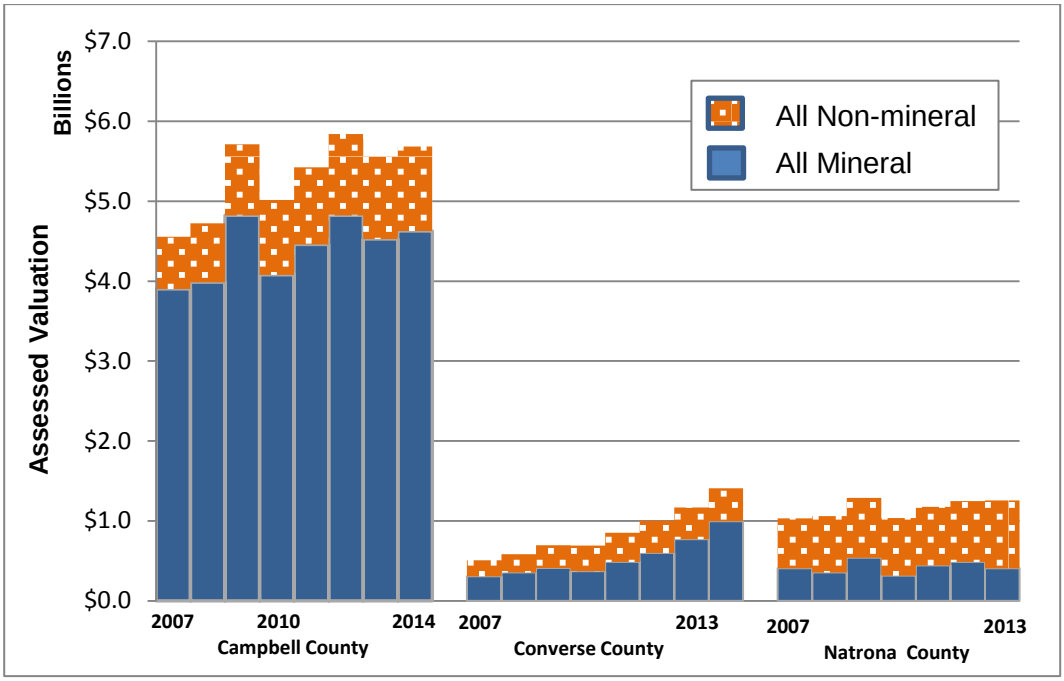
Source: Wyoming Department of Revenue 2008-2014; Wyoming State Board of Equalization 2014.

Figure 3.11-18 Total County Assessed Valuation: 2007–2014

The net gain in assessed valuation in Natrona County was $378.4 million (37 percent), but virtually the entire gain was attributable to valuation on residential, commercial, and industrial property. Total valuation increases of $1.1 billion (25 percent) were registered in Campbell County despite a substantial reduction in coal production volumes (**Figure 3.11-3**). The changes in mineral and non-mineral valuation, along with the comparative levels of valuation for each county, are shown in **Figure 3.11-19**.

As noted, oil and gas production has increased dramatically in Converse County in recent years. The valuation of this increased production accounted for more than 75 percent of Converse County's total increased valuation in 2014. Similar gains in oil production have occurred in Campbell County, although the increase represented a smaller change due to the large base of valuation associated with coal production.

The average property tax rates in 2014 for property owners in the three counties (**Table 3.11-29**) ranged from 59.588 mills in Converse County to 63.245 mills in Natrona County, the latter reflecting more than a 10 percent decline in tax rates compared to the preceding year. The respective tax rates reflect differences in the number and respective tax levies by taxing entities in each county. For example, countywide levies support the hospital district in Campbell County and a community college in Natrona County in addition to the county, local municipalities, and school districts levies.



Source: Wyoming Department of Revenue 2008–2014; Wyoming State Board of Equalization 2014.

Figure 3.11-19 Mineral and Non-mineral Valuation by County: 2007–2014

Table 3.11-29 Average Property Tax Rates and Total Property Taxes Levied: 2013-2014

Parameter	Campbell County	Converse County	Natrona County
2014 Tax Rates (average mills)	60.111	59.588	63.245
Total Property Taxes Levied[1]			
2013	$334,156,581	$70,127,477	$88,205,189
2014	$341,777,346	$83,899,403	$99,077,826
Change	$7,620,765	$13,771,926	$10,872,637
Percent Change	2.3	19.6	12.3

[1] Dollar amounts are in nominal dollars.

Source: Wyoming State Board of Equalization 2014.

In Converse County, local entities with taxing authorities levied total taxes of $83.9 million in 2014, an increase of nearly 20 percent (approximately $13.8 million) from 2013, primarily in response to a sharp increase in valuation. Total property taxes levied by taxing authorities in Natrona County also saw double-digit year-over-year increases, rising 12.3 percent ($10.9 million), with total property tax receipts exceeding $99.0 million. Total taxes levied by taxing entities in Campbell County increased by $7.6 million, or 2.3 percent.

Typically, there is a direct correlation between changes in local assessed valuation and local property tax receipts as increases in assessed valuation result in increases in property taxes levied. This correlation holds unless statutory limitations restrict the responsiveness of local revenues, local officials act to use

discretionary authority to change local tax rates, voters approve changes in tax rates or local facilities and services that result in changes in taxes, or long-term debt and the corresponding debt service is retired.

Sales, Use, and Lodging Taxes

Sales and use tax receipts are another vital revenue source for local governments in Wyoming. These taxes revenues are derived from taxes on capital equipment, motor vehicles, and materials and supplies purchased by oil and gas firms as well as on the retail purchases of motor vehicles, consumer goods, meals, and other taxable items by employees supported directly and indirectly by such development. The volume of sales and use taxes collected serve as a useful barometer of local economic activity over time, with changes in the industrial mix of collections providing important insights into the performance of specific industries. Although sales taxes tend to be associated with retail trades and food services, such taxes are levied by establishments in all industries, and the use taxes associated with out-of-state purchases of capital equipment, materials, and supplies can comprise substantial shares of the overall receipts. The state collects these taxes and disburses the local share back to the appropriate entities.

Counties may impose up to a 2.0 percent general-purpose local tax and up to a 2.0 percent specific-purpose tax for capital improvements. General-purpose taxes typically flow to the local general fund; whereas, receipts from the specific-purpose option typically are enacted for a specific duration or defined level of generated revenue that is earmarked for specific programs or projects. Converse and Campbell counties also were levying 1.0 percent specific-purpose option taxes. Approved for up to 10 years, the voter-approved tax measure contained sunsetting provisions of those levies that automatically eliminated the special purpose tax after the maximum authorized revenue had been collected (**Table 3.11-30**).

Table 3.11-30 Sales, Use, and Lodging Tax Rates: 2014

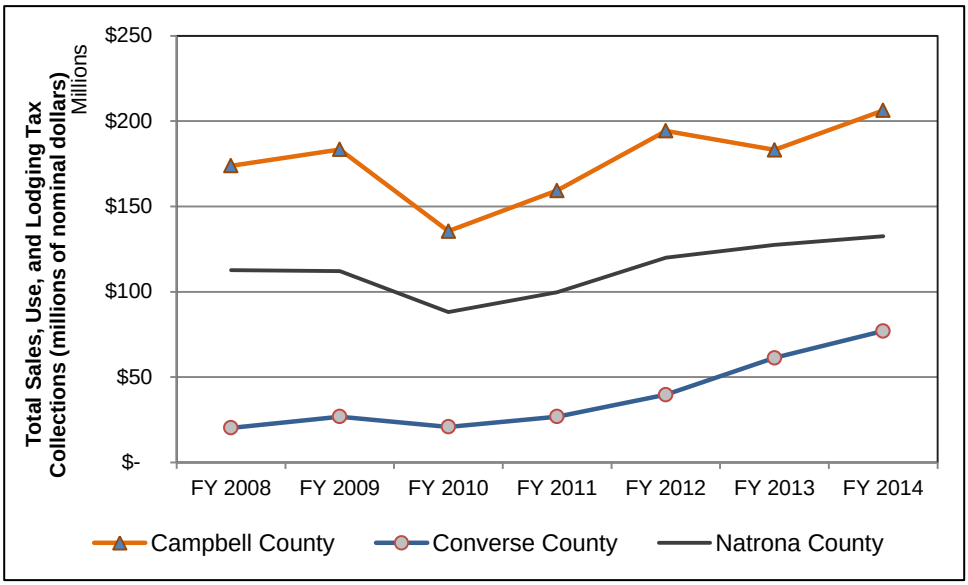
County	State Sales and Use Tax Rate (percent)	Local General Purpose Option (percent)	Local Specific Purpose Option[1] (percent)	Lodging Tax (percent)	Total Tax Rate General / Lodging (percent)
Converse	4	1	1	3	6 / 8
Natrona	4	1	--	3	5 / 8
Campbell	4	1	1	2	6 / 8

[1] These levies have since lapsed because the maximum authorized revenue had been collected.

Source: Wyoming Department of Revenue 2014b.

Counties also have the option to levy a lodging tax of up to 4.0 percent on lodging stays of less than 30 days. Tracking receipts over time can be useful in identifying and monitoring local tourism activity. Increases in receipts over time also may reflect expansion of a local lodging base and increasing rates due to high demand, both of which occur in Converse County in response to the upswing in oil and gas development activity. Proceeds from the lodging tax are to be used for tourism promotion and economic development.

Sales, use, and lodging tax receipts vary dramatically between the three counties in magnitude, composition, and recent trends. Patterns in the overall receipts by county from 2008 to 2014 are shown in **Figure 3.11-20**. Total annual sales and use tax collections in Converse County mirror the pattern described for assessed valuation, more than tripling over the 6-year period and almost doubling in the from 2013 to $69.6 million in 2014. Increases in sales tax collections account for the vast majority of growth; however, use tax receipts associated with out-of-state capital purchase of equipment such as drilling pipe or pipe for oil and gas transmission lines also increased, climbing by $5.0 million between 2012 and 2013.



Source: EAD 2014c, 2013.

Figure 3.11-20 Annual Sales, Use, and Lodging Tax Receipts in Analysis Area: Fiscal Years 2008–2014

The pattern of annual sales and use tax collections in Natrona County is similar to that in Campbell County, showing year-to-year declines between 2009 and 2010, followed by increases from 2011 through 2014. Factors contributing to the increases include the general economic recovery and oil and gas development in many areas of Wyoming that was supported from Casper. However, Casper derives a large portion of its sales tax receipts on consumer purchases rather than industrial activity, so the gains in Natrona County have been more modest in scale than those in Converse and Campbell counties.

Total annual collections from Campbell County ranged from $135.5 million to more than $206.3 million between 2008 and 2014. Factors contributing to the wide range include the major capital investment associated with construction of the Dry Fork generating station, response to the recession in capital investments by the mines, and increased oil and gas activity. In general, use tax receipts have declined over time in Campbell County, while sales taxes have increased.

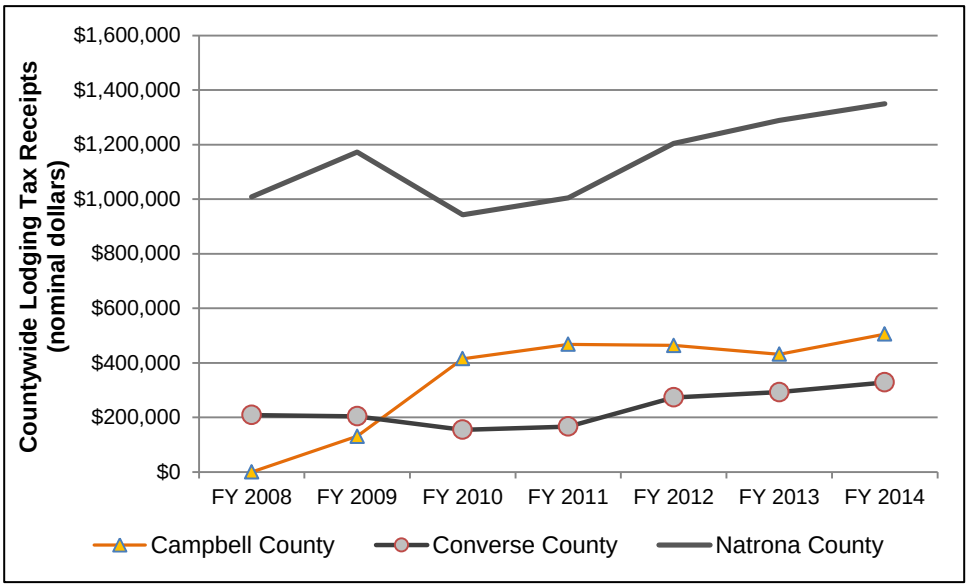
Information reported by the Wyoming Department of Revenue for fiscal years 2013 and 2014 reveal across-the-board, year-over-year increases in sales and use tax receipts for all three counties (**Table 3.11-31**). The increases varied from nearly 26 percent in Converse County to 4 percent in Natrona County. The fiscal year 2014 receipts of $76,977,509 in Converse County and $132,511,671 in Natrona County both represent all-time highs.

All three counties levy a lodging tax. This lodging tax is at a 2 percent rate in Campbell County and 3 percent in Converse and Natrona counties. Among the three counties, Natrona has the largest base of hotel and motel rooms (**Table 3.11-22**), including a number of recent additions. Serving the energy, traveler, and special events and conference markets has helped the local hospitality industry to maintain relatively high occupancy rates. As a result, annual lodging tax receipts in Natrona County exceeded $1.2 million for the 3 consecutive years from 2012 through 2014 (**Table 3.11-31** and **Figure 3.11-21**).

Table 3.11-31 Sales, Use, and Lodging Tax Receipts in Analysis Area: 2013–2014

Location / Tax	FY 2013	FY 2014	Percent Change
Converse County			
Sales and Use	$61,237,365	$76,977,509	25.7
Lodging	293,143	328,774	12.2
County Total	**$61,530,508**	**$77,306,283**	**25.6**
Natrona County			
Sales and Use	$127,485,311	$132,511,671	3.9
Lodging	1,288,626	1,349,272	4.7
County Total	**$128,773,937**	**$133,860,943**	**4.0**
Campbell County			
Sales and Use	$183,089,241	$206,280,095	12.7
Lodging	431,762	505,759	17.1
County Total	**$183,521,003**	**$206,785,854**	**12.7**

Source: EAD 2014c.



Source: EAD 2014c.

Figure 3.11-21 Lodging Tax Receipts in the Analysis Area: Fiscal Years 2008–2014

Converse County realized lower lodging tax receipts than either Natrona or Campbell counties, with receipts in fiscal year 2014 totaling 24 percent of those collected in Natrona County. Although Converse County collected fewer lodging tax receipts, its local hospitality industry has benefitted in recent years from strong local demand associated with pipeline construction, oil and gas development, and new commercial and industrial construction in the county. These and other factors have contributed to higher occupancy rates and higher nightly rates. Annual receipts topped $300,000 for the first time in fiscal year

2014 and likely will increase following the completion of a new hotel that was under construction during the summer of 2014.

Lodging tax receipts in Campbell County generally have been between one-third and one-half the receipts in Natrona County. In part the differences reflect the lower tax rate. Another contributing factor is that RV parks provide more temporary lodging capacity in Campbell County than do hotel rooms. Recreational vehicle pads generate lower nightly fees and may have more stays of longer than 30 days, which are tax exempt. Extended motel stays by energy development workers also may be exempt from lodging taxes, although the extent to which this is the case is unknown.

The state sales and use tax of 4.0 percent is collected based on the point of sale. After the withholding of one percent of the total to cover administration and processing, 69 percent of the remaining sales and use tax revenue is transferred to the state's general fund, and the remainder (a statutorily established 30 percent of the statewide total receipts) is distributed back to local governments. The amounts returned to individual counties and incorporated municipalities are determined using a multi-tiered formula that allocates a fixed amount to each county; a portion based on each county's share of the statewide population and the remainder based on the percentage shares of net statewide sales and use taxes attributable to venders in that jurisdiction.

Table 3.11-32 details the sales and use tax collections and distributions in the analysis area for 2013. Sales and use taxes derived from economic activity in the three counties totaled $375.7 million, of which $190.4 million was retained by the state and $185.3 million was disbursed to local governments. The three counties received a combined total of $72.7 million, led by Campbell County at $52.5 million. As a group, the municipalities in the three counties received $112.6 million, with Gillette and Casper each receiving in excess of $40 million. Douglas received $11.9 million.

Table 3.11-32 Distribution of Sales and Use Taxes in Analysis Area: 2013

	Annual Sales and Use Tax Receipts			Distribution of Local Share		
County	Total	State Retained	Disbursed to Local Government	County	Primary Community	Other Communities
Campbell	$184,316,370	$85,576,567	$98,739,803	$52,537,323	$43,510,538 Gillette	$2,691,942
Converse	$ 61,796,820	$33,323,953	$28,472,867	$10,829,501	$11,899,058 Douglas	$5,744,308
Natrona	$129,604,285	$71,542,744	$58,061,541	$9,327,381	$41,958,796 Casper	$6,775,364

Source: Wyoming Department of Revenue 2013.

Wyoming State Severance Taxes

Wyoming levies a state severance tax on oil, natural gas, coal, and many other minerals produced in the state. Local counties and communities wherein the production occurs do not benefit directly from severance taxes levied on that production. Rather, the revenues accrue to the state, which are then allocated according to a multi-tiered statutory formula summarized below. The first tier allocations include a constitutionally mandated diversion of the proceeds from a 1.5 percent tax levy into the Permanent Wyoming Mineral Trust Fund. The fund principal (now in excess of $6.7 billion) is invested, and the derived income is transferred to the state's General Fund. Like other investments, earnings from the Permanent Wyoming Mineral Trust Fund are subject to market fluctuations and other risks. Following these allocations, remaining severance tax proceeds are allocated as follows:

- An amount equal to the proceeds of a 1-cent statewide gas tax is dedicated for environmental remediation of leaking underground storage tanks.
- Remaining amounts, up to an annual cap of $155 million, are transferred to the general fund (62.3 percent), water development accounts (14.6 percent), local governments (13.1 percent), highway and state aid to county road funds (7.23 percent), and capital construction (2.8 percent).
- Amounts in excess of $155 million per year are allocated to the general fund (33.3 percent) and the state's budget reserve account (66.7 percent).

The current severance tax rates, levied on the value of production, are 6.0 percent on oil and gas and 7.0 percent on surface coal. Tax rates on other mineral commodities range from 2.0 percent to 4.0 percent. Severance taxes are quite sensitive to changes in production as well as prices such that substantial year-to-year changes occur. For example, total severance taxes of $1.15 billion were estimated on all mineral production in 2009. The following year, the corresponding total was $770 million; a decline of $385 million or 33 percent (**Table 3.11-33**). In 2014, the estimated severance taxes levied totaled $888.6 million (Wyoming Department of Revenue 2014b). The largest single share of the total was taxes levied on natural gas: $305.4 million or 34 percent. Severance taxes on oil followed closely at $291.7 million.

Table 3.11-33 Annual Severance Tax Receipts on Statewide Mineral Production: 2009–2014

Year	Source of Annual Severance Tax Receipts (nominal dollars)				Total Statewide Severance Tax Receipts (nominal dollars)
	Coal	Natural Gas	Oil	All Other	
2009	259,741,502	720,207,059	130,633,403	44,234,842	1,154,816,800
2010	264,979,575	351,663,078	108,349,929	44,815,013	769,807,595
2011	281,395,969	456,086,175	148,501,982	59,313,989	945,298,115
2012	294,739,166	431,323,040	204,323,040	52,795,460	983,180,706
2013	283,848,546	268,239,476	253,799,879	27,163,686	833,051,587
2014	264,689,326	305,418,653	291,701,423	26,813,350	888,622,752

Source: Wyoming Department of Revenue 2008-2014.

Federal Mineral Royalties

Federal mineral royalties are assessed on coal, natural gas, oil, and other minerals produced on federal leases. Producers pay a 12.5 percent royalty to the federal treasury on the value of all oil, natural gas, and surface coal production on federal leases. Forty-nine percent of federal mineral royalty receipts (one-half of the total net of a 2 percent processing and administrative fee) are disbursed to the state in which the production occurred. The size of the resource base, the rate of mineral production in the Powder River Basin, and the predominance of federal ownership combine to make federal mineral royalties an important revenue source. Across Wyoming, approximately 90 percent of all coal production and large shares of the natural gas and oil are from federal minerals (ONRR 2014; WDWS 2014).

Federal mineral royalty receipts on coal (in nominal dollars) have grown sharply as production in Wyoming, and from the Powder River Basin in particular, has increased. Royalty receipts on coal produced in Wyoming first topped $100 million in 1989 and $200 million in 1999. Total federal mineral royalties from coal in 2003 were $298.6 million, increasing to over $635.7 million in 2012 (**Table 3.11-34**), before falling to $560.8 million in 2013 as production declined. Aggregated federal mineral royalties on coal over the past 5 years totaled slightly over $3 billion.

Table 3.11-34 Federal Mineral Royalties and Related Revenues and Disbursements to the State of Wyoming: 2009–2013

Source	Mineral Revenues (nominal dollars)					
	2009	2010	2011	2012	2013	5-Year Total
Coal	$591,544,868	$603,288,725	$627,212,526	$635,735,109	$560,790,404	$3,018,571,632
Natural gas	$566,454,275	$832,384,441	$754,302,856	$418,689,748	$548,325,839	$3,120,157,159
Oil	$179,140,031	$259,855,491	$312,990,789	$407,695,329	$335,409,964	$1,495,091,603
Other minerals	$15,517,891	$15,435,768	$20,218,474	$43,456,350	$46,809,306	$ 141,437,790
Bonus bids and other sources	$423,330,069	$172,922,087	$303,640,646	$424,433,716	$507,548,254	$1,831,874,773
Total Mineral Revenues	**$1,775,987,134**	**$1,883,886,513**	**$2,018,365,291**	**$1,930,010,252**	**$1,998,883,767**	**$9,607,132,957**
Disbursements to Wyoming	**$957,232,075**	**$886,871,352**	**$971,498,012**	**$995,169,510**	**$932,475,424**	**$4,743,246,373**

Source: ONRR 2014.

Since 2005, federal mineral royalties also have been generated on coalbed natural gas production. When combined with federal mineral royalties from conventional gas and natural gas liquids, those revenues topped $832 million in 2010, but declined sharply as the price of gas fell dramatically in 2011/2012. Total federal mineral royalties on gas over the past 5 years were $3.12 billion, surpassing the total from coal by approximately $100 million.

Federal mineral royalties on oil produced from federal leases have climbed sharply in recent years; although, the total federal mineral royalties of $1.5 billion from oil over the past 5 years equaled only approximately half of that from coal. Total federal mineral royalties on all other minerals over the past 5 years were less than 5.0 percent of the revenues generated from either coal or natural gas.

Additional federal mineral revenues are generated by mineral lease rents and bonus bids paid on new parcels leased during BLM's quarterly lease sale in Wyoming. The annual amounts of such revenues fluctuate in response to the number, size (quantity of resources), and quality of resources offered. These other sources generated more than $1.8 billion in Wyoming over the past 5 years.

From 2009 to 2013, aggregate federal mineral royalties and other revenues in Wyoming averaged $1.92 billion per year and totaled $9.6 billion. After a 2.0 percent deduction for administration and processing, half of the remainder was disbursed to Wyoming. For this 5-year period, those disbursements totaled $4.74 billion.

Like severance tax receipts, distributions of the state's share of federal mineral royalty receipts follow a legislatively established, two-tier formula. The first tier covers total annual receipts up to $200 million and the second applies to receipts over $200 million per year. Under the tier-one allocation, a 1.0 percent administration fee is transferred to the general fund. The remaining funds are allocated to the Wyoming School Foundation Program (44.8 percent), the highway and county road funds (30.4 percent), cities and towns (9.375 percent), the University of Wyoming (6.75 percent), and capital and school construction accounts (6.45 percent). Allocations of the tier-two funds (i.e., annual receipts in excess of $200 million) are distributed to the state budget reserve account (66.67 percent) and the Wyoming School Foundation Program (33.33 percent).

Payments in Lieu of Taxes

Congress authorized PILT to local governments that have certain federal lands within their boundaries (31 USC 6901-6907–1976). These payments supplement other federal land receipt-sharing payments that the government may receive to help offset the costs of providing public services such as law enforcement, fire protection, and road construction/maintenance affected by the presence and use of those federal lands.

PILTs are authorized to local governments (generally counties) based on the acres of entitlement lands within their boundaries. Such entitlement lands consist of lands in the National Forest and National Park systems, some lands involved in Bureau of Reclamation projects, National Wildlife Refuges, and lands administered by the BLM. The entitlement acreage is updated annually to reflect additions or disposal of federal lands. The amount of PILT disbursed to each eligible county is based on a formula factoring in the number of entitlement acres, a per-acre payment rate, deductions for certain other federal land payments, and a ceiling or cap on payments based on the population of the area.

A total of 2,254,004 acres of entitlement land are located in the three-county analysis area (**Table 3.11-35**). Of that total, approximately 81 percent is public land managed by the BLM, 18 percent is land within the National Forests/National Grasslands, and the remainder is other eligible federal lands. Among the three counties, Natrona County has the largest base of PILT entitlement acres with 1.448 million. The annual PILTs for the three counties in Fiscal Year 2014 ranged from $631,029 in Converse to $3.47 million in Natrona County.

Table 3.11-35 Entitlement Acreage and Federal Payments in Lieu of Taxes: Fiscal Year 2014

County	Entitlement Acres				PILT Payment
	BLM	USFS	Other	Total	
Converse	145,464	257,456	1,061	403,981	$631,029
Natrona	1,448,346	5,533	30,105	1,483,984	$3,474,159
Campbell	227,687	138,352	0	366,039	$638,158
Three-county Combined	1,821,497	401,341	31,166	2,254,004	$4,743,346

Source: ONRR 2014.

Unlike federal mineral royalties, the amount of PILT is not a function of land use activity or mineral production that might occur on the land. Consequently, oil and gas development on federal land does not directly affect a county's eligibility for PILT, although land exchanges or substantial development-related impacts affecting local population levels could indirectly affect PILT payments.

3.11.10.2 Local Government Fiscal Overview

The three county governments and their municipalities shoulder the primary responsibilities for providing general administrative, judicial, law enforcement, and other essential public services to residents and businesses within their respective jurisdictions. Energy resource development generates revenues for these local governments, but also creates demands on facilities and services. Previous sections of this baseline described current conditions for public education and key facilities and services in the region.

The region's history with energy and mineral resource development provides local governments with substantial capability to address issues associated with oil and gas development. That capability is accompanied by a fiscal foundation supported by the existing energy infrastructure and ongoing development. **Tables 3.11-36** and **3.11-37** provide selected fiscal indicators for the three counties and

their respective county seats. All of the jurisdictions are fiscally sound, have reserves meeting or exceeding the required minimums, and have no outstanding long-term general obligation debt.

Table 3.11-36 Fiscal Summary for Campbell, Converse, and Natrona Counties: 2013

Parameter	Campbell County	Converse County	Natrona County
Total Assessed Valuation	$5,559,437,548	$1,003,112,636	$1,255,227,453
Property Tax Mill Levies			
General Purpose	11.051	12.00	12.00
Bonds and Interest	0.00	0.00	0.00
Current General Fund Budget			
Revenues	$119,850,609	$21,467,817	$40,929,122
Expenditures	$111,953,206	$14,243,012	$43,458,757
Ending Fund Balances[1]	$82,562,051	$20,675,735	*not reported*

[1] Fund balances are for the general fund and represent net balances accumulated over time. Fund balances include reserves and may include funds being set aside for capital projects.

Source: Campbell County 2014f; Converse County 2014a,b; Natrona County 2014b.

Table 3.11-37 Fiscal Summary for the Cities of Gillette, Douglas, and Casper: 2013

Parameter	City of Gillette	City of Douglas	City of Casper
Total Assessed Valuation	$214,341,272	$46,434,684	$463,379,072
Property Tax Mill Levies			
General Purpose	8.00	8.00	8.00
Bonds and interest	0.00	0.00	0.00
Current General Fund Budget			
Revenues	$56,452,926	$8,754,268	$48,158,252
Expenditures	$53,610,786	$6,695,288	$39,061,857
Ending Fund Balances[1]	$41,324,469	*not reported*	$54,629,541
City Staff (full time equivalent)	303.25	*not reported*	645

[1] Fund balances are for the general fund and represent net balances accumulated over time. Fund balances include reserves and may include funds being set aside for capital projects.

Source: City of Casper 2014; City of Douglas 2014c; City of Gillette 2014c.

3.11.11 Social Conditions and Trends

This section focuses on social conditions and trends associated with recent and ongoing oil and gas development in the analysis area. Information for this section was obtained from BLM documents; interviews with local officials, service administrators and residents; and from newspaper articles, editorials, interest group websites, and other publications.

Section 3.81 of the BLM Casper RMP identifies some of the interests on BLM lands in the Casper Resource Area and states that "… resource development and resource protection are (both) community values within the planning area" (BLM 2007b). Chapter 1 of the TBNG LRMP states that… "National forests and national grasslands have a role in sustaining or diversifying area economies and providing

amenity values" (USFS 2002). Chapter 3 of the LRMP identifies various major public user/interest groups of USFS lands.

Although 6 percent of the CCPA surface area is administered by the BLM, and four percent by the USFS, over 83 percent of the surface is privately owned. As demonstrated by public comments received during the scoping process, there are a variety of public parties with interests in the CCPA. These generally include oil and gas interests, local businesses, local landowners that lease minerals or receive surface use payments from oil and gas operators, economic development organizations, ranchers, rural residential landowners, recreational users of public lands, environmental interest groups, and those interested in maintaining the existing character of communities and landscapes. It is important to note that an individual may hold values for more than one of these interests. For example, some ranchers also may be a recreational user of public lands, and some members of economic development organizations may have interests in maintaining the existing character of communities and landscapes. It also is the case that an individual may have a range of attitudes toward oil and gas development, supporting such development on public lands and in rural areas, but opposing development in proximity to communities and rural residential areas. This section identifies some of the trade-offs that have emerged with recent oil and gas development in and near the CCPA.

Converse, Natrona, and Campbell counties and the communities within the analysis area have had long histories of energy development prior to the current oil and gas expansion. Each county has experienced periods of economic expansion and decline tied to energy development, but the diversity of natural resources and the underlying agriculture and tourism/outdoor recreation and traveler economies have helped avoid the more drastic "busts" that have occurred in other energy communities in the western U.S.

Converse County has experienced coal mine and power plant construction as well as oil and gas booms. More recently, construction of wind energy projects, natural gas pipelines, and uranium mining has resulted in periodic economic and employment surges in the county. Growth in Natrona County has been related to oil and gas development and to the role of Casper as a regional oil and gas, construction, commercial, professional services, and health care center. Campbell County has experienced periods of economic and population growth and decline related to coal mining and electric power generating plant construction and operations, as well as oil and gas development.

Local governments and residents of all three counties are familiar with the economic and fiscal effects that accompany surges in energy and natural resource development. They are equally familiar with the challenges such surges and subsequent declines can pose for local governments, school districts, businesses, housing markets, and the quality of life for their residents.

During the expansion phases of energy and natural resource development projects, economic and fiscal expansions often are accompanied by work force and housing competition, increased demand for community infrastructure and services, increased traffic, and the presence of large numbers of temporary workers in communities. These effects can alter the community setting and pose challenges for local governments, school districts, and some residents of affected communities. Expansion phases are typically accompanied by substantial tax revenues, which have, in turn, been used by local governments and school districts to improve facilities and expand service systems. Although municipalities that provide public services and infrastructure to energy-related populations receive a portion of production related tax revenues, local governments often have difficulty funding infrastructure and service expansions in a timely fashion because local distributions of these funds are small and tend to lag a year or more behind when community services begin being strained by the added demand associated with the influx of energy development workers (AECOM 2012b).

Given the familiarity with energy industries and the fact that the employment of many residents is supported directly or indirectly by energy development, many residents accept and support energy

development in the analysis area. In a survey conducted for the Douglas Master Plan, nearly 60 percent of respondents identified energy development (oil, gas, and coal) as their top economic development priority (City of Douglas 2014b). In a survey of residents conducted in conjunction with the Campbell County 2013 Comprehensive Plan, 81.5 percent of respondents agreed with the goal to promote mineral development and energy production (Campbell County 2013).

While the general attitude toward energy development within the analysis area is supportive and accepting, there also has been conflict associated with adjacent land use, health, traffic, and split estate issues. The potential for conflict arises when residences, farms, ranches, and public recreation areas are within or adjacent to energy development areas and along primary access routes. Conflict also can occur where ancillary facilities such as natural gas processing plants, pipeline terminals, and rail transfer stations are located or planned. These issues have involved concerns, about noise, traffic, lighting, air quality, water quantity and quality, health and safety, changes in the setting and character of areas adjacent to development, and effects on property values, agricultural, and recreational uses.

While the majority of the CCPA is rural and sparsely populated, there are some communities inside the CCPA (i.e., Rolling Hills and Bill) as well as adjacent to the CCPA (i.e., Douglas and Glenrock are adjacent to the southern boundary, and Lost Springs is located along an access route just outside of the boundary). The CCPA also includes rural residential areas around Douglas, where oil and gas development has increased in recent years.

As noted in Section 3.11.3, approximately 84 percent of the federal mineral estate in the CCPA is located beneath privately owned surface estate, resulting in a large area of split estate, wherein the surface and mineral estate have different owners. Consequently, there is relatively high potential for conflicts between mineral developers and the owners of surface rights adjacent to oil and gas development, particularly in parts of the county where there is a higher concentration of rural residential and smaller agricultural properties. The potential for conflict within the CCPA is heightened by the fact that Converse County does not have a zoning ordinance. As a result, industrial land uses can and do occur in relatively close proximity to residential land uses, subject to state regulations.

In November 2014, 32 rigs were drilling in the three county region; 18 of those in Converse County (Baker Hughes 2014). The Casper area also was experiencing an upsurge in economic activity related to its role as a regional oil and gas service center. Consequently, communities in the analysis area are experiencing both positive and adverse socioeconomic effects of the current oil and gas boom.

As might be expected, these challenges include work force and housing shortages (Blanchard 2014; Blanton 2014; Chaffin 2014; Espeland 2014; Hughes 2014; McCreight 2014). The 2014 labor market was tight, and most oil and gas service firms and industrial and commercial construction companies were relying heavily on nonlocal workers. As discussed in Section 3.11.7, temporary housing is in short supply, particularly in Converse County. The lodging industry was beginning to respond to the demand; new hotels were being constructed in Douglas and Casper and several were under consideration for Gillette and Wright (Chaffin 2014; Collins 2014; McCreight 2014; Surface 2014). However, addressing the housing issues was challenging because real estate developers and lenders have previous experience with energy boom-bust cycles, and developers experienced difficulty hiring and retaining contractors and qualified construction laborers to construct new lodging establishments and conventional housing for the rental and owner-occupied markets. Construction costs also were rising due to demand for equipment, concrete, and other materials and supplies. The competition for qualified labor, combined with the effects of the high wages paid by the oil and gas industry and high cost and limited availability of housing also resulted in hiring and recruiting difficulties for local governments and businesses (Blanton 2014; Collins 2014; Espeland 2014; Maidl 2014; Sonenson 2014).

Although essential utility systems (water, wastewater, and solid waste disposal) had adequate capacity to accommodate growth through 2014, rapid increases in demand for public services such as law

enforcement and road maintenance strained local government capacities, particularly in Converse County. For example, the Converse County Sheriff's Office increased the number of deputies by 45 percent, from 11 to 16, in response to an 80 percent increase in calls for service between 2009 and 2013. The number of criminal cases also rose approximately 20 percent per year (Becker 2014; Douglas Budget 2014b). The Douglas Police Department increased its staffing by three officers (City of Douglas 2014a), and Memorial Hospital of Converse County increased the number of staff physicians and opened its urgent care facility on Saturdays (Dugger 2014).

A number of land use conflicts and health, safety, and traffic concerns accompanied the recent round of oil and gas development in Converse County. A truck-to-rail oil transfer facility, a gas processing plant, and oil and gas pipelines and other ancillary facilities were developed outside the CCPA in areas that previously were rural and residential. The siting and operation of these industrial facilities raised concern regarding traffic and air quality in Douglas. Traffic, flaring of natural gas, the potential for accidents, and adverse effects on the value of adjacent and nearby properties have caused concerns for some residents of rural residential and agricultural areas experiencing oil and gas development.

Larger landowners in Converse County have benefitted from past experience in dealing with energy companies during previous rounds of coal, oil and gas, uranium, and more recent wind energy development. That experience served as an impetus for the formation of the Converse County Land Owners Association, which serves as a resource for landowners who are negotiating with energy companies for surface use and damage agreements. For some large landowners, payments associated with surface use and damage agreements provide an additional source of income, which has been helpful in light of economic hardships associated with the recent drought. Some large landowners have negotiated surface agreements that include such conditions as speed limits on private roads, dust control, limitations on times of use, and fines for livestock and wildlife mortality (Huntington 2014; Schroeder 2014).

Many smaller landowners and rural homeowners whose land and homes are adjacent to areas of development or along county roads providing access to development receive little or no direct benefits from oil and gas development. The traffic, noise, lighting effects, concern for health and safety, and change in character of the rural setting are seen as adverse effects on their lifestyle, quality of life and property values. These concerns were heightened for landowners by a 2012 well blowout, an increase in drilling and industrial development in the rural residential area north and east of Douglas (including that along Antelope Road/Wyoming 52) increases in the volume of heavy truck traffic and accidents on county roads, recent oil and gas leasing near the Town of Rolling Hills, and development of ancillary facilities south of Douglas.

These concerns resulted in oil and gas impact forums and citizen, landowner, and non-governmental organization requests for action on the part of the Wyoming legislature and the WOGCC (Powder River Basin Resource Council et al. 2013), including consideration by the WOGCC of new rules for setbacks between wells and homes, schools, and other residential buildings; flaring; and bonding for development on split estate lands (WOGCC 2014a). In response, the Wyoming legislature passed a measure to increase the bonds paid by oil companies on split estates, and the WOGCC initiated a rule-making process to increase the required setback distance for drilling rigs from occupied structures from a distance of 350 feet to 500 feet. This process also requires notification of landowners within 1,000 feet of a lease before drilling is to begin.

Heritage resources include cultural and archeological resources and historic trails (BLM 2007b). Cultural resources within and near the CCPA help support the tourism and recreation economy in Converse County and surrounding areas, and also are important as an amenity for many residents and nonresidents. During the scoping process for this analysis, there was a concern that damage to heritage resources, including historic and cultural landscapes (e.g., wide open spaces), could adversely affect the

tourism and recreation economy and reduce the quality of life for residents. See Section 3.2, Cultural Resources, Historical Trails, and Native American Concerns, for more detail regarding these concerns.

3.11.12 Non-market Values

People derive a variety of values from public and private lands in Central Wyoming. These values include those associated with commercial and non-commercial uses of these lands (e.g., grazing, mineral and energy resource production, guided hunting and fishing, and unguided recreational opportunities) as well as the personal benefits derived from the physical appearance and ecological processes and functions of the landscape. These two types of values are known as market and non-market values.

Market values supported by BLM-administered surface lands and federal mineral estates are relatively easy to understand and assess. Commodities produced through the use of BLM-administered lands (e.g., oil and gas, hard rock minerals, mineral materials, livestock, and timber) are bought and sold through market transactions using prices that reflect their value. Other uses of BLM-administered lands (e.g., outdoor recreation) may not require users to pay a fee but also are attributed with stimulating economic activity through visitors' purchases of gas, food, lodging, rental equipment, and local guides. These land use activities often are economic drivers for rural economies that surround federal public lands and contribute to the economic well-being of local residents.

In addition to market values, people derive a variety of values from environmental goods and services that are not reflected in traditional market transactions. Non-market values of open space and well-managed natural resources include a broad range of human benefits resulting from healthy ecosystem conditions and functions. Natural landscapes within the CCPA provide clean air and water and help sustain regional biodiversity, decomposition of wastes, soil and vegetation generation and renewal, pollination of crops and natural vegetation, groundwater recharge, seed dispersal, greenhouse gas mitigation, and aesthetically pleasing landscapes that serve as habitat for wildlife and important game species. Although people do not explicitly pay to enjoy these natural amenities, they are widely recognized to derive "use" and "non-use" benefits that contribute to personal health and well-being and are an important part of the unique sense of place and quality-of-life enjoyed by rural residents from these ecosystem services.

Other examples of non-market values include non-monetary benefits from wildlife viewing, fishing, or hunting for recreation.

Visiting OHV users, fishermen, and hunters spend money on motels and restaurants, but for the most part recreation on BLM- and USFS-managed lands comes free or at a nominal charge. Therefore, much of the value that humans might place on maintaining lands for conservation and recreation have no monetary value in the market economy. The BLM and USFS are increasingly asked to consider these values, in effect, to replace that zero value with a more useful number for planning and analysis purposes.

Non-market values derived from natural and cultural resources administered by the BLM include both use and non-use values. Use values refer to the benefits an individual derives from direct and indirect interactions with the environment, such as outdoor recreation, watershed services, and soil stabilization and erosion control. In contrast, non-use values, also referred to as "passive use" values, are not associated with individual consumptive or non-consumptive uses of the environment. Instead, these values stem from a desire to preserve or improve a resource (e.g., natural landscape, restored ecosystem, endangered species) as a social or public good (existence value), for future use (option value), or for enjoyment by future generations (bequest value) (Brown et al. 2007; Sanders et al. 1990).

Economists have developed a variety of non-market valuation techniques to estimate the monetary value people associate with public lands and the benefits they provide. In the absence of traditional prices, economists measure these non-market values by estimating the consumer surplus, or personal benefits, individuals derive beyond any monetary costs they incurred to derive them. These net benefits reflect the personal satisfaction or utility derived from the natural environment that an individual would have been willing to pay for but does not have to pay for in order to receive personal satisfaction. Around the country, on-site use values have been calculated for public goods like recreation and water quality. Passive use values have been calculated for rare species and environments such as wilderness. Valuation studies of recreation use are common nationally and many studies of this type are available for the intermountain area (Rosenberger and Loomis 2001). **Table 3.11-38** provides an example of such estimates, displaying the average on-site use values for selected recreation activities that resemble public use near the CCPA. These values represent the economic value received by users over and above what they received for their direct expenditures.

Table 3.11-38 Non-market Use Value of Recreation on Public Lands in the Intermountain Area

Recreational Activity	Value per Person per Activity Day (2006 dollars)[1]
Biking	69
Camping	28
General Recreation[2]	16
Hiking	35
Picnicking	28
Sightseeing	14
Wildlife Viewing	38

[1] Original data in 1996 dollars was adjusted to 2006 dollars using the gross domestic product inflation index.

[2] General recreation is a composite of recreation opportunities at a site with a measure for the site, not a specific activity.

NOTE: The Intermountain Area is USDA Forest Service Regions 1 through 4.

Source: Rosenberger and Loomis 2001.

Individuals, groups, and society also may value lands and landscapes for their non-use, or "passive," attributes and characteristics that do not involve active on-site use. Examples of passive, or non-use, values include the pleasure associated with viewing a scenic open vista or a ranching landscape with cattle grazing in an irrigated pasture; individual actions to support establishment of wilderness and the opportunities for solitude thereby provided, whether one ever intends to recreate in a wilderness or not; or, satisfaction from the knowledge that efforts are being taken to protect critical habitat for an endangered species. While passive use values can be more difficult to quantify than use values, their existence can be observed in people's willingness to give up time, money, and energy to preserve natural resources that they never use in any tangible way. Examples of this willingness to preserve in the absence of direct use can be observed through local, state, and national taxpayer funded programs that support a large variety of conservation and protection programs (e.g., national parks, state parks, local parks and parkways, open space initiatives) as well as non-profit organizations devoted a wide variety of conservation and wildlife-related causes. Many if not most of the supporters of these programs and organizations derive no direct benefit from their contributions.

Use values and passive or non-use values associated with public lands are very much a matter of individual preference, lifestyle, and social and economic circumstances. Non-market values can vary over time or in response to changing levels of availability, jeopardy, or scarcity of a resource or condition. Thus, while individuals may not assign much value to protecting common habitat or insect species that

are considered pests, they would assign higher values to efforts to protect and restore an endangered species. On the other hand, where one group of individuals might view improved access onto public lands as a benefit by supporting motorized recreation and easier access to fishing, others would view it negatively because it may increase pressures on wildlife.

To date there has been relatively limited research in terms of the potential effects of oil and gas development located on wide-open prairie and grassland landscapes, characterized as lightly populated, mostly privately held surface lands used for ranching and farming. Concerns regarding potential adverse effects of oil and gas development, and specifically hydraulic fracturing, have risen over time as horizontal drilling has become a widespread practice, and the public at large has gained awareness regarding the mechanics, water use, and other aspects of the practice. Included among the concerns are the following:

- The effects on visual quality, particularly when industrial development is located within the foreground setting of a larger vista;
- Adverse effects on wildlife species, including breeding and migration, and adverse effects on habitat fragmentation;
- Potential or perceived effects on human health and quality of life due to traffic, noise, air quality effects, and hydraulic fracturing;
- Potential conflicts with established traditional uses, including agriculture, hunting, grazing, and other outdoor recreation on public lands, or diminishment of the level of enjoyment/pleasure gained from such use; and
- Potential or perceived adverse effects on property values, particularly to nearby/adjacent property where the surface owners realized no direct benefit from development or in proximity to industrial facilities and rail lines used to transport products.

Public awareness of the potential linkages between oil and gas development and public goods has become part of the community dialogue in Wyoming. Although the foundation of non-market values is rooted in economic terms, the local dialogue regarding impacts, compatibility with other uses, and other effects is subjective and qualitative in nature, often using personal perspectives and frames of reference and terms that are more social in character than they are economic. The fact that the dialogue is occurring is an indication of a shift in public attitudes toward oil and gas development among some members of the public.

Another aspect of the local dialogue regarding oil and gas development relates to the concept of externalities. Externalities refers to the effects of resource use decisions by one party on others who did not have a choice in the decision and whose interests were not taken into account in the decision. An example of a negative externality would be noise from a highway, drilling rigs, compressor stations, or airports that diminishes the quality of life of residents living nearby and may detract from property values. Externalities also can be positive or beneficial.

While there are difficulties associated with measurement of non-market values, it is well-accepted that the natural and cultural resources of an area and the open space the area may provide can have monetary values ascribed to them. For example, it is common for real estate investors to pay more for view lots or property adjacent to open space, and for people to donate to help protect endangered species or other sensitive resources.

Although the generalized evidence of nonuse values is clear, estimating nonuse values for specific resources is difficult and often controversial. BLM guidance recommends that use values be emphasized rather than nonuse values (BLM 2010b).

3.11.13 Environmental Justice

Environmental Justice is defined by the USEPA as “The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people including racial, ethnic, or socioeconomic groups should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies” (USEPA 1998).

EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, states “each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations…”

EO 12898 also applies to federally recognized Indian tribes; therefore, it is important to determine whether any Indian tribes are present in the area, have treaty or reserved rights for lands and resources in the analysis area, or have traditional cultural and historical use tied to lands and resources in the analysis area. This requires federal agencies to determine what, if any, interests federally recognized Tribes may have in a given analysis area.

The purpose of EO 12898 is to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects on low-income populations, minority populations, or Indian tribes that may experience common conditions of environmental exposure or effects associated with a project. It is important to note that minority populations, low-income populations, or tribes may experience common effects from a project even if they do not reside in the immediate analysis area. EO 12898 requires federal agencies to ensure opportunities for effective public participation by potentially affected low-income populations, minority populations, or Indian tribes. These populations are potential environmental justice populations of concern that should be addressed throughout the NEPA process.

The assessment of potential environmental justice impacts is guided by the CEQ Environmental Justice Guidance under the NEPA (CEQ 1998). Determination of environmental justice impacts for minority and low income populations requires three steps: 1) determining the presence and geographic distribution of low-income, minority, and tribal populations in the affected area; 2) assessing whether the action under consideration would produce impacts that are high and adverse; and 3) determining whether high and adverse effects would disproportionately affect minority and low income populations. Determination of potential impacts on Native American lands and resources (e.g., treaty-protected resources, cultural resources and/or sacred sites) requires identification of current and historical use of the area by Native Americans, identification of resources of Native American concern within the area, and determination of the impacts of the actions under consideration on those resources.

The BLM and USFS work in cooperation with American Indian tribes to coordinate and consult before making decisions or approving actions that could result in changes in land use, physical changes to lands or resources, changes in access, or alienation of lands. Federal programs are required to be carried out in a manner sensitive to American Indian concerns and tribal government planning and resource management programs. Details regarding public involvement and tribal consultation to date are provided in Sections 1.6 and 7.2, respectively.

The remainder of this section identifies the presence and geographic distribution of minority and low income populations in areas potentially affected by the Project to determine whether sufficient numbers and relative concentrations of either category exist to warrant detailed consideration of disproportionate affects from an environmental justice perspective. This section also describes interests of federally recognized Indian tribes in areas potentially affected by the Project as a basis for determining

environmental justice effects of the action alternatives on those interests. See Section 1.6 for a description of the scoping process and other opportunities for minority, low income, and Native American participation in the EIS process. See Section 7.2.1 for a description of the government-to-government consultation process conducted to date by the BLM with affected federally recognized Indian Tribes.

The CCPA primarily encompasses the central and northern portions of Converse County, including the communities of Rolling Hills and Bill, and the southern portions are near Douglas, Glenrock, and Lost Springs. **Table 3.11-39** provides the 2010 U.S. Census information on the presence of racial and ethnic minority residents in the U.S., the State of Wyoming, and Converse, Campbell, and Natrona counties. For purposes of this assessment minority is defined as individuals who self-identified themselves as other than White Alone by race and of non-Hispanic ethnicity, including American Indians (U.S. Census Bureau 2011b).

There are no recognized American Indian Reservations in or near the CCPA.

Table 3.11-39 Racial and Ethnic Minority Populations in the Analysis Area: 2010

Geographic Area	Total Population	White Alone and not Hispanic or Latino (percent)	Total Racial and Ethnic Minority[1] (percent)	American Indian or Alaskan Native[2] (percent)
U.S.	308,745,538	63.7	36.3	1.7
Wyoming	563,626	85.9	14.1	3.3
Converse County	13,833	91.3	8.7	1.6
Census Tract 9566, Block Group 12	1,451	95.7	4.3	1.7
Campbell County	46,133	88.9	11.1	2.1
Census Tract 1, Block Group 23	2,359	95.0	5.0	2.0
Natrona County	75,450	89.1	3.2	1.9

[1] This category includes all people who self-identified as something other than non-Hispanic and White Alone. American Indians alone or in combination with one or more other races are included in this category.

[2] American Indian or Alaskan Native alone or in combination with one or more other races. This category is included in the total racial and ethnic minority category.

[3] Census Tract 9566, Block Group 1 includes the rural portion of Converse County north of the North Platte River including the communities of Rolling Hills and Bill.

[4] Census Tract 1, Block Group 2 includes the southwestern portion of Campbell County including the Town of Wright.

Source: U.S. Census Bureau 2011b, 2011a.

At the time of the 2010 Census, all three counties in the socioeconomics and environmental justice analysis area, the Converse County block group that encompasses most of the CCPA, and the block group in southwestern Campbell County that includes Wright and the surrounding rural areas had relatively smaller racial and ethnic minority populations, expressed as a percentage of the total population, than did either the nation or the state as a whole. Residents identifying themselves as American Indians, either alone or in combination with one or more other races, accounted for lower shares of the local populations in the analysis area than across the state and was comparable to or slightly higher than the national average.

Converse County Census Tract 9566, Block Group1 from the 2010 Census covers more than 2,000 square miles and most closely corresponds to the portion of the CCPA in central and northern Converse County. The 2010 Census reported an estimated population of 1,451 residents in the area,

which is equivalent to an average population density below 1.0 person per square mile. Of those, 62 (approximately 24 percent) were not white and not Hispanic, 24 of whom were American Indian. The majority of racial and ethnic minority residents living elsewhere in Converse County, including 86 percent of the 106 American Indian residents in the county, lived in or near Douglas and Glenrock. Review of the 3,481 census tracts in Converse County revealed that there are no large concentrations of racial minorities, including American Indians, in any census tract. No concentrations of racial minorities, including American Indians, were identified in any community or rural area during the EIS scoping process or in interviews with local government officials and staff.

Based on county-level estimates prepared by the U.S. Census Bureau, **Table 3.11-40** provides a summary of the incidence of poverty for 2012 in the CCPA.

Table 3.11-40 Estimated Poverty Rates in the Analysis Area: 2012

Geographic Areas	2012 Population	Persons in Poverty	Percent of Population Below Poverty Level
U.S.	306,086,063	48,760,123	15.9
Wyoming	561,478	66,879	11.9
Converse County	13,862	1,316	9.5
Census Tract 9566, Block Group 1[1]	1,468	28	1.9
Campbell County	47,118	3,292	7.0
Census Tract 1, Block Group 2[2]	2,512	210	8.4
Natrona County	76,633	9,595	12.5

[1] Census Tract 9566, Block Group 1 includes the rural portion of Converse County north of the North Platte River including the communities of Rolling Hills and Bill.

[2] Census Tract 1, Block Group 2 includes the southwestern portion of Campbell County including the Town of Wright.

Source: U.S. Census Bureau 2013.

As noted in Section 3.11.5.5, the 2012 per capita personal income in Converse, Natrona, and Campbell counties was higher than the national average, and in Converse and Natrona counties it was higher than the statewide average. Per capita income in Campbell County was 3 percent below the statewide average in 2012. Across Converse and Campbell counties, the estimated incidence of poverty in 2012 was lower than the national and state averages. The incidence of poverty in Converse County, Census Tract 9566, Block Group 1 was 1.9 percent, which was considerably lower than the county and statewide averages. An estimated 8.4 percent of the 2012 population of Campbell County, Census Tract 1, Block Group 2, which lies north of the CCPA and includes the Town of Wright, had income below the poverty level.

The incidence of poverty in Natrona County was lower than the national average but 0.6 percent higher than the statewide average. The Natrona County poverty level was not meaningfully higher than the statewide average, and given that the CCPA is at some distance from Natrona County, adverse health or safety effects would not be anticipated.

No concentrations of low-income residents were identified in any community or rural area during the EIS scoping process or in interviews with local government officials and staff.

As noted in Section 3.2.3.1, the analysis area for effects on land and resources of Native American concern is the CCPA plus their viewsheds. Based on historical research and on tribal consultation

conducted by the BLM, Native American groups known to have used the CCPA protohistorically and historically include the Crow, Eastern Shoshone, Northern Arapaho, Northern Cheyenne, and Sioux tribes. The 1868 Treaty of Fort Laramie established the Great Sioux Reservation, encompassing all of present day western South Dakota and acknowledging a large portion of eastern Wyoming and northern Nebraska as “unceded” territory (Section 3.2.3.1).

WYCRO file searches conducted as part of the cultural assessment for the EIS identified two known TCPs within the CCPA (Section 3.2.3.5). Tribal consultation was previously conducted for the two sites, finding that both are culturally significant and eligible for the NRHP. Previous inventories identified additional site types that potentially also could be TCPs or other resources of Native American concern.

3.12 Soils

A variety of data sources were used to identify the baseline soil characteristics in the CCPA. Information on Major Land Resource Areas (MLRAs) and soil types was obtained from NRCS literature or databases, including the Land Resource Regions and MLRAs of the United States, the Caribbean, and the Pacific Basin U.S. Department of Agriculture Handbook 296 (USDA-NRCS 2006) and the Soil Survey Geographic Database (SSURGO). Soil baseline characterization for the CCPA was based on SSURGO database review and analyses. SSURGO is the most detailed level of soil mapping done by the NRCS (2014).

3.12.1 Laws, Ordinances, and Regulations

Soil resources are managed through a broad set of regulations, guidelines, and formal planning processes. These controls and directions are administered through federal, state, or local units of government. At the federal level, primary land management agencies include the BLM and USFS. Through state and local agency offices, the NRCS administers soil conservation programs on private lands. In addition, the NRCS inventories Prime and Unique Farmlands, as identified in 7 CFR 657. These farmlands are of statewide or local importance to crop production. The Farmland Protection Policy Act states that federal programs that contribute to the unnecessary and irreversible conversion of farmland to non-agricultural uses will be minimized and shall be administered in a manner that, as practicable, is compatible with state and local government and private programs and policies to protect farmland.

On lands administered by the BLM, soil resources primarily are addressed through BLM Handbook H-4810-1, Rangeland Health Standards, which are based on 43 CFR 4180.1, Fundamentals of Rangeland Health. This regulation directs the BLM to ensure that “watersheds are in, or are making significant progress toward, properly functioning physical condition, including their upland, riparian-wetland, and aquatic components; soil and plant conditions support infiltration, soil moisture storage, and the release of water that are in balance with climate and landform and maintain or improve water quality, water quantity, and timing and duration of flow.” The BLM CFO administers these regulations and guidelines, including soil conservation considerations, through the Casper RMP and ROD (BLM 2007b) and project-level assessments. Additionally, the Surface Operating Standards for Oil and Gas Exploration and Development (Gold Book) provides guidance and standards to help oil and gas operators obtain permit approval for development on federal surface or mineral estate (USDOI-USDA 2007). The Gold Book guidance includes avoidance of sensitive soils, topsoil segregation and storage, use of drainage structure, and erosion control. The Gold Book applies to lands managed by both the BLM and the USFS, including those within the TBNG. The BLM Wyoming Reclamation Policy (IM WY-2012-032) identifies reclamation requirements, including measures for topsoil and subsoil salvage that must be addressed when developing reclamation proposals for any surface-disturbing activity on BLM-administered lands. Other guidance that can be used to determine soil health includes Soil Inventory, Monitoring, and Management Handbook H-7100-1 and EO 11514, Protection and Enhancement of Environmental Quality.

The USFS addresses soil resource management by implementing policy set forth in the TBNG LRMP through management, protection and use goals and guidelines in accordance with the National Forest Management Act. The Forest Service Manual, Soil Management (Chapter 2550) and the Forest Service Handbook, Watershed Conservation Practices Handbook (Chapter 2509.25) specific to each region also provide policy and guidance on managing soil resources.

The WDEQ administers the Wyoming Pollutant Discharge Elimination System Large Construction General Permit, which requires the implementation of a Storm Water Pollution Prevention Plan to minimize exposed soil during construction, disturbance of steep slopes, soil compaction, and other factors that contribute to soil erosion during construction on all lands regardless of ownership.

Local soil conservation districts report to state administrative agencies, typically conservation commissions associated with state departments such as the Wyoming Department of Agriculture. The soil conservation districts are responsible for local planning, program development, and reporting in order to administer soil and water conservation programs. They interact with their respective state-level departments as well as the NRCS.

3.12.2 Major Land Resource Areas

The majority of the CCPA is located within two MLRAs (USDA-NRCS 2006):

- Southern Portion of the Northern Rolling High Plains
- Mixed Sandy and Silty Tableland and Badland

The Southern Portion of the Northern Rolling High Plains MLRA is in the Missouri Plateau, unglaciated section of the Great Plains Province of the Interior Plains and makes up the largest proportion of the analysis area. This MLRA is an area of old plateaus and terraces that have been deeply eroded. Slopes are generally gently rolling to steep, and wide belts of steeply sloping badlands border a few of the larger river valleys. Terraces are common along most of the major river systems in the area. In places, flat-topped, steep-sided buttes rise sharply above the plains. The dominant soil orders in this MLRA are aridisols and entisols. Aridisols form in an arid or semi-arid climate. They are well developed soils that have a very low concentration of organic matter. In contrast, entisols are considered recent soils that lack soil development because erosion or deposition rates occur faster than the rate of soil development. Soils have developed in alluvium and residuum derived mainly from the Wasatch Formation. Lithology consists of light to dark yellow and tan siltstone and sandstones with minor coal seams.

The south eastern portion of the CCPA is in the Mixed Sandy and Silty Tableland and Badland Missouri Plateau MLRA. This MLRA is located in the unglaciated section of the Great Plains Province of the Interior Plains. This portion of the MLRA is an area of old plateaus and terraces that have been deeply eroded. Badlands consist of eroded walls and escarpments, small grass-covered tablelands and mesas, and basins in which there are scattered eroded buttes. Slopes range from nearly level to very steep. Many streams and gullies cut the Badlands. Tertiary continental sediments consisting of sandstone, siltstone, and claystone underlie most of this area. The Badlands consist of stream-laid layers of silt, clay, and sand mixed with layers of volcanic ash. The dominant soil orders in this MLRA are entisols, inceptisols, and mollisols. Entisols are described above. Inceptisols are soils that exhibit minimal horizon development, but exhibit more soil development that entisols. They are often shallow to bedrock or on steeply sloping lands. Mollisols are fertile soils with high organic matter and a nutrient-enriched, thick dark surface.

3.12.3 Existing Conditions

Soil characteristics such as susceptibility to erosion and the potential for revegetation are important to consider when planning for construction activities and stabilization of disturbed areas. These hazards or limitations for use are a function of many physical and chemical characteristics of each soil, in combination with the climate and vegetation. **Table 3.12-1** provides a summary of limiting soil characteristics in the CCPA including prime farmland, hydric, highly erodible, limited revegetation potential, droughty soils by land ownership. The descriptions of each soil characteristics are described in further detail below.

Table 3.12-1 Acreage of Limiting Soil Characteristics

Limiting Soil Characteristic	Acres in CCPA					Percent of CCPA
	BLM	USFS	State	Private	Total	
Water Erodible	23,506	4,985	13,410	166,852	208,753	14
Wind Erodible	24,092	4,202	19,801	234,679	282,773	19
Droughty Soils	37,240	23,031	44,321	555,757	660,349	44
Hydric Soils[1]	1,545	1,124	4,315	49,644	56,874	4
Shallow Depth to Bedrock	0	0	119	262	381	<1
Prime Farmland	0	0	127	604	731	<1
Compaction Prone	26,525	38,428	29,254	352,652	446,859	30
Limited Reclamation Potential	14	0	76	4,106	4,196	<1

[1] The acreage of hydric soils likely is overestimated because it is based on the acreage of entire map unit, which may be only partially hydric.

Source: NRCS 2014.

Water erosion is the detachment and movement of soil by water. Natural erosion rates depend on inherent soil properties, slope, soil cover, and climate. Water erosion hazard is determined by several factors including organic matter content, K factor (the higher the number the higher the hazard), permeability class, and slope. Soils on steep slopes are highly prone to water erosion. Water erosion prone soils were determined to have a K factor greater than 0.32 and a slope greater than 20 percent. Additionally, all soils on slopes over 30 percent were determined to be water erosion prone (**Figure 3.12-1**). Areas susceptible to water erosion potential are present throughout most of the CCPA, with the exception of the northeast portion and a corridor on either side of State Highway 59. Water erodible soils within the CCPA are often found along drainages. Approximately 14 percent of the soils within the CCPA are highly water erodible.

Wind erosion is the physical wearing of the earth's surface by wind that removes and redistributes soil. Small blowout areas may be associated with adjacent areas of deposition at the base of plants or behind obstacles, such as rocks, shrubs, fence rows, and roadbanks. Severe wind erosion hazards were identified by using the soil wind erodibility group rating, which is a numerical value indicating the susceptibility of soil to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture, frozen soil layers, surface fragments (rock, duff, litter) slope and other factors also may influence erosion. There are nine wind erodibility groupings: 1, 2, 3, 4, 4L, 5, 6, 7, and 8. The lower the number, the greater the risk of wind erosion. Wind erodible soils were characterized as having a wind erodibility group value of 1 or 2. The greatest concentration of soils with high wind erosion potential is associated with eolian sand dunes in the southwestern portion of the analysis area (**Figure 3.12-2**). Approximately 19 percent of the soils within the CCPA are wind erodible.

Droughty soils have physical characteristics that may limit plant growth due to low water holding capacity. Droughty soils in the CCPA were determined by identifying soils with a surface texture of sandy loam or coarser and a drainage class of moderately well to excessively drained. In addition, the success of stabilization and restoration efforts in these areas may be limited unless additional treatments and practices are employed to offset the adverse physical characteristics of the soils. The majority of the soils in the CCPA are droughty. Approximately 44 percent of the soils within the CCPA are droughty (**Figure 3.12-3**).

Hydric soils are soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper portion. These soils are commonly associated with floodplains, lake plains, basin plains, riparian areas, wetlands, springs, and seeps. Due to the scale of mapping, small areas of hydric soils may not be captured by this dataset. Approximately 4 percent of the soils within the CCPA are hydric.

In areas with a shallow depth to lithic bedrock (relative to the well pad excavation depth or a pipeline), excavation may result in rock fragments remaining on the surface at levels that would limit the success of restoration efforts. Shallow depth to bedrock is of low concern in the CCPA.

Prime farmland is land that has the best combination of physical and chemical characteristics for producing crops and that is available for these uses. Prime farmland soils have the combination of soil properties, growing season, and moisture supply needed to produce sustained high yields of crops in an economic manner if they are treated and managed according to acceptable farming methods. These soils have the capability to be prime farmland, but may not have yet been developed for irrigated agriculture uses. The Farmland Protection Policy Act states that federal programs that contribute to the unnecessary and irreversible conversion of farmland to non-agricultural uses will be minimized and shall be administered in a manner that, as practicable, are compatible with state and local government as well as private programs and policies to protect farmland. Soils within the analysis area are only characterized as prime farmland if they are irrigated. No prime farmlands occur on federal lands within in the CCPA.

Soil compaction occurs when soil particles are pressed together, which reduces the pore spaces between them and increases the bulk density. This results in a decrease in infiltration and an increase in runoff and erosion. Moist, fine textured (i.e., clayey) soils are most susceptible to compaction. Soils with greater than 28 percent clay were interpreted as compaction prone. Approximately 30 percent of the soils in the CCPA are compaction prone (**Figure 3.12-4**).

The BLM Wyoming statewide reclamation policy definition of areas with limited reclamation potential includes those characterized by highly sensitive and/or erosive soils, highly sensitive vegetation types, soils with severe physical or chemical limitations, extremely steep slopes, etc. These limited reclamation potential areas may require site-specific reclamation measures not specifically addressed in the Wyoming Reclamation Policy. Some areas with limited reclamation potential are identified as miscellaneous areas including, but not limited to, badlands, rock outcrop, and gullied lands in the SSURGO soils data. Other potential areas with limited reclamation potential may include areas susceptible to mass movement, very shallow soils, blown-out areas, areas with chemical properties rated unsuitable in WDEQ topsoil and overburden criteria, or other areas identified through on-site investigation as having properties that make meeting all of the reclamation requirements unrealistic or impossible.

Soils with limited reclamation potential have chemical characteristics such as high salts, sodium, or pH that may limit plant growth. Salinity impacts a plant's ability to take in water, whereas sodicity slows the movement of water through the soil. In addition, the success of stabilization and restoration efforts in these areas may be limited unless additional treatments and practices are employed to offset the adverse physical and chemical characteristics of the soils. Soils with limited reclamation potential are not prevalent in the CCPA (**Figure 3.12-5**).

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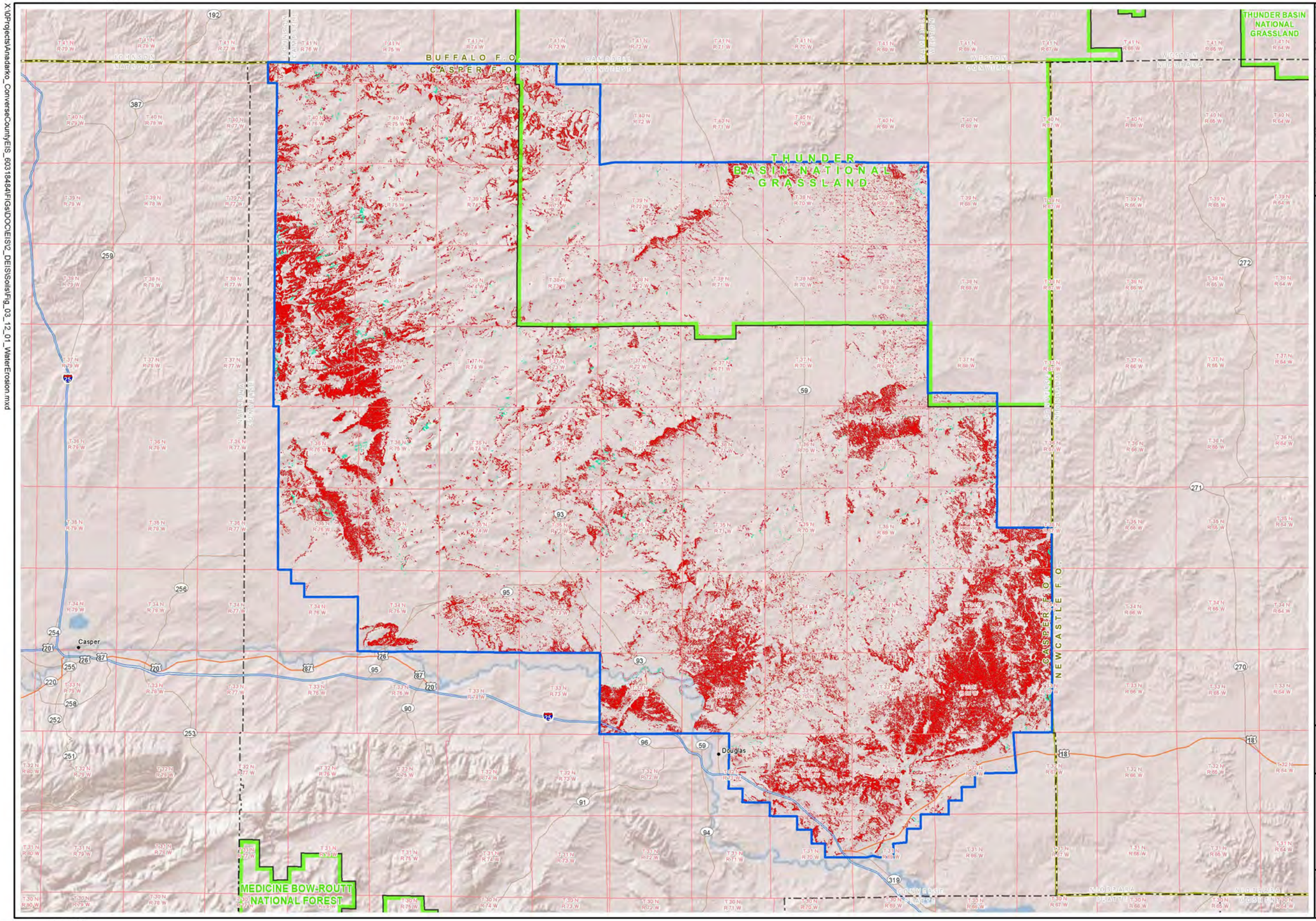

Project Boundary
BLM Field Office Boundary
USFS Administrative Boundary

Water Erosion Susceptibility

Severe
Moderate

Source: USGS 2012.

CONVERSE COUNTY OIL AND GAS EIS

Figure 3.12-1
Soils Prone to Water Erosion

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0 2.5 5 10 Kilometers
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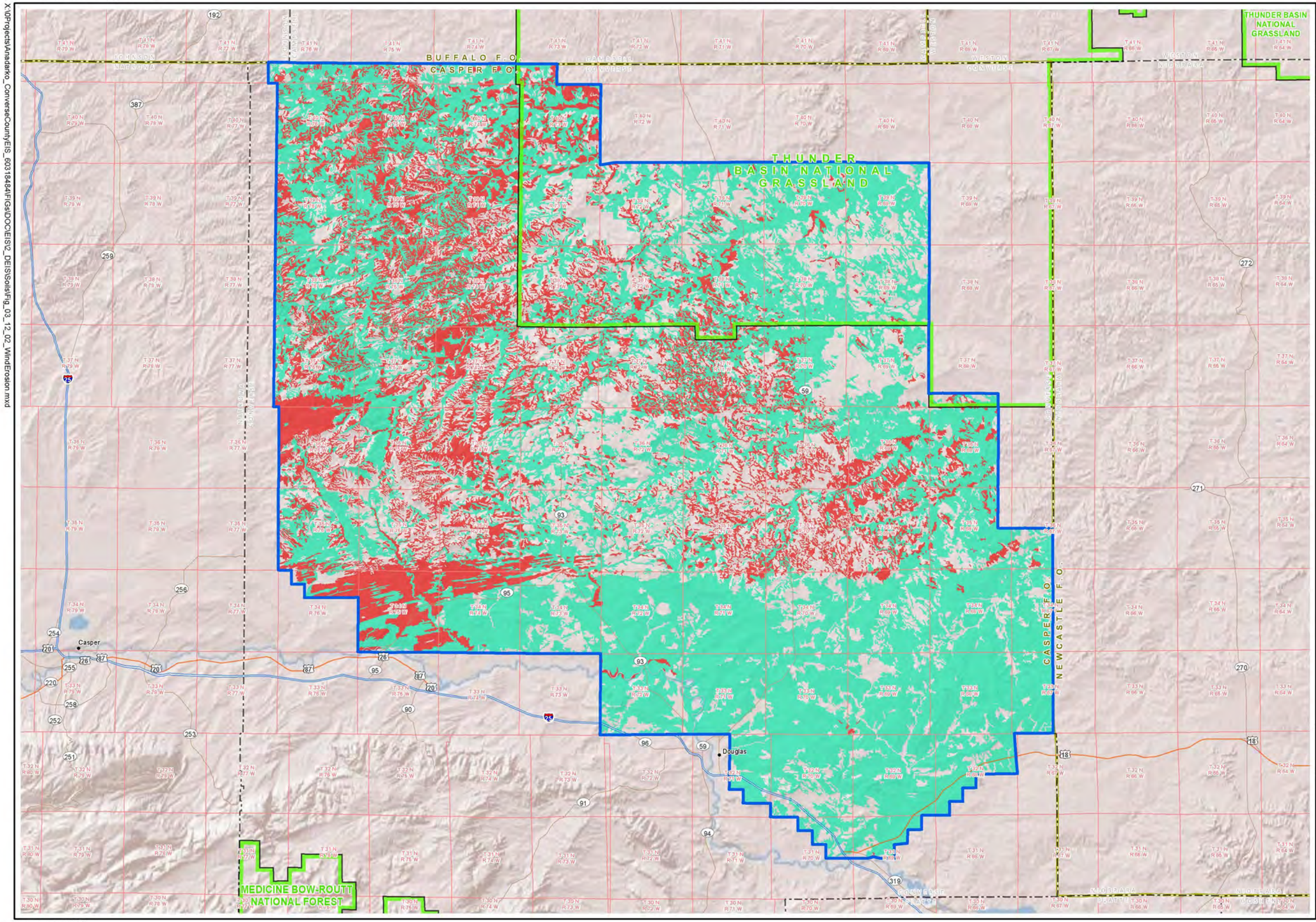

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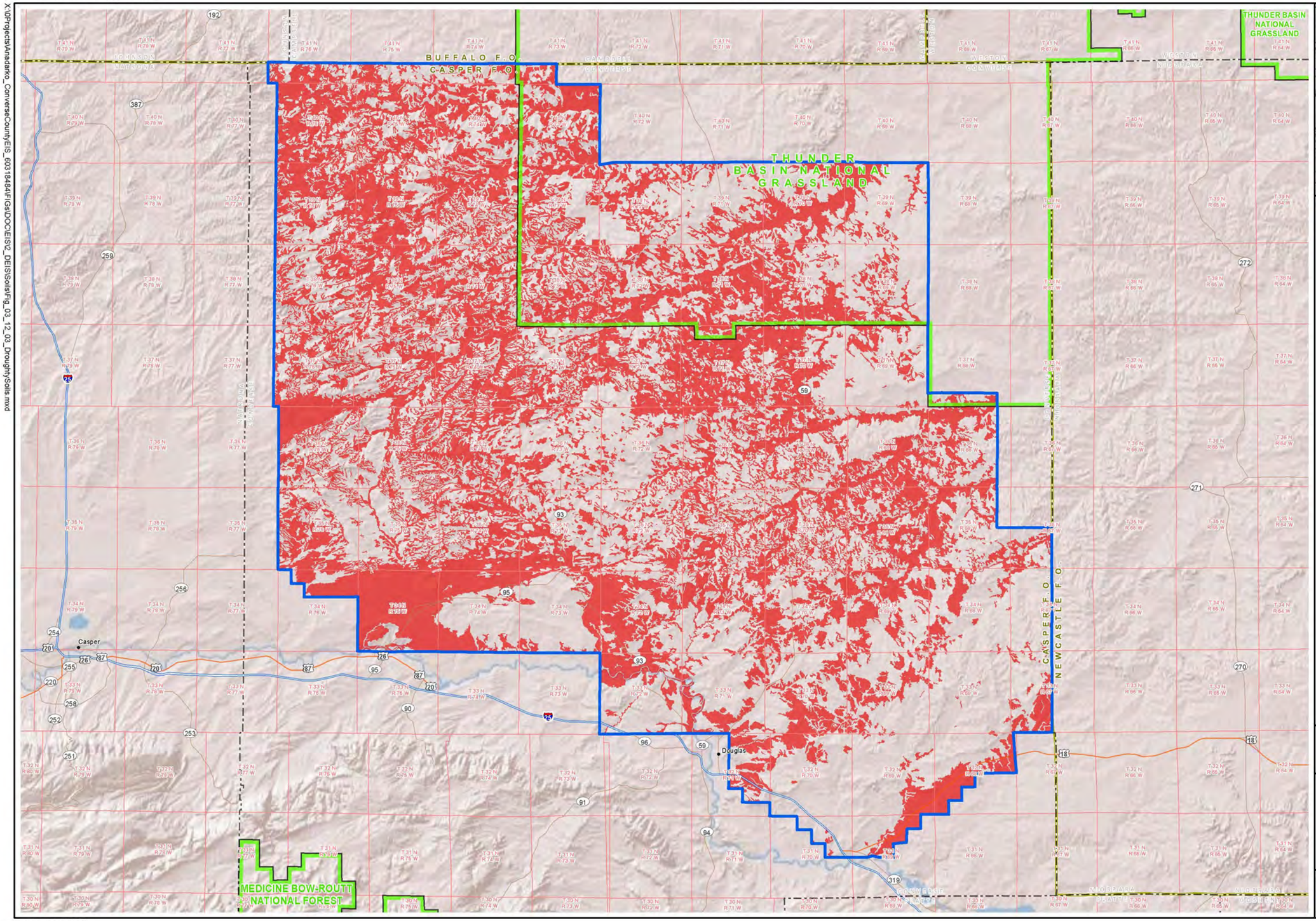

Source: USGS 2014d.

CONVERSE COUNTY OIL AND GAS EIS

Figure 3.12-3
Droughty Soils

0 2.5 5 10 Miles
0 2.5 5 10 Kilometers
1:450,000

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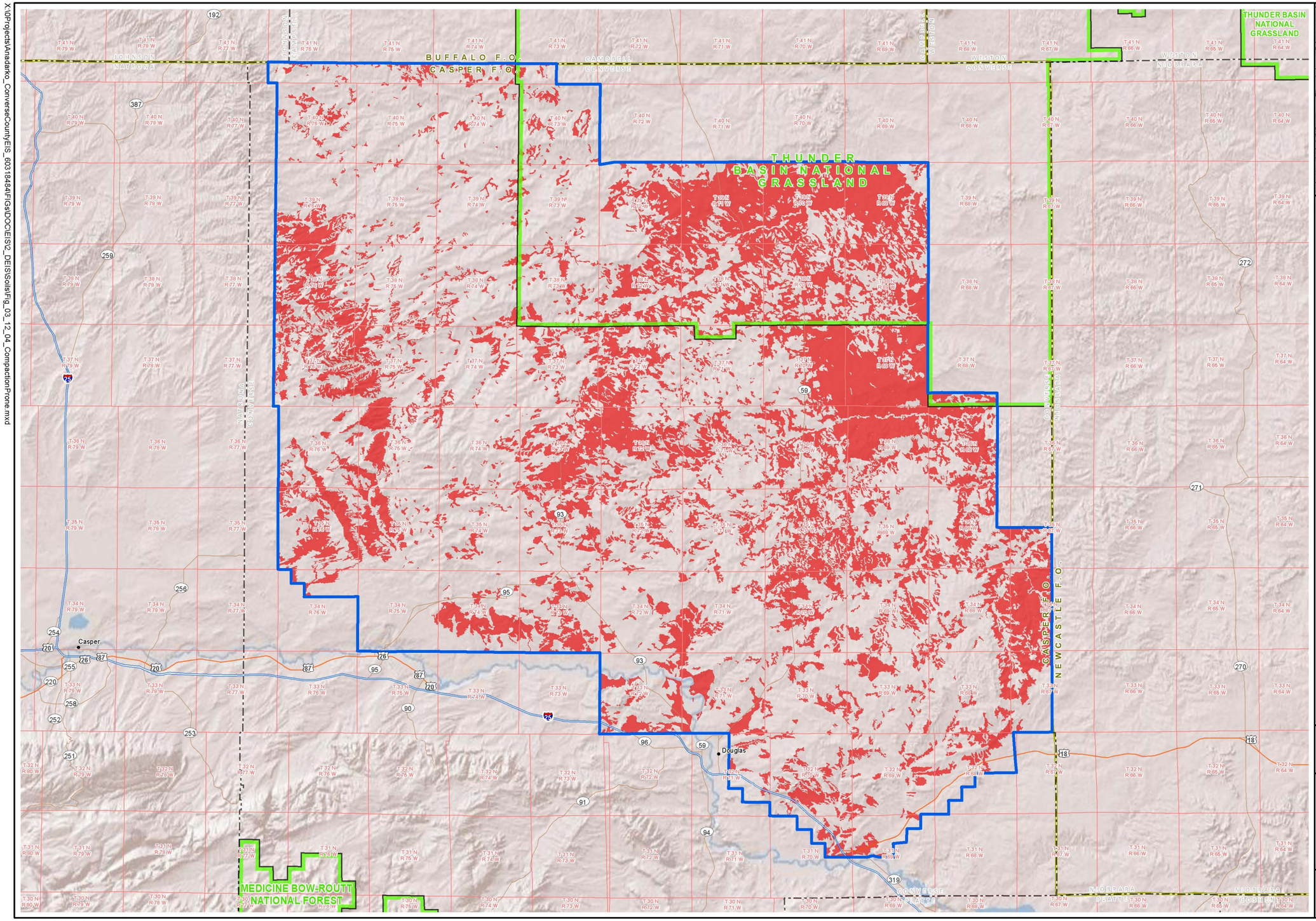

Project Boundary
BLM Field Office Boundary
USFS Administrative Boundary
Compaction Prone Soil

Source: USGS 2014d.

CONVERSE COUNTY OIL AND GAS EIS

Figure 3.12-4
Compaction Prone Soils

0 2.5 5 10 Miles
0 2.5 5 10 Kilometers
1:450,000

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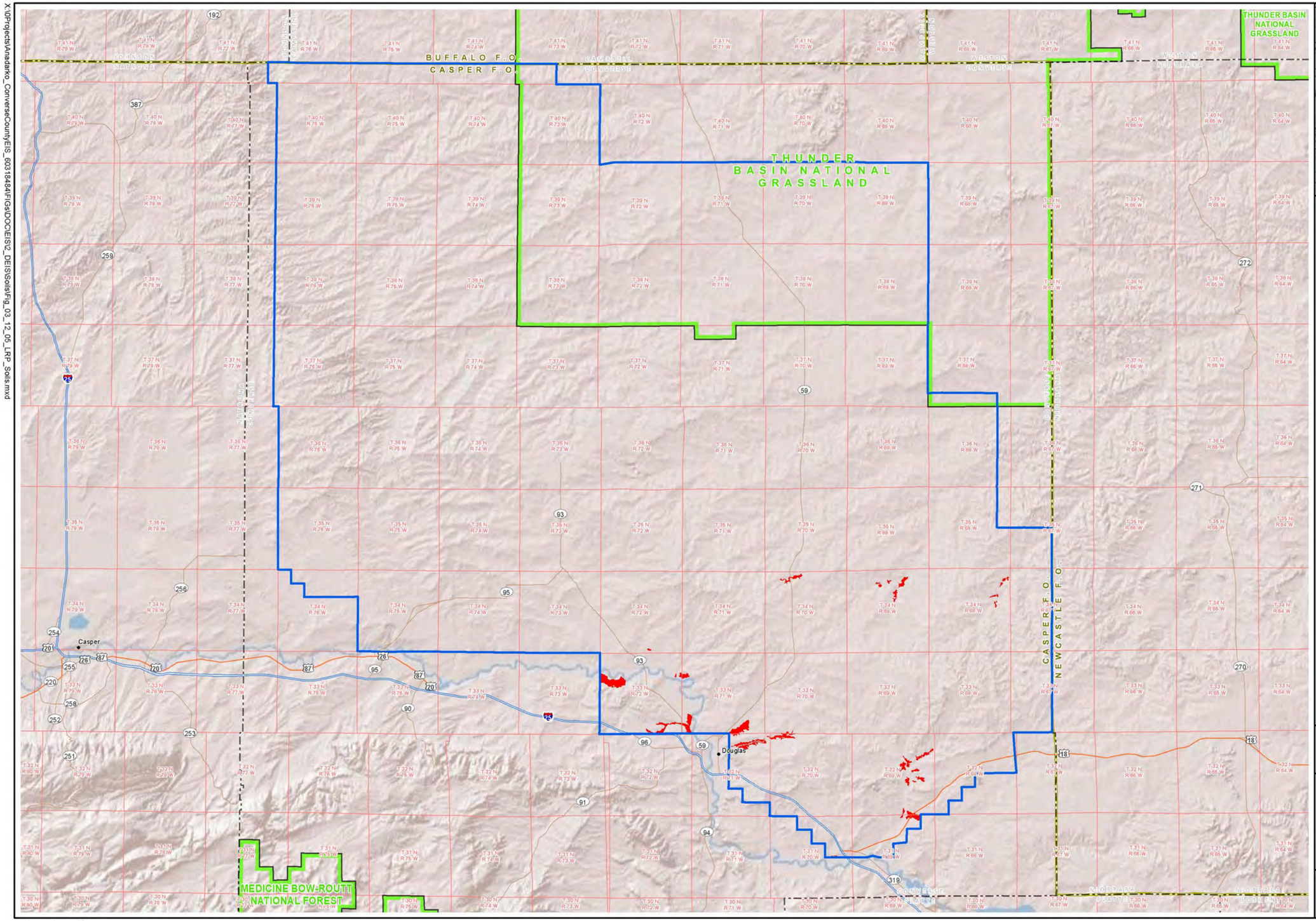

Project Boundary
BLM Field Office Boundary
USFS Administrative Boundary
Soils with Low Revegetation Potential

Source: USGS 2012.

CONVERSE COUNTY OIL AND GAS EIS

Figure 3.12-5
Soils with Limited Revegetation Potential

0 2.5 5 10 Miles
0 2.5 5 10 Kilometers
1:450,000

Print Date: 8/11/2017

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3.12.4 Ecological Sites

Ecological site descriptions provide soil and vegetation information needed for resource identification, management, and reclamation recommendations. A summary of the ecological sites within the CCPA and their corresponding MLRA, approximate acreage, and percentage of the total area identified within the CCPA boundary are listed in **Table 3.12-2**.

Table 3.12-2 Ecological Site within CCPA

MLRA / Ecological Site Name	Acres	Percent of CCPA
Southern Portion of Northern Rolling High Plains		
Clayey (10- to 14-inch Northern Plains Precipitation Zone)	131,455	8.7
Clayey Overflow (10- to 14-inch Northern Plains Precipitation Zone)	2,672	0.2
Gravelly Loamy (12- to 17-inch Precipitation Zone)	218	<0.1
Loamy (High Plains Southeast)	2,047	0.1
Loamy (10- to 14-inch Northern Plains Precipitation Zone)	536,492	35.7
Loamy (12- to 17-inch Precipitation Zone)	67	<0.0
Lowland (10- to 14-inch Northern Plains Precipitation Zone)	51,989	3.5
Overflow (10- to 14-inch Northern Plains Precipitation Zone)	612	<0.1
Ponderosa Pine and Little Bluestem	22,080	1.5
Saline Upland (10- to 14-inch Northern Plains Precipitation Zone)	30,542	2.0
Sands (10- to 14-inch Northern Plains Precipitation Zone)	52,206	3.5
Sandy (10- to 14-inch Northern Plains Precipitation Zone)	183,985	12.2
Sandy (14- to 17-inch Precipitation Zone)	210	<0.1
Shallow Clayey (10- to 14-inch Northern Plains Precipitation Zone)	2,524	0.2
Shallow Loamy (10- to 14-inch Northern Plains Precipitation Zone)	363,831	24.2
Shallow Sandy (10- to 14-inch Northern Plains Precipitation Zone)	23,132	1.5
Shallow Sandy (15- to 17-inch Northern Plains Precipitation Zone)	134	<0.1
Very Shallow (10- to 14-inch Northern Plains Precipitation Zone)	133	<0.1
Wet Land	2	<0.1
Wetland (10- to 14-inch Northern Plains Precipitation Zone)	23	<0.1
Non-site	679	<0.1
Undefined	55,354	3.7
Total Southern Portion of Northern Rolling High Plains	*1,460,387*	*97.2*
Mixed Sandy and Silty Tableland and Badlands		
Clayey (10- to 14-inch Northern Plains Precipitation Zone)	158	<0.1
Loamy (High Plains Southeast)	901	0.1
Loamy (10- to 14-inch Northern Plains Precipitation Zone)	14,986	1.0
Loamy (12- to 17-inch Precipitation Zone)	102	<0.1
Loamy (14- to 17-inches Precipitation Zone)	49	<0.1
Lowland (10- to 14-inch Northern Plains Precipitation Zone)	862	0.1
Overflow (10- to 14-inch Northern Plains Precipitation Zone)	592	<0.1
Ponderosa Pine and Little Bluestem	763	<0.1

Table 3.12-2 Ecological Site within CCPA

MLRA / Ecological Site Name	Acres	Percent of CCPA
Sandy (10- to 14-inch Northern Plains Precipitation Zone)	10,454	0.7
Sandy (14- to 17-inch Precipitation Zone)	2,206	0.2
Shallow Loamy (10- to 14-inch Northern Plains Precipitation Zone)	4,135	0.3
Shallow Sandy (10- to 14-inch Northern Plains Precipitation Zone)	2,833	0.2
Non-site	1,672	0.1
Undefined	2,168	0.1
Total Mixed Sandy and Silty Tableland and Badlands	*41,881*	*2.8*
Grand Total	**1,502,268**	**100.0**

Source: NRCS 2014.

Dominant ecological sites and plant communities identified in the CCPA include loamy, sandy, shallow loamy, and clayey sites all within the 10- to 14-inch Northern Plains Precipitation Zone MLRA. These four ecological site types are all rangeland site types. Minor ecological sites and plant communities identified as areas that are difficult to reclaim include sands and sandy sites. Additionally, small inclusion areas of shallow parent material (10 feet or less deep) exist within the CCPA. See Section 3.14, Vegetation for a more detailed description of vegetation types in the CCPA.

The loamy ecological site covers approximately 36 percent of the CCPA. Composed of gently undulating rolling lands, this ecological site receives approximately 10 to 14 inches of annual precipitation and consists of well-drained, moderately permeable, and deep to moderately deep soils. The dominant species found within this ecological site include western wheatgrass (*Pascopyrum smithii*), needle-and-thread (*Hesperostipa comate*), green needlegrass (*Nassella viridula*), Cusick's bluegrass (*Poa cusickii*), Sandberg bluegrass (*Poa secunda*), bluebunch wheatgrass (*Pseudoroegneria spicata* spp. *spicata*), and blue grama (*Bouteloua gracilis*). Wyoming big sagebrush (*Artemisia tridentate*) typically comprises 15 percent of the vegetation community. Disturbances such as overgrazing and changes in the fire regime lead to changes in the vegetation community. Overgrazing would increase the Wyoming big sagebrush and blue grama but decrease cool season grasses. The absence of fire could increase the cover and percentage of Wyoming big sagebrush on the site until it becomes the dominant species. Disturbances also can lead to an increase in cheatgrass, western wheatgrass, and plains pricklypear (*Opuntia polyacantha*) (USDA-NRCS 2015).

The shallow loamy ecological site covers approximately 24 percent of the CCPA. Found on hills, ridges, and escarpments ranging from nearly level to 60 percent slopes, these ecological sites receive approximately 10 to 14 inches of annual precipitation and consist of shallow, well-drained soils. The dominant species found within this ecological site include western wheatgrass, bluebunch wheatgrass, needle-and-thread, little bluestem (*Schizachyrium scoparium*), Cusick's and Sandberg bluegrass, blue grama, and prairie junegrass (*Koeleria macrantha*). Wyoming big sagebrush typically comprises 5 to 10 percent of the vegetation community. As with the loamy ecological site in this same precipitation zone, disturbances such as overgrazing and changes in the fire regime lead to changes in the vegetation community (USDA-NRCS 2015).

The sandy ecological site covers approximately 12 percent of the CCPA. Found on alluvial fans, plateaus, and ridges ranging from nearly level to 30 percent slopes, these ecological sites receive approximately 10 to 14 inches of annual precipitation and consist of moderately deep to very deep, well-drained soils. Soils are moderately to very deep, well-drained, and have moderate to rapid permeability. These ecological site types are dominated by warm and cool season midgrasses. Typical species

include needle-and-thread, prairie sandreed (*Calamovilfa longifolia*), little bluestem, Sandberg bluegrass, and Indian ricegrass (*Achnatherum hymenoides*). Dominant forb species include silver sagebrush (*Artemisia cana*) and green rabbitbrush (*Chrysothamnus viscidiflorous*). Disturbances such as overgrazing can lead to the conversion of sandy and loamy sites to a blowout community dominated by yucca (*Yucca glauca*), plains pricklypear, fringed sagewort (*Artemisia frigida*), sandbur (*Cenchrus* spp.) and western ragweed (*Ambrosia psilostachya*) (USDA-NRCS 2015).

The clayey ecological site covers approximately 9 percent of the CCPA. Found on hill sides, alluvial fans, and stream terraces on nearly level to slopes of 30 percent, this ecological site receives approximately 10 to 14 inches of annual precipitation and consists of well-drained, slightly permeable, and moderately to deep soils formed in alluvium or alluvium over residuum. The dominant species found within this ecological site include western wheatgrass, green needlegrass, Cusick's bluegrass, Sandberg bluegrass, needleleaf sedge (*Carex duriuscula*), blue grama, and plains reedgrass. Big sagebrush is a conspicuous element of this community (5 to 10 percent), occurring in a mosaic pattern; however, big sagebrush may become a dominant species with the absence of fire. As a result of frequent and severe grazing, species such as blue grama, plains pricklypear, cheatgrass, and big sagebrush may increase in dominance (USDA-NRCS 2015).

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3.13 Transportation and Access

The analysis area for transportation and access is the CCPA plus the regional highway network. The CCPA is located north of I-25 and is transected north-south by Wyoming SH 59 (**Figure 3.13-1**). Access to the CCPA typically is by Wyoming SH 59, Wyoming SHs 95 and 93, and U.S. Highway 18/20, all initiating from I-25 near the southern portion of the CCPA. Wyoming SH 59 heads north from I-25 near the City of Douglas. Wyoming SHs 95 and 93 also head in northerly directions from I-25 and U.S. Highway 18 heads east from I-25, and U.S. Highway 20 combines with I-25 and heads west. Several county roads branch off from these highways, and there are numerous existing rural roads and 4 wheel drive trails throughout the CCPA.

3.13.1 Regulatory Guidance

Transportation resources on BLM-managed land are subject to the stipulations and recommendations detailed in the BLM Handbook H-8342 and Manuals 9113 and 1626. BLM Handbook H-8342 provides specific guidance for preparing, amending, revising, maintaining, implementing, monitoring, and evaluating BLM land use and travel management plans. BLM Manual 9113 provides for the inventory, functional classification, sufficiency analyses, and establishment of maintenance levels on BLM roads, as well as BLM road standards, and guidelines for road project planning, design, construction and maintenance. Lastly, BLM Manual 1626 provides detailed policy, direction, and guidance to establish a comprehensive program for travel and transportation planning. The BLM categorizes roads as collector roads, local roads, and resource roads as follows:

- Collector Roads: These roads normally provide primary access to large blocks of land and connect with or are extensions of the public road system. Collector roads generally receive the highest volume of traffic on all roads in the BLM system. User cost, safety, comfort, and travel time are primary road management considerations.
- Local Roads: These roads typically serve a smaller area than collector roads and connect to collector roads or public road systems. Local roads receive lower volumes, carry fewer traffic types, and generally serve fewer users. User cost, comfort, and travel time are secondary to construction and maintenance cost considerations.
- Resource Roads: These roads generally are spur roads that provide point access and connect to local or collector roads. Resource roads carry very low volume and accommodate only one or two types of use. Use restrictions are applied to prevent conflicts between users needing the road and users attracted to the road.

Portions of the CCPA also are under USFS jurisdiction. The Travel Management Rule Action Plan, applicable to USFS-managed land, was revised in 2007 and is designed to serve as a tool for implementation of the 2005 Travel Management rule. This rule requires each USFS district to designate the roads, trails, and areas that are open to motor vehicle use. Classification of USFS roads falls into maintenance levels 1 through 5. Approximately 200 miles of roads transect USFS-managed lands. Of these 200 miles of roads, 84 miles are classified as level 1 maintenance roads, which are closed to motor vehicle use. These roads provide for long-term management access, but they are not to be used for general motor vehicle use. The remainder of the roads are classified as level 2 maintenance roads, which are for administrative and public use and are maintained for pickup trucks and other higher clearance vehicles, although passenger cars are not prohibited from using these roads.

Figure 3.13-1 depicts the road network in and around the CCPA. The CCPA is transected by or is adjacent to two federal highways, three state highways, and numerous county roads. I-25 skirts the southern portion of the CCPA and is a four-lane federal highway that is maintained by the Federal Highway Administration and the WYDOT. U.S. Highway 18/20 transects the southeastern portion of the CCPA and is accessed via I-25 at the Town of Orin. U.S. Highway 18/20 also is a two-lane federal highway maintained by the Federal Highway Administration and WYDOT. Wyoming SHs 59 and 93 both

originate in Douglas and track north and northwest, respectively, into the CCPA. They are two lane roads maintained by WYDOT. Wyoming SH 95 also is a two lane state highway. It originates in Glenrock and tracks northeast into the CCPA. Numerous county roads also transect the CCPA. These roads include but are not limited to county roads 31 (Ross Road), 32 (Highland Loop Road), 34 (Jenne Trail Road), 38 (Dull Center Road), 43 (Walker Creek Road), 48 (Flat Top Road), 55 (Ranch Road), and 63 (Bill Hall Road). There are approximately 305 miles of county roads within the CCPA. These roads are depicted in **Figure 3.13-1**.

There are approximately 2,978 miles of roads within the CCPA, the majority of which are rural in nature or are associated with oil and gas development. Of the 2,978 miles of roads within the CCPA, 169 miles transect BLM-managed lands, the majority of which roads are classified as local roads.

Traffic counts for roads in the vicinity of the CCPA are provided in **Table 3.13-1**. Traffic on I-25 near the CCPA decreased from 2003 to2016. With the exception of truck traffic on a portion of U.S. Highway 18/20, I-25 is the only major roadway near the CCPA to witness an overall decline in all vehicle traffic; however, I-25 also experienced the largest increase in truck traffic. Of the major roadways within the CCPA, Wyoming SH 95 experienced the most dramatic increase in traffic during the 2003 to 2016 timeframe, with all vehicle traffic rising by over 900 percent. The majority of traffic along these roads consists of oil and gas maintenance workers as well local traffic associated with ranching activities. A portion of traffic traveling Wyoming SH 59 consists of vehicles that support coal mining within and adjacent to the Converse County border with Campbell County.

Table 3.13-1 Interstate Traffic Volume Near the CCPA: 2003 to 2016

Route	2003		2016		Percent Change 2003 to 2016	
	All Vehicles	Trucks	All Vehicles	Trucks	All Vehicles	Trucks
I-25 (Junction WY 59)	6,560	220	5,436	672	-17	205
I-25 (East Douglas Corporation Limit)	5,300	280	3,994	750	-25	168
WY 59 (County Road 43)	1,700	200	2,072	464	22	132
WY 59 (Converse/Campbell County)	1,200	200	2,403	319	100	60
US 18/20 (Junction WY 319)	1,830	420	2,059	322	13	-23
WY 93 (Junction WY 95)	80	10	102	24	28	140
WY 95 (Junction County Road 26)	220	50	2,411	69	996	38

Note: Traffic counts presented in Average Daily Traffic Volume.

Source: WYDOT 2017, 2014.

Three rail lines transect the CCPA: the BNSF, the Union Pacific (UP), and the BNSF/UP Joint rail lines. The BNSF rail line roughly parallels I-25 along the southern portion of the CCPA traveling west at the town of Orin. A UP line roughly parallels U.S. Highway 18/20 transecting the southeast portion of the CCPA in an easterly direction from Orin. The BNSF/UP Joint rail line primarily transports coal from the Powder River Basin and transects the CCPA in a north-south direction, roughly paralleling Wyoming SH 59. Approximately 75 miles of railway transect the CCPA.

On BLM-managed lands, there are areas where OHV travel is allowed, areas where OHV use is limited to designated or existing roads and trails, and areas that are closed to OHV use. The majority of public lands in the CCPA are designated as OHV use limited to existing roads and trails. Additionally, on USFS-managed lands, OHV use is limited to designated roads and trails (USFS 2002). As noted in **Figure 3.13-1**, there is a small portion of the CCPA associated with the Sand Hills Management Area where OHV use is limited to existing roads and trails.

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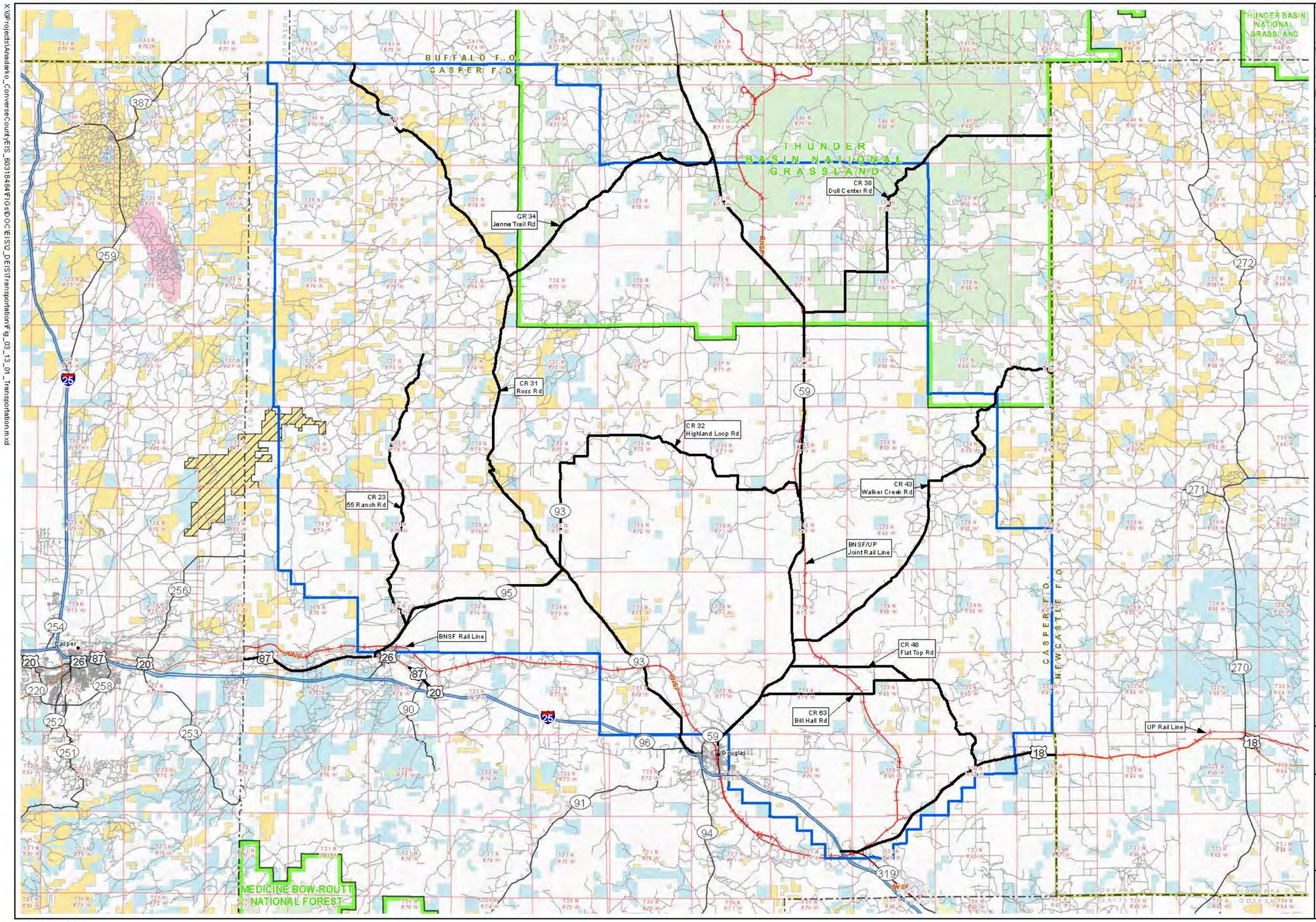

- Project Boundary
- BLM Field Office Boundary
- USFS Administrative Boundary
- Sand Hills Management Area
- Railroad
- Abandoned Railroad
- Road
- Interstate Highway
- US/State Highway
- Local Road/Highway
- County Road

Surface Ownership

- Bureau of Land Management
- US Forest Service
- State
- Private
- Bureau of Reclamation
- DOD/USACE

Source: BLM 2004i; U.S. Census Bureau 2014c, 2009.

CONVERSE COUNTY OIL AND GAS EIS

Figure 3.13-1

Transportation

0 2.5 5 10 Miles
0 2.5 5 10 Kilometers
1:450,000

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3.14 Vegetation

Vegetation resources presented in this section include general vegetation communities, noxious weeds and invasive plant species, and special status plant species.

3.14.1 General Vegetation

The CCPA is located within two MLRAs identified by NRCS (2006) as:

- Northern Rolling High Plains, Southern Part
- Mixed Sandy and Silty Tableland and Badland

This area typically experiences a dry climate with approximately 12 to 14 inches average annual precipitation according to five nearby National Oceanographic and Atmospheric Administration (NOAA) weather stations (WRCC 2014). Sagebrush shrubland and grassland are the dominant vegetation communities within the CCPA (BLM 2007b). Common plants found within these communities include Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), silver sagebrush (*Artemisia cana*), winterfat (*Krascheninnikovia lanata*), rubber rabbitbrush (*Chrysothamnus nauseosus*), green needlegrass (*Nassella viridula*), needle-and-thread grass (*Hesperostipa comata*), bluebunch wheatgrass (*Pseudoroegneria spicata*), prairie junegrass (*Koeleria macrantha*), Sandberg bluegrass (*Poa secunda*), blue grama (*Bouteloua gracilis*), little bluestem (*Schizachyrium scoparium*), asters (*Aster* spp.), paintbrushes (*Castilleja* spp.), biscuitroot (*Lomatium* spp.), western yarrow (*Achillea millefolium*), fringed sagewort (*Artemisia frigida*), Hood's phlox (*Phlox hoodii*), buckwheat (*Eriogonum* spp.), and numerous other grasses and forbs (BLM 2012a).

3.14.1.1 Vegetation Community Types

Vegetation cover types and community characterizations in the CCPA were based on the Landscape Fire and Resource Management Planning Tools Project (LANDFIRE) database (LANDFIRE 2014). Due to the extensive characterization of the LANDFIRE dataset, the vegetation community types were grouped into nine general vegetation community types: grassland, sagebrush shrubland, barren/sparsely vegetated, conifer, agriculture, developed, wetland/riparian, mixed shrubland, and open water. Distribution of vegetation types in these areas is strongly influenced by variations in landscape position, soil type, moisture, elevation, and aspect. **Table 3.14-1** summarizes the acreage of each vegetation type within the CCPA. The distribution of these vegetation types throughout the CCPA is displayed on **Figure 3.14-1**.

Table 3.14-1 Vegetation Community Types within the CCPA

Vegetation Community Type	Surface Ownership (acres)				Total	
	BLM	USFS	State	Private	Acres	Percent of CCPA
Grassland	53,648	40,775	66,827	834,456	995,706	66.3
Sagebrush shrubland	23,280	13,407	23,437	270,339	330,463	22.0
Barren/sparsely vegetated	8,951	9,102	8,375	99,588	126,016	8.4
Conifer	1,220	5.0	540	9,475	11,240	0.7
Agriculture	14	21	316	9,922	10,273	0.7
Developed	154	104	222	9,840	10,320	0.7
Wetland/riparian	132	443	857	7,676	9,108	0.6
Mixed shrubland	1,064	50	425	5,878	7,417	0.5
Open water[1]	2.0	5.4	13	304	1,838	0.1
Total	**88,465**	**63,912**	**101,012**	**1,247,478**	**1,502,381**	**100**

[1] Open water also includes 1,514 acres of the North Platte River that does not fall under any of the listed land owners.

Descriptions of the nine general vegetation community types are provided in the following subsections. Species nomenclature is consistent with the NRCS Plants Database (NRCS 2011).

Grassland

The grassland vegetation community type is comprised of mixed and short-grass prairie, desert and montane grassland, and meadow communities (LANDFIRE 2014). Grasslands occupy approximately 66.3 percent of the CCPA (995,706 acres) and are dispersed fairly evenly across the area, interspersed with shrubland communities. Common native graminoid species may include Indian ricegrass (*Achnatherum hymenoides*), basin wildrye (*Leymus cinereus*), thickspike wheatgrass (*Elymus lanceolatus* ssp. *lanceolatus*), prairie junegrass (*Koeleria macrantha*), western wheatgrass (*Pascopyrum smithii*), needle-and-thread grass (*Hesperostipa comata*), little bluestem (*Schizachyrium scoparium*), green needlegrass (*Nassella viridula*), blue grama (*Bouteloua gracilis*), and bluebunch wheatgrass (*Pseudoroegneria spicata*) (LANDFIRE 2014; USFS 2014c). There are areas of introduced upland plants concentrated in the northeastern portion of the CCPA as well as along several intermittent streams found in the northern portion of the CCPA. The LANDFIRE (2014) database does not provide species specific occurrence information.

Sagebrush Shrubland

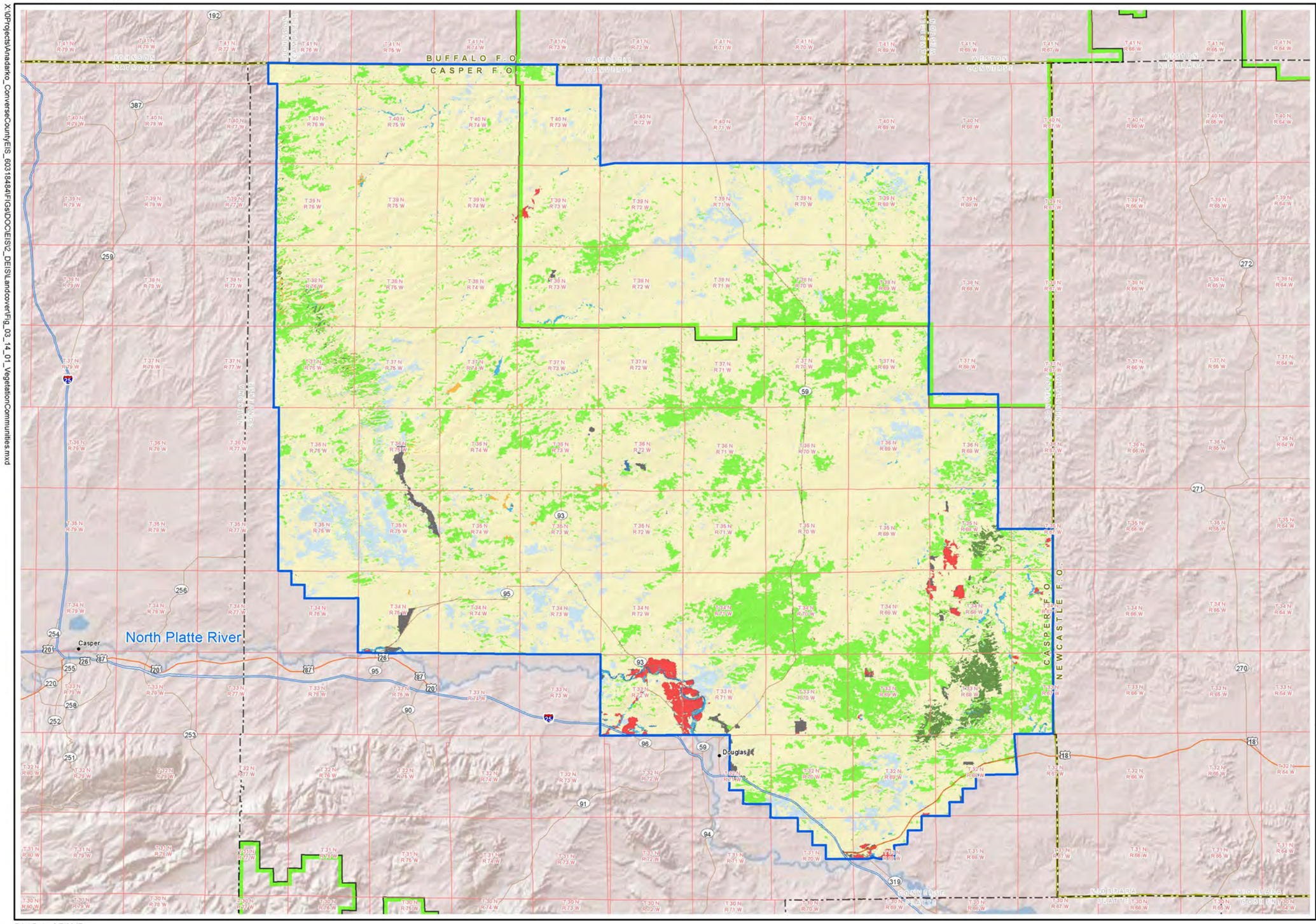
The sagebrush shrubland vegetation community type is comprised of intermountain sagebrush steppe and basin communities (LANDFIRE 2014). Sagebrush shrublands occupy approximately 22.0 percent of the CCPA (330,463 acres) and are dispersed fairly evenly across the area among mixed shrublands and grasslands. In addition to big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), common sagebrush shrubland species may include shadscale saltbush (*Atriplex confertifolia*), silver sagebrush (*Artemisia cana*), and mountain big sagebrush (*Artemisia tridentata* var. *vaseyana*) (LANDFIRE 2014; USFS 2014c).

Barren/Sparsely Vegetated

The barren/sparsely vegetated community type is comprised of barren, cliff, scree, rock, alpine-montane, and Great Plains sparsely vegetated systems (LANDFIRE 2014). Barren/sparsely vegetated areas occupy approximately 8.4 percent of the CCPA (126,016 acres) and are concentrated in the southwestern portion of the CCPA in sand dunes.

Conifer

The conifer vegetation community type is comprised of pine-juniper woodland, montane mixed conifer forest, and ponderosa pine (*Pinus ponderosa*) woodland and savanna communities (LANDFIRE 2014). Mixed shrublands occupy approximately 0.7 percent of the CCPA (11,240 acres). Conifer vegetation is largely concentrated in two higher elevation areas of the CCPA; one in the southeast and one in the west in an area referred to as Pine Ridge. The conifer vegetation community type is comprised of evergreen (conifer), open, closed, and sparse canopy communities. Woodlands within the CCPA typically occupy warm, dry sites on mountain slopes and ridges on substrates. Common overstory species may include limber pine (*Pinus flexilis*), ponderosa pine, juniper (*Juniperus* spp.), douglas fir (*Pseudotsuga menziesii*), quaking aspen (*Populus tremuloides*), and lodgepole pine (*Pinus contorta*) (LANDFIRE 2014). Shrub and herbaceous layers generally are sparse but may include curl-leaf mountain mahogany (*Cercocarpus ledifolius*), alderleaf mountain mahogany (*Cercocarpus montanus*), shrubby cinquefoil (*Dasiphora fruticosa* ssp. *floribunda*), skunkbush sumac (*Rhus trilobata*), Woods' rose (*Rosa woodsii*), chokecherry (*Prunus virginiana*), sagebrush, blue grama, needle-and-thread grass, rough fescue (*Festuca campestris*), spike fescue (*Leucopoa kingii*), prairie junegrass (*Koeleria macrantha*), littleseed ricegrass (*Piptatherum micranthum*), Sandberg bluegrass, and bluebunch wheatgrass (*Pseudoroegneria spicata*) (CNHP 2005; LANDFIRE 2014).



Source: DOI 2014.

CONVERSE COUNTY OIL AND GAS EIS

Figure 3.14-1

Vegetation Communities

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Agricultural

The agricultural vegetation community type is comprised of active row crops, fallow/idle cropland, pasture, hayland, and wheat fields (LANDFIRE 2014). Agriculture occupies approximately 0.7 percent of the CCPA (10,273 acres) and is concentrated in the south and southeast.

Developed

The developed category is comprised of quarries, strip mines, gravel pits, roads, and towns. This category also includes urban forest, shrubland, and herbaceous areas (LANDFIRE 2014). Developed areas occupy approximately 0.7 percent of the CCPA (10,320 acres). These areas are concentrated in the southern portion of the CCPA and include subdivisions, abandoned pivots, homesteads, and a reclaimed mine area that has been converted to a wind farm.

Wetland/Riparian

The wetland/riparian vegetation cover type is comprised of floodplain, riparian, and herbaceous wetland communities (LANDFIRE 2014). Wetland/riparian occupy approximately 0.6 percent of the CCPA (9,108 acres) and are located primarily along the North Platte River as well as Antelope, Bear, La Prele, Sand, and Stinking Water creeks. The wetland/riparian areas are fairly dispersed across the CCPA among the grassland and shrubland communities. See Section 3.17, Wetlands and Riparian Areas, for further information regarding these community types.

Mixed Shrubland

The mixed shrubland vegetation community type is comprised of curl-leaf mountain mahogany shrubland, greasewood flat, and montane foothill deciduous shrubland communities (LANDFIRE 2014). Mixed shrublands occupy approximately 0.5 percent of the CCPA (7,417 acres) and are dispersed fairly evenly across the area among grassland communities. The mixed shrubland vegetation community type is comprised of shrublands not dominated by sagebrush species. These may include but are not limited to winterfat, paintbrushes, rubber rabbitbrush, curl-leaf mountain mahogany, saltbush, chokecherry, serviceberry (*Amelanchier arborea*), rose (*Rosa* spp.), and sagebrush. Graminoid species typically are found within this community type, such as *Poa* spp., western wheatgrass, and alkali sacaton (*Sporobolus airoides*).

Open Water

The open water cover type is comprised only of open water (LANDFIRE 2014). Open water occupies approximately 0.1 percent of the CCPA (1,838 acres). Approximately 1,514 acres of this is the North Platte River. The rest is distributed within the CCPA and is concentrated mostly at Rice Reservoir and Morton Reservoir in the middle to northwest portion of the CCPA.

3.14.2 Noxious Weeds and Invasive Plant Species

3.14.2.1 Laws, Ordinances, Regulations, and Standards

Under the Federal Plant Protection Act of 2000 (formerly the Noxious Weed Act of 1974 [7 USC SS 2801–2814]), a noxious weed is defined as “any plant or plant product that can directly or indirectly injure or cause damage to crops, livestock, poultry, or other interests of agriculture, irrigation, navigation, the natural resources of the U.S., the public health, or the environment.” Each state is federally mandated to uphold the rules and regulations set forth by this act and manage their lands accordingly.

The Plant Protection Act (7 USC 7701 et seq.) prohibits the import, introduction, export, or movement in interstate commerce of any noxious weed “unless the importation, entry, exportation, or movement is authorized under general or specific permit and is in accordance with such regulations as the Secretary [of Agriculture] may issue to prevent the introduction of plant pests into the U.S. or the dissemination of plant pests within the United States.”

The Wyoming Department of Agriculture manages and coordinates weed and pest activities for the State of Wyoming among the Wyoming Weed and Pest Control Districts; Wyoming Weed and Pest Council; federal, state, and local agencies; as well as the private sector. Per Wyoming Statutes, a declared weed is defined as "any plant which the board and the Wyoming Weed and Pest Council have found, either by virtue of its direct effect, or as a carrier of disease or parasites, to be detrimental to the general welfare of persons residing within a district."

The Federal Plant Protection Act also requires cooperation with state, local, and other federal agencies in the application and enforcement of all laws and regulations relating to the management and control of noxious weeds. Recognizing these regulations, the BLM requires that NEPA documents consider and analyze the potential for the spread of noxious weed species and provide preventative rehabilitation measures for each management action involving surface disturbance. The BLM considers plants invasive if they have been introduced into an environment where they did not evolve. As a result, they usually have no natural enemies to limit their reproduction and spread.

The BLM CFO and the Converse County Weed and Pest District have a Memorandum of Understanding that provides authorization to manage invasive plants throughout Converse County using an integrated pest management approach. The BLM conducts cheatgrass treatments according to the Decision Record for Cheatgrass Treatments for Natrona and Converse Counties (BLM 2011a).

3.14.2.2 Resource Overview and Existing Condition

Many invasive, non-native plant species, including noxious weeds, occur or have the potential to occur within the CCPA. Introduction and establishment of invasive plant species are more likely to occur in surface-disturbed areas. Known vectors for introduction can include wind, vehicles, machinery, livestock, wildlife species, and humans. Cheatgrass is very difficult to control, and invasion remains pervasive across the CCPA; in some cases cheatgrass is the dominant herbaceous species (BLM 2011b).

The analysis area for invasive plant species includes the CCPA, where Project-related activities may contribute to the spread of invasive plant species. Species addressed in this section include:

- State of Wyoming Designated Noxious Weeds
- Converse County Declared Weeds: a species that the "Wyoming Board of Agriculture and the Wyoming Weed and Pest Council have found, either by virtue of its direct effect or as a carrier of disease or parasites, to be detrimental to the general welfare of persons residing within a district" (Wyoming Legislative Service Office 1973).
- Invasive species: a species "non-native to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health" (EO 13112). The National List of Invasive Weed Species of Concern (BLM 2008c) is included in this definition.

The description of existing conditions for invasive plant species in the CCPA is based on the Converse County list of declared weeds (Wyoming Weed and Pest Control 2017a); Wyoming Noxious Weed List (Wyoming Weed and Pest Control 2017b); BLM National List of Invasive Weed Species of Concern (BLM 2008c); and EAs recently conducted in the CCPA (BLM 2012a,b,c, 2011b).

Noxious weeds have invasive habits and/or the potential to become monocultures that damage native ecosystems and wildlife habitat as well as degrade land value. Invasive non-native plant species can cause economic impacts due to loss of forage productivity for livestock and increased control costs. Some noxious weeds and invasive plant species such as halogeton (*Halogeton glomeratus*) and black henbane (*Hyoscyamus niger*), can be poisonous to livestock when ingested. Invasive plant species also can increase soil erosion and risk of wild fire. They generally result in increased competition with native plants for habitat, sunlight, nutrients, and water. Most noxious weeds are early successional species that

prosper following surface disturbance after activities such as wildfires, human developments, and surface erosion.

Invasive plant species such as cheatgrass, musk thistle (*Carduus nutans*), Canada thistle (*Cirsium arvense*), field bindweed (*Convolvulus arvensis*), Russian knapweed (*Acroptilon repens*), spotted knapweed (*Centaurea maculosa*), diffuse knapweed (*Centaurea diffusa*), leafy spurge (*Euphorbia esula*), hoary cress (*Cardaria draba*), halogeton, perennial pepperweed (*Lepidium latifolium*), and dalmatian toadflax (*Linaria genistifolia* spp. *dalmatica*) may all occur within the CCPA (BLM 2012a). **Table 3.14-2** identifies the invasive plant species and declared weeds present or with the potential to occur in the CCPA. The BLM processes several pesticide use proposals each year within the CCPA where treatment on BLM lands would occur. Species treated include Canada thistle, musk thistle, Scotch thistle (*Onopordum acanthium*), and Russian knapweed, as well as other noxious weeds (BLM 2014a, 2013c). **Figure 3.14-2** shows documented heavily infested locations of noxious weeds and invasive plants within the CCPA.

3.14.3 Special Status Plant Species

This section identifies special status plant species documented and those with the potential to occur in the CCPA. Special status plant species include those listed as threatened, endangered, or proposed for listing under the ESA as well as plant species classified as sensitive by the BLM CFO and USFS Region 2.

3.14.3.1 Resource Overview

The analysis area for special status plant species is the CCPA plus a one mile buffer to account for any indirect effects. The analysis area also includes riparian habitats of the North Platte River downstream of the CCPA with potential to be affected by water depletions from Project-related activities.

Existing data to describe the potential for the CCPA to support special status plant species was used for analysis. Special status plants include the following:

- Species listed as threatened, endangered, or proposed for listing under the ESA (50 CFR 17.11).
- BLM sensitive species requiring special management consideration to promote their conservation and reduce the likelihood and need for future listing under the ESA. The species are designated as sensitive by the BLM Wyoming State Director and are listed within each BLM Field Office (BLM 2008b).
- USFS Region 2 (Rocky Mountain) sensitive species, designated by the Regional Forester for which the USFS develops and implements conservation strategies in coordination with other USFS units, managing agencies, and landowners.

Those species documented to occur or have the potential to occur in the analysis area were either analyzed through existing Wyoming Natural Diversity Database (WYNDD) predictive distribution models or were analyzed through desktop GIS to identify suitable habitat. Parameters such as vegetation cover, soils, and elevation were developed based on the following sources:

- USFWS species accounts;
- USFS Region 2 sensitive species conservation assessments;
- WGFD Wyoming Interagency Spatial Database and Online Management (WISDOM) database; and
- WYNDD species records, species accounts, and habitat descriptions.

3.14.3.2 Laws, Orders, Regulations and Standards

The USFWS has jurisdiction over species listed as threatened or endangered under Section 7 of the Federal ESA (16 USC 1536 et seq.). Under Section 7 of the ESA of 1973, as amended, land management agencies, in coordination with the USFWS, must ensure that any action they authorize, fund, or carry out would not adversely affect a federally listed threatened or endangered species, or result in the destruction of or adversely modify areas designated as critical habitats. The ESA and 50 CFR 402 contain the implementation regulations for Section 7(a)(2) of the Act where in federal action agencies are required, with the assistance of the USFWS, to ensure that any action authorized, funded, or carried out is not likely to jeopardize the continued existence of the species or result in the destruction or adverse modification of designated critical habitat for threatened and endangered species.

The Wyoming BLM State Director's Sensitive Species List is maintained by the Wyoming State Office. The field offices coordinate with the State Office in maintaining the list and occurrence of these species within their District and field offices.

The FSM 2600 (USFS 2005) provides policies pertaining to the management of sensitive plants on USFS-administered land. This manual stipulates that the USFS provide special management importance for sensitive species to ensure their sustainability and preclude trends toward federal listing. USFS Region 2 accomplishes this by maintaining a list of sensitive plant species specific to the region. Section 2672.2 of the manual states that the USFS should manage habitat at levels that aid in the recovery of federally listed species, as documented in USDA recovery plans (USFS 2005).

The BLM 6840 Manual is the principal policy instrument for BLM management of special status species. Special status species include those species listed or proposed for listing under the ESA together with species designated internally as BLM sensitive. The manual identifies how field offices are to meet their responsibilities under the ESA and its implementing regulations, as well as how to designate and ensure the conservation of BLM sensitive species on public lands.

3.14.3.3 Endangered, Threatened, Proposed, and Candidate Species

The Ute ladies'-tresses orchid (*Spiranthes diluvialis*) is the only federally listed plant species with the potential to occur within the CCPA. One federally endangered species, the Western prairie fringed orchid (*Platanthera praeclara*), does not occur within the CCPA (**Table 3.14-3**) but does have known occurrances downstream of the CCPA; therefore, it was included in the analysis due to the potential to be impacted by activity upstream. Documented occurrences, habitat, and known threats to these species are described below.

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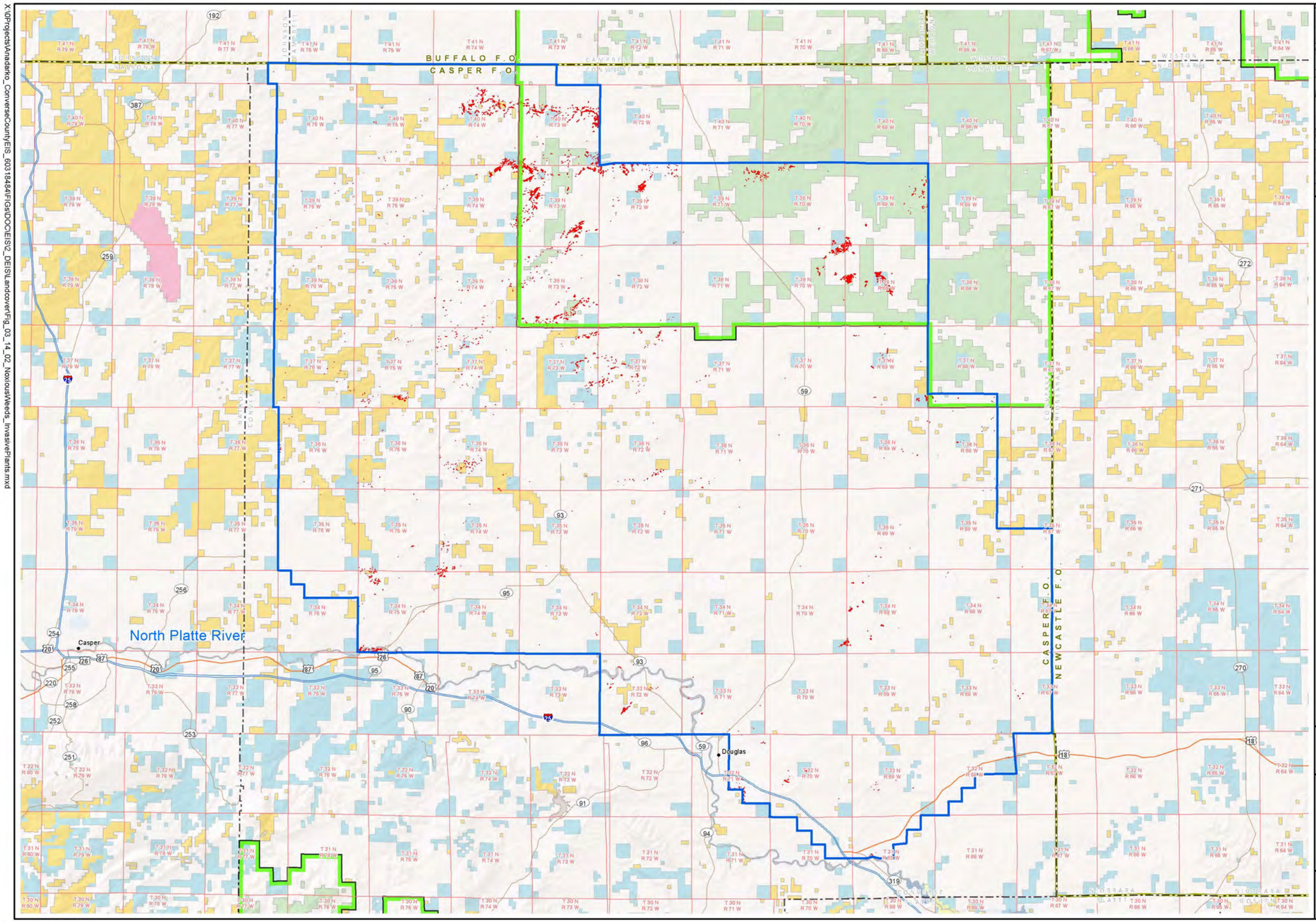

Project Boundary
BLM Field Office Boundary
USFS Administrative Boundary
Noxious Weeds and Invasive Plant Species

Surface Ownership

Bureau of Land Management
US Forest Service
State
Private
Bureau of Reclamation
DOD/USACE

Source: DOI 2014.

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Figure 3.14-2
Noxious Weeds and Invasive Plant Species

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Table 3.14-2 Invasive Plant Species and Declared Noxious Weeds Present or with Potential to Occur in the CCPA

Common Name	Scientific Name	BLM National List[1]	Wyoming Noxious Weed List[2]	Converse County Declared List[3]
Absinth wormwood	*Artemisia absinthium*	X		X
Baby's breath	*Gypsophila paniculata*	X		X
Black henbane	*Hyoscyamus niger*	X	X	
Buffalobur	*Solanum rostratum*	X		X
Bull thistle	*Cirsium vulgare*	X		X
Bur buttercup	*Ceratocephala testiculata*	X		X
Canada thistle	*Cirsium arvense*	X	X	
Cheatgrass	*Bromus tectorum*	X		X
Chicory	*Cichorium intybus*	X		X
Common burdock	*Arctium minus*	X	X	
Common cocklebur	*Xanthium strumarium*	X		X
Common crupina	*Crupina vulgaris*	X		X
Common mullein	*Verbascum Thapsus*	X		X
Common St. Johnswort	*Hypericum perforatum*		X	
Common sunflower	*Helianthus annuus*	X		X
Common tansy	*Tanacetum vulgare*		X	
Curly dock	*Rumex crispus*	X		X
Curlycup gumweed	*Grindelia squarrosa*	X		X
Dalmation toadflax	*Linaria genistifolia* spp. *dalmatica*	X	X	
Dames rocket	*Hesperis matronalis*	X		X
Diffuse knapweed	*Centaurea diffusa*	X	X	
Dyers woad	*Isatis tinctoria*		X	
Field bindweed	*Convolvulus arvensis*	X	X	
Goatsrue	*Galega officinalis*	X		X
Gorse	*Ulex europaeus*	X		X
Halogeton	*Halogeton glomeratus*	X		X
Hoary cress	*Cardaria draba*	X	X	
Houndstongue	*Cynoglossum officinale*	X	X	
Iberian starthistle	*Centaurea iberica*	X		X
Italian thistle	*Carduus pycnocephalus*	X		X
Jointed goatgrass	*Aegilops cylindrical*	X		X
Leafy spurge	*Euphorbia esula*	X	X	
Meadow knapweed	*Centaurea pratensis*	X		X
Medusahead	*Taeniatherum caputmedusae*	X		X
Musk mustard	*Chorispora tenella*	X		X
Musk thistle	*Carduus nutans*	X	X	

Table 3.14-2 Invasive Plant Species and Declared Noxious Weeds Present or with Potential to Occur in the CCPA

Common Name	Scientific Name	BLM National List[1]	Wyoming Noxious Weed List[2]	Converse County Declared List[3]
Orange hawkweed	*Hieracium aurantiacum*	X		X
Ox-eye daisy	*Chrysanthemum leucanthemum*		X	
Perennial pepperweed	*Lepidium latifolium*	X	X	
Perennial sowthistle	*Sonchus arvensis*		X	
Plains larkspur/Geyer larkspur	*Delphinium geyeri*	X		X
Plumeless thistle	*Carduss acanthoides*		X	
Poison hemlock	*Conium maculatum*	X		X
Puncturevine	*Tribulus terrestris*	X		X
Purple loosestrife	*Lythrum salicaria*		X	
Purple starthistle	*Centaurea calcitrapa*	X		X
Quackgrass	*Agropyron repens*		X	
Redstem filaree	*Erodium cicutarium*	X		X
Rush skeletonweed	*Chondrilla juncea*	X		X
Russian knapweed	*Centaurea repens*	X		
Russian olive	*Elaeagnus angustifolia*	X	X	
Saltcedar	*Tamarix* spp.	X	X	
Sandbur	*Cenchrus incertus*	X		X
Scentless chamomile	*Matricaria perforate*	X		X
Scotch broom	*Cytisus scoparius*	X		X
Scotch thistle	*Onopordum acanthium*	X	X	
Showy milkweed	*Asclepias speciosa*	X		
Skeletonleaf bursage	*Franseria dicolor Nutt.*		X	
Spotted knapweed	*Centaurea maculosa*	X	X	
Squarrose knapweed	*Centaurea virgata Lam.* ssp. *Squarrosa*	X		X
Sulfur cinquefoil	*Potentilla recta*	X		X
Syrian beancaper	*Zygophyllum fabago*	X		X
Tansy ragwort	*Senecio jacobaea*	X		X
Teasel	*Dipsacus fullonum*	X		X
Wavyleaf thistle	*Cirsium undulatum*	X		X
Western sticktight	*Lappula occidentalis*	X		X
Whitetop	*Cardaria draba* and *Cardaria pubescens*	X	X	

Table 3.14-2 Invasive Plant Species and Declared Noxious Weeds Present or with Potential to Occur in the CCPA

Common Name	Scientific Name	BLM National List[1]	Wyoming Noxious Weed List[2]	Converse County Declared List[3]
Wild licorice	*Glycyrrhiza lepidota*	X		X
Yellow hawkweed	*Hieracium fendleri*	X		X
Yellow toadflax	*Linaria vulgaris*		X	

[1] BLM 2008a.

[2] Wyoming Weed and Pest Control 2017a.

[3] Wyoming Weed and Pest Control 2017b.

Table 3.14-3 Federally Threatened and Endangered Plant Species Suitable Habitat within the CCPA

Species (*Scientific Name*)	Status	Habitat Description	Suitable Habitat by Ownership (acres)			
			BLM	USFS	State	Private
Ute ladies'-tresses orchid (*Spiranthes diluvialis*)	Threatened	Low, flat floodplain terraces or abandoned oxbows below 7,000 feet. Sites are subirrigated, often seasonally flooded, and remain moist into the summer. Soils are sandy loams, sands, and silt loams derived from Quaternary alluvial deposits.	166[1]	12[1]	772[1]	5,724[1]
Western prairie-fringed orchid (*Platanthera praeclara*)	Endangered	Unplowed, calcareous prairies and sedge meadows.	None[2]	None[2]	None[2]	None[2]

[1] Based on existing WYNDD data.

[2] Has not been documented within the CCPA but may occur in the downstream riparian habitats of the North Platte River in Nebraska and could be adversely affected by water depletions in the North Platte River system resulting from Project-related activities.

Source: BLM 2007b.

Ute Ladies'-Tresses Orchid

Ute ladies'-tresses orchid (*Spiranthes diluvialis*) is listed as federally threatened (USFWS 2015). A petition to delist this species and initiate a 5-year review was issued by the USFWS in 2004 (69 FR 60605-60607), and a rangewide status review was completed in 2005 (Fertig et al. 2005). The final ruling is pending. This species currently is known from western Nebraska, southeastern Wyoming, north-central Colorado, northeastern and southern Utah, east-central Idaho, southwestern Montana, and central Washington. In Wyoming, the Ute ladies'-tresses orchid is known from the western Great Plains in Converse, Goshen, Laramie, and Niobrara counties. Rangewide, the Ute ladies'-tresses orchid occurs primarily on moist, sub-irrigated or seasonally flooded soils in valley bottoms, gravel bars, old oxbows, or floodplains bordering springs, lakes, rivers, or perennial streams at elevations between 1,780 and 6,800 feet (Fertig 2000). Suitable soils vary from sandy or coarse, cobbley alluvium to calcareous, histic, or fine-textured clays and loams. Populations have been documented from alkaline sedge meadows,

riverine floodplains, flooded alkaline meadows adjacent to ponderosa pine, Douglas fir woodlands, sagebrush steppe, and streamside floodplains. Some occurrences also are found on agricultural lands managed for winter or early season grazing or hay production. Known sites often have low vegetative cover and may be subjected to periodic disturbances such as flooding or grazing. Populations are often dynamic and "move" within a watershed as disturbances create new habitat or succession eliminates old habitat (Fertig 2000). Threats to the species include habitat loss and modification through urbanization, competition from invasive species, herbicide drift (i.e., from management of noxious weeds), overcollection, recreation, grazing, and hydrology changes (e.g., modification of wetlands, flood control, and de-watering) (USFWS 2015).

Based on a predictive distribution model developed by WYNDD, approximately 6,675 acres of suitable habitat exist for Ute ladies'-tresses orchid within the CCPA (**Figure 3.14-3**). There are three populations known to occur within the CCPA located along Antelope, Wind, and North Stinking Water creeks (BLM 2017c). The BLM Casper Field Office administers the land at these locations. Based on Fertig et al. (2005), the number of individual plants observed at the Antelope Creek population between 1994 and 2004 varied from 0 to 35. Current threats to this population include competition from non-native plants and vegetation succession. There also are three populations found outside the CCPA in Goshen, Niobrara, and Laramie counties on lands owned by the State of Wyoming and private parties. As reported by Fertig et al. (2005), populations overall are more stable, especially if subterranean seedling and dormant individuals are counted, and more tolerant of human-induced disturbances than originally suspected.

Western Prairie Fringed Orchid

The Western prairie-fringed orchid was listed as threatened under the ESA in September of 1989. The USFWS published 5-year summary and evaluation in February of 2009. While a large number of the orchid's populations were protected from habitat destruction, the evaluation determined that protection under the ESA was still warranted, and the status for the western prairie fringed orchid remained the same (71 FR 16176). Threats to the species include conversion of habitat to cropland, overgrazing, competition from invasive species, herbicide drift, and off-site water drainage that would lower water levels downstream.

The western prairie fringed orchid may occur in downstream riparian habitats of the North Platte River in Nebraska. Soil moisture is a critical determinant of the growth, flowering, and distribution of this species (USFWS 2009). Water depletions upstream could cause a reduction of soil moisture, which could adversely affect the western prairie fringed orchid. As discussed in Section 3.16.1, hydrologically connected sub-basins of the North Platte River watershed exist within the CCPA (**Figure 3.16-3**). If water-related activities associated with the Project exceed 0.1 acre-foot of depletion in the Platte River Basin, then consultation with the USFWS will be mandatory.

3.14.3.4 BLM and USFS Sensitive Species

The BLM has identified five sensitive plant species that may occur within the CCPA and has undertaken specific management efforts toward maintaining satisfactory habitats for these species (BLM 2010a). The USFS Region 2 has identified 90 sensitive plant species that may have the potential to occur with the CCPA; **Appendix F** provides an assessment of these BLM and USFS sensitive plant species. **Table 3.14-4** lists only those species documented to occur or determined to have the potential to occur in the CCPA.

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THUNDER BASIN NATIONAL GRASSLAND

THUNDER BASIN NATIONAL GRASSLAND

CASPER F.O.

NEWCASTLE F.O.

BUFFALO F.O.

CASPER F.O.

North Platte River

MEDICINE BOW-ROUTT N.F.

Casper

Douglas

JOHNSON

NATRONA

CAMPBELL

CONVERSE

WESTON

NIOBRARA

PLATTE

GOSHEN

MONTANA

WYOMING

UTAH

COLORADO

SOUTH DAKOTA

IDAHO

Project Boundary

BLM Field Office Boundary

USFS Administrative Boundary

Ute Ladies'-tresses Orchid Suitable Habitat

Surface Ownership

Bureau of Land Management

US Forest Service

State

Private

Bureau of Reclamation

DOD/USACE

Source: WYNDD 2008a.

CONVERSE COUNTY OIL AND GAS EIS

Figure 3.14-3
Ute Ladies'-tresses Orchid Suitable Habitat

0 2.5 5 10 Miles

0 2.5 5 10 Kilometers

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Table 3.14-4 BLM and USFS Sensitive Plant Species Potential and Documented Occurrence in the CCPA

Species (*Scientific Name*)	Habitat Description	Suitable habitat in CCPA			
		BLM Land	USFS Land	State	Private
BLM Sensitive Species					
Porter's sagebrush (*Artemisia porter)*	Sparsely vegetated badlands of ashy or tufaceous mudstone and clays slopes 5,300 to 6,500 feet in elevation.	Suitable habitat present	Suitable habitat present	Suitable habitat present	Suitable habitat present
USFS Sensitive Species					
Barr's milkvetch *(Astragalus barrii)*	Dry badlands and semi-barren slopes with low vegetation cover.	Not Documented	Documented	Unlikely to occur	Unlikely to occur
Prairie dodder *(Cuscuta plattensis)*	Sand prairie hill habitat.	Unlikely to occur	Suitable habitat present	Suitable habitat present	Suitable habitat present
Visher's buckwheat *(Eriogonum visheri)*	Gentle, rolling plains and hillocks of barren or semi-barren sandy clay, or clay soils derived from shale in dry steppe communities.	Unlikely to occur	Suitable habitat present	Suitable habitat present	Suitable habitat present
Common twinpod (*Physaria didymocarpa)*	Sagebrush steppe and foothills/intermontane prairie.	Suitable habitat present	Suitable habitat present	Suitable habitat present	Suitable habitat present

Source: BLM 2010a, 2002a; USFS 2014a, 2013; WYNDD 2016.

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Based on WYNDD (2016) data, Porter's sagebrush is the only BLM sensitive species with potential suitable habitat or documented populations in the CCPA. Four USFS sensitive species have suitable habitat or documented populations in the CCPA: Barr's milkvetch, prairie dodder, Visher's buckwheat, and common twinpod.

Porter's Sagebrush

WYNDD has recorded 209 observations of Porter's sagebrush throughout Wyoming; however, there currently are no documented occurrences of this species in the CCPA (WYNDD 2016). Based on a predictive distribution model developed by WYNDD, potential suitable habitat does exist in the western portion of the CCPA (**Figure 3.14-4**). Porter's sagebrush is endemic to the Wind River and Powder River basins in central Wyoming and occurs primarily on BLM-managed lands in the Buffalo, Casper, and Lander field office jurisdictions. This species occurs in sparsely vegetated clay flats, gullies, depressions, and badlands slopes at 5,300 to 6,500 feet amsl. Most populations are found on pale whitish or red- to green-banded silty loams derived from shales or consolidated volcanic ash of the Eocene Wagon Bed or Wind River formations (Fertig 2002). Threats to this species include oil and gas exploration and development (BLM 2007b).

Barr's Milkvetch

There are 87 documented populations of Barr's milkvetch in Wyoming, six of which have been documented in the CCPA (WYNDD 2016). Current distribution of Barr's milkvetch is limited to the northeastern corner of the CCPA, primarily on USFS-managed lands (Heidel 2003), although WYNDD data indicates suitable habitat in the extreme southeast portion of the CCPA (WYNDD 2016). This species is a regional endemic of northeastern Wyoming; however, its elevation range and habitat only exist within the TBNG. Barr's milkvetch is found primarily on dry, rocky prairie knolls, hillsides, and barren areas. In Wyoming, populations occur most frequently on sparsely vegetated badlands, often on whitish, sandy-silty (often calcareous) or sandy soils at elevations of 3,700 to 5,700 feet amsl. Reported threats to this species in Wyoming may include coal bed natural gas, oil, and gas developments (Fertig 2008).

Prairie Dodder

Suitable habitat exists for prairie dodder within the CPPA based on GIS analysis of habitat, vegetation cover, elevation, and soil (**Figure 3.14-5**); however, there are no known occurrences within the CCPA. Prairie dodder is known from one extant location and three historical reports in the vicinity of the TBNG (Handley and Fertig 2001). This species is an annual, rootless, twining, parasitic herb primarily found on sand prairie hills at elevations of 4,200 to 4,900 feet amsl. Threats to this species may include agricultural practices, especially herbicide drift (Handley and Fertig 2001).

Common Twinpod

Common twinpod is a regional endemic to the Powder River Basin. However, in Wyoming it has a low number of occurrences, low population numbers, and unknown trends, and it is not known in Converse County (Heidel and Handley 2004). It inhabits sparsely vegetated, sandy or clayey soil of eroding slopes, banks, and badlands within montane plains and valleys (Montana Natural Heritage Program 2014). It is known from 14 occurrences in the foothills of the Bighorn Range and Powder River Basin in Big Horn, Campbell, Johnson, and Sheridan counties. There also are three occurrences within the Bighorn National Forest. No occurrences are known but suitable habitat does exist within the CCPA based on GIS analysis of vegetative cover (**Figure 3.14-6**). Threats to the species appear to be livestock trampling, recreational use of habitat, and mining (Mills and Fertig 2000).

Visher's Buckwheat

Current USFS Region 2 documented occurrences of Visher's buckwheat are restricted to South Dakota and no occurrences have been documented within the CCPA. Suitable habitat does exist and it is similar to the vegetative habitat of common twinpod (**Figure 3.14-6**), but the species' habitats vary based on differing soil requirements. The species inhabits the badlands, gentle, rolling plains, and hillocks of barren or semi-barren loamy, sandy clay, or clay soils in dry steppe communities with a semiarid continental climate. Visher's buckwheat grows in the least vegetated parts of the grassland/shrubland mosaic at elevations between 1,900 and 2,700 feet amsl (Ladyman 2006). In USFS Region 2, livestock grazing, agricultural uses, invasive non-native plant species, and recreation activities appear to be the greatest threats (Ladyman 2006).

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THUNDER BASIN NATIONAL GRASSLAND

JOHNSON NATRONA CAMPBELL CONVERSE BUFFALO F.O. CASPER F.O. WESTON CONVERSE WESTON NIOBRARA CASPER F.O. NEWCASTLE F.O. CONVERSE NIOBRARA

THUNDER BASIN NATIONAL GRASSLAND

North Platte River

Casper

Douglas

MEDICINE BOW-ROUTT N.F.

CONVERSE NATRONA NIOBRARA PLATTE NIOBRARA GOSHEN

MONTANA SOUTH DAKOTA IDAHO WYOMING UTAH COLORADO

Project Boundary
BLM Field Office Boundary
USFS Administrative Boundary
Porter's Sagebrush Suitable Habitat

Surface Ownership
Bureau of Land Management
US Forest Service
State
Private
Bureau of Reclamation
DOD/USACE

Source: WYNDD 2015.

CONVERSE COUNTY OIL AND GAS EIS

Figure 3.14-4
Porter's Sagebrush Suitable Habitat

0 2.5 5 10 Miles
0 2.5 5 10 Kilometers
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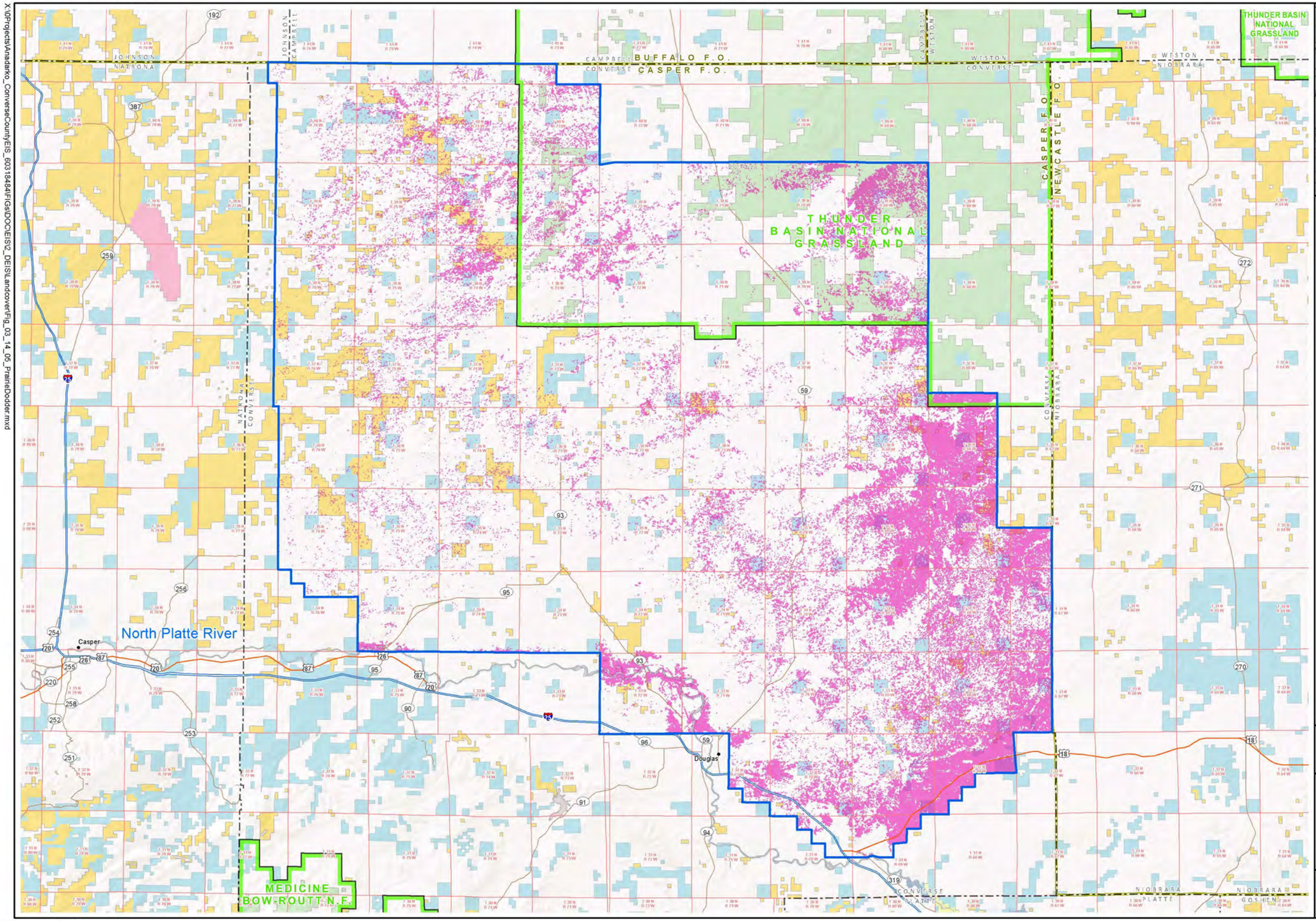

Project Boundary
BLM Field Office Boundary
USFS Administrative Boundary
Prairie Dodder Suitable Habitat

Surface Ownership
Bureau of Land Management
US Forest Service
State
Private
Bureau of Reclamation
DOD/USACE

Source: DOI 2014.

CONVERSE COUNTY OIL AND GAS EIS

Figure 3.14-5
Prairie Dodder
Suitable Habitat

0 2.5 5 10 Miles
0 2.5 5 10 Kilometers
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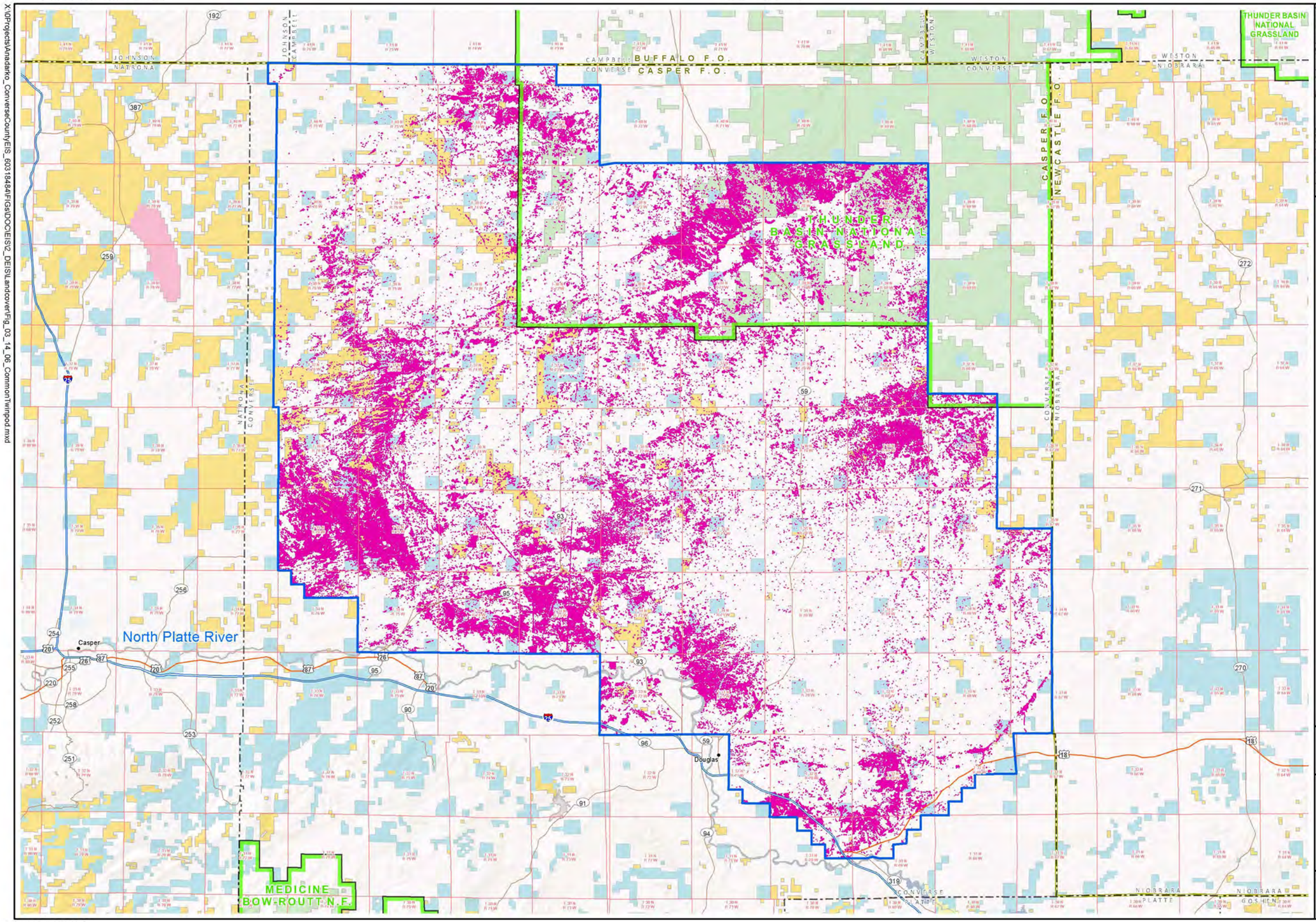

Project Boundary
BLM Field Office
USFS Administrative Boundary
Common Twinpod Suitable Habitat

Surface Ownership

Bureau of Land Management
US Forest Service
State
Private
Bureau of Reclamation
DOD/USACE

Source: DOI 2014.

CONVERSE COUNTY OIL AND GAS EIS

Figure 3.14-6
Common Twinpod
Suitable Habitat

0 2.5 5 10 Miles
0 2.5 5 10 Kilometers
1:450,000

N

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