3.9 Soils

This section provides context for the evaluation of potential project-induced environmental consequences to soil resources occurring within the Application Area. The BLM RFO has a completed Order 3 soil survey for BLM lands in Carbon County, Wyoming. Baseline information used to characterize soils was derived from the BLM Order 3 soil survey data review and analyses (Texas Resource Consultants 1981; Soil and Land Use Technology, Inc. 1981). In addition, the NRCS is updating the Order 3 soil survey on BLM lands. Where available, NRCS data was used in conjunction with BLM data or in areas where BLM data was not available. Soil survey mapping was extrapolated to a small percentage of the Application Area (less than 5 percent) that had no existing mapping data.

In addition to the Order 3 soil survey data, a soil verification study has been completed to further identify soil characteristics and constraints. These data have been incorporated into the analysis and provide further detail on project related affected environment and environmental consequences and will determine if applicant committed mitigation measures are adequate or if additional mitigation measures will be required.

3.9.1 Regional Overview

Soil resources within the Application Area have formed within the Cool Central Desertic Basins, Mountains, and Plateaus, Major Land Resource Area 34A (NRCS 2006). The physiography of the area is characterized by alluvial fans, piedmont plains, and pediments originating from the surrounding mountains that form broad intermountain basins. The topography ranges from nearly level to steep and slopes are commonly dissected. Most of the soils formed in alluvium, slope alluvium, or residuum derived from sedimentary materials. Many of the soils are shallow or moderately deep to shale or sandstone bedrock.

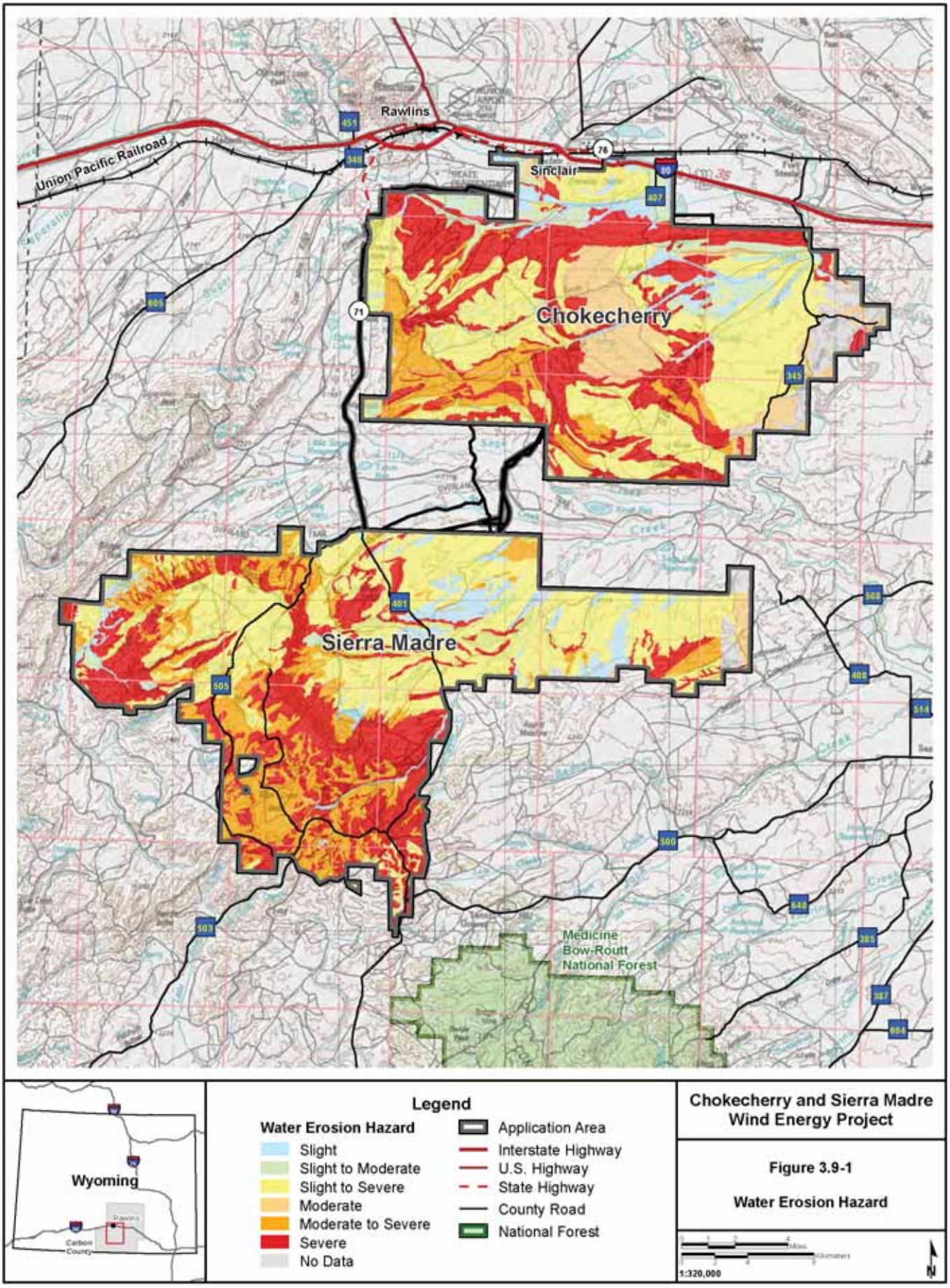
The dominant soils are Orthents, which are shallow to very deep and medium to fine textured and have a frigid temperature regime and an aridic moisture regime.. Torriorthents (Patent and Garsid series) and Haplargids (Diamondville series) are on piedmont plains, alluvial fans, and pediments. Torrifluvents are on floodplains. Shallow Torriorthents (Blazon and Haterton series) are on rough, broken slopes. Some Torriorthents and Torrifluvents have a high content of exchangeable sodium.

3.9.2 Application Area Soils

3.9.2.1 Data Summary

A variety of soils occur across the Application Area. The soil variability stems primarily from a variety of parent materials as influenced by topography, aspect, elevation, vegetation, and differential rates of mineral weathering. The soils in the Chokecherry portion of the Application Area formed from alluvium, colluvium, residuum, and eolian parent materials primarily derived from sedimentary rocks. Shallow to moderately deep (20 to 40 inches deep) soils are common in the Chokecherry area. Soil depths range from shallow (less than 20 inches) on ridges and hillslopes to very deep (greater than 60 inches) in valley bottoms with slopes ranging from 0 to 70 percent. The soils in the Sierra Madre portion of the Application Area formed from alluvium, colluvium, and residuum parent materials primarily derived from shale and sandstone. Soil depths range from shallow to very deep (40 to greater than 60 inches deep) with slopes ranging from 0 to 50 percent.

Several revegetation limitations are listed for the soil map units overlying the Application Area. These limitations include high clay content, alkalinity, salinity, sodicity, and (lack of) precipitation, water holding capacity, hydric soils, soil depth, rock fragment content, erosion potential, and flooding potential. Unsurfaced road ratings (presented in **Table 3.9-1**) consider soil limitations such as low soil strength, depth to bedrock, sand content, shrink-swell potential, slope, wetness, flooding potential, and potential for road dust. **Figures 3.9-1** through **3.9-5** illustrate the potential limitations in the Application Area. Acres of pertinent limitations of the soils located within the Application Area boundaries are presented in **Table 3.9-1**.



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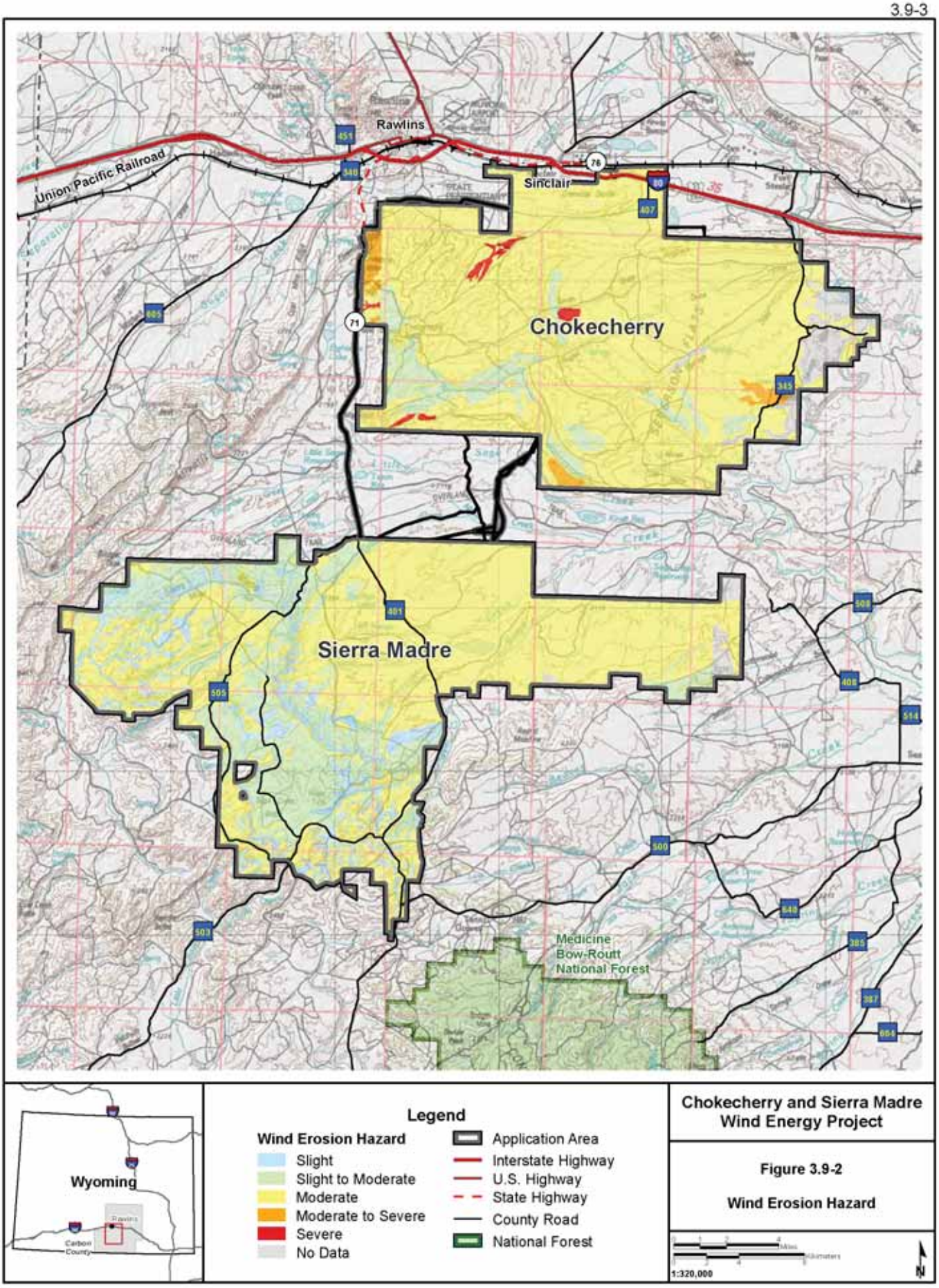
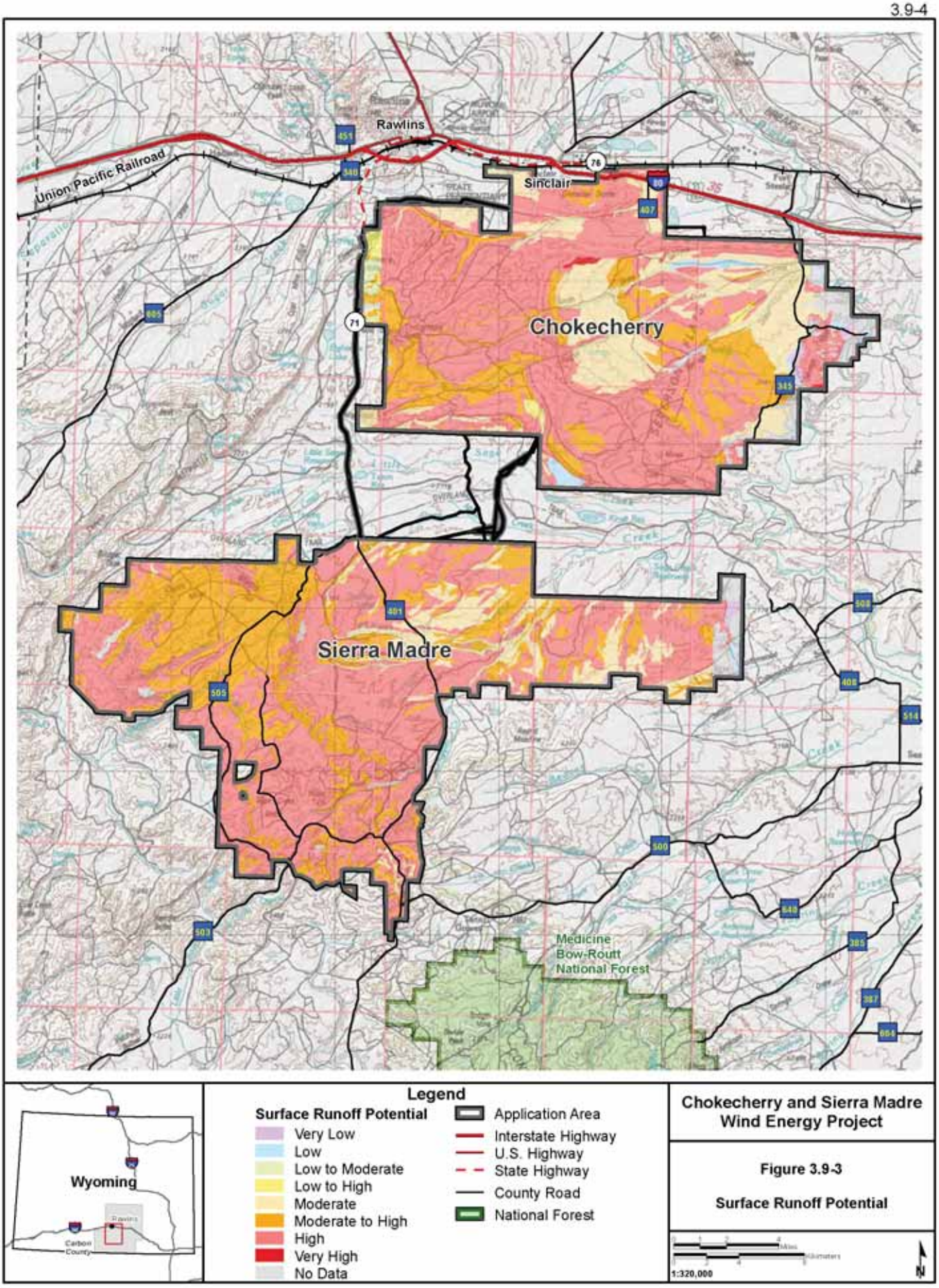


Chokecherry and Sierra Madre Wind Energy Project

Figure 3.9-2

Wind Erosion Hazard



Chokecherry and Sierra Madre Wind Energy Project

Figure 3.9-3

Surface Runoff Potential

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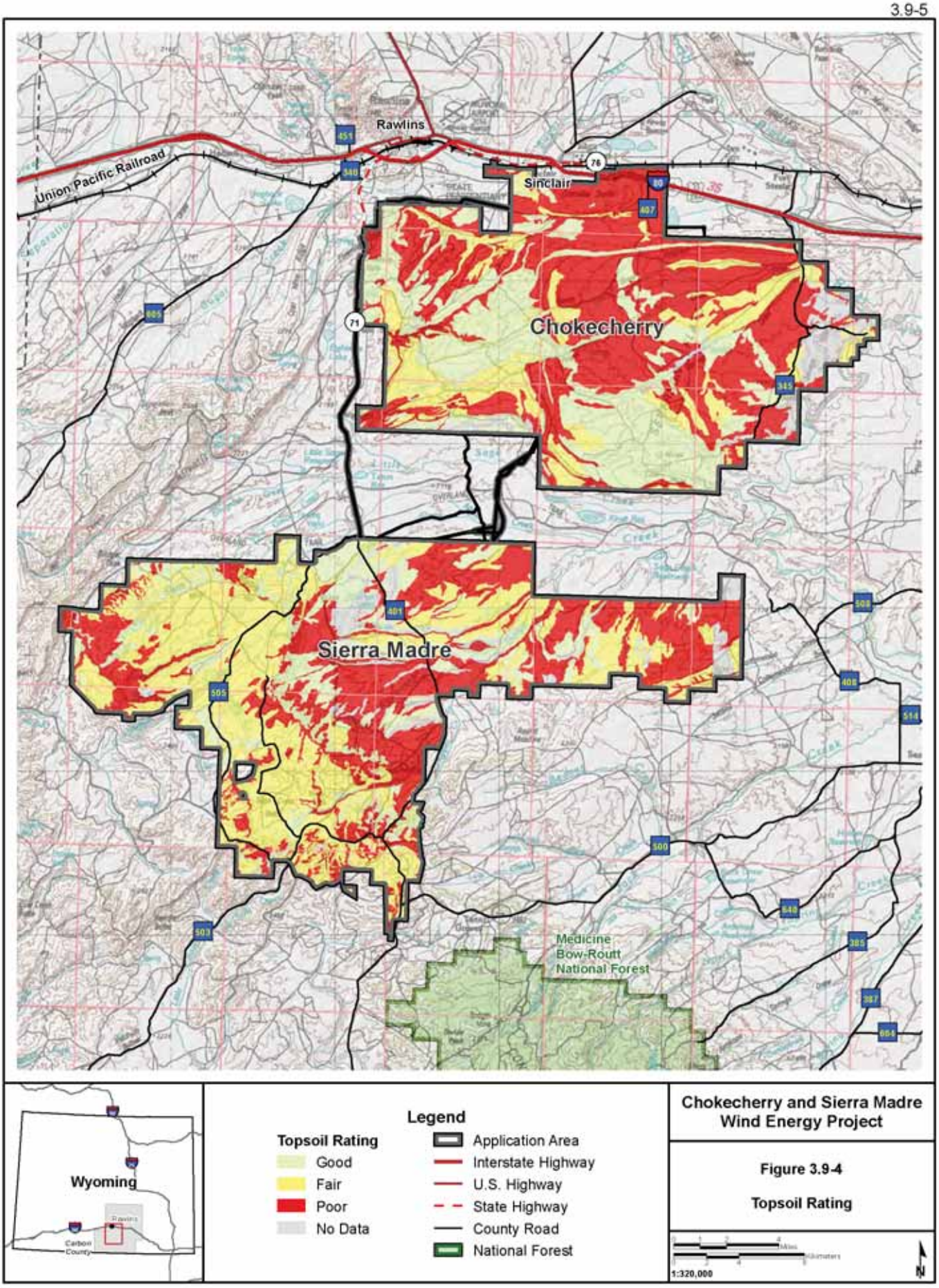

Chokecherry and Sierra Madre Wind Energy Project

Figure 3.9-4

Topsoil Rating

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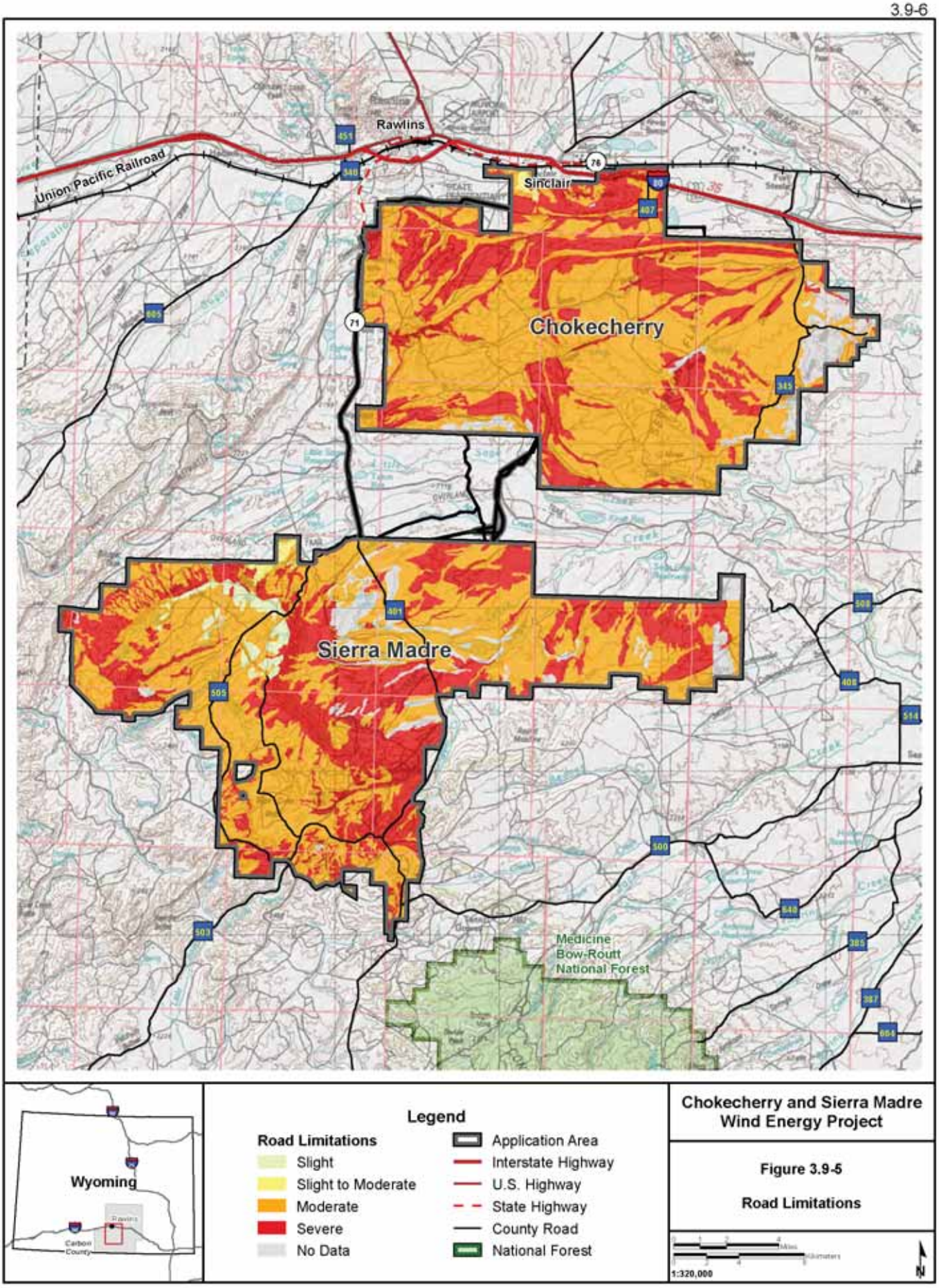

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Table 3.9-1 Total Acres of Soil Factors Within the Application Area

Water Erosion Potential	Acres	Topsoil Rating	Acres
Slight	14,621	Good	55,370
Slight/Moderate	7,787	Fair	68,052
Slight/Severe	87,548	Poor	93,510
Moderate	12,764	No Data	12,144
Moderate/Severe	33,622		
Severe	66,105	**Road Rating[1]**	**Acres**
No Data	6,628	Slight	2,389
		Slight/Moderate	1,010
Wind Erosion Potential	**Acres**	Moderate	138,383
Slight	11,767	Severe	75,149
Slight/Moderate	38,761	No Data	12,144
Moderate	168,342		
Moderate/Severe	2,607		
Severe	981		
No Data	6,619		
Runoff Potential	**Acres**		
Very Low	1,021		
Low	2,089		
Low to Moderate	693		
Low to High	981		
Moderate	33,838		
Moderate to High	52,185		
High	131,135		
Very High	323		
No Data	6,812		

[1] Road rating based on severity of soil limitations.

The most commonly encountered soils in the Chokecherry area include the Rentsac, Blazon, and Diamondville series. The Rentsac series occurs on mountains, escarpments, bedrock-floored plains, and hills. Slopes range from 10 to 70 percent. Rentsac soils are shallow to calcareous sandstone with loamy-skeletal textures. Water erosion potential is high and wind erosion potential is moderate. Topsoil suitability is poor due to large stones. The Blazon series is shallow to shale bedrock and occurs on pediments, hillslopes, plateaus and ridges. Slopes range from 6 to 40 percent. The Blazon series is calcareous and is also compaction prone when moist or saturated. Water erosion potential is high and wind erosion potential is moderate. Topsoil suitability is good. The Diamondville series consists of moderately deep, well drained soils that formed in alluvium and residuum weathered from calcareous

loamstone and sandstone. Diamondville soils are on fan remnants, plateaus, hills and ridges of cold intermountain basins. Slopes range from 3 to 70 percent. Water erosion potential is severe and wind erosion potential is slight. Topsoil suitability is fair due to high clay.

The most commonly encountered soils in the Sierra Madre area include the Wellsville, Echemoor, and Lupinto series. The Wellsville series formed in thick, calcareous, gravelly locally transported materials derived from limestone and other sedimentary rocks. Wellsville soils are deep and occur on alluvial fans and valley side slopes. Slopes range from 2 to 20 percent. Topsoil suitability is fair due to large stones. The Echemoor series has a dark thick surface layer rich in organic matter overlaying channery subsoil. A channery soil has more than 15 percent by volume thin, flat fragments of sandstone, shale, slate, limestone, or schist (less than 6 inches in length). The soil is moderately deep to paralithic bedrock and formed in residuum and colluvial materials derived from sedimentary rock. Echemoor soils are on mountain slopes and hillslopes contiguous to mountain fronts. Slopes range from 3 to 10 percent. Water erosion potential is severe and wind erosion potential is slight. Topsoil suitability is fair due to high clay. The Lupinto series consists of deep, well drained soils on relict fan aprons, terraces, and valley fill positions. These soils formed in calcareous gravelly alluvium from mixed sources. Slopes range from 6 to 20 percent. Water erosion potential is severe and wind erosion potential is slight. Topsoil suitability is fair due to large stones and high clay.

3.9.2.2 Observations

The Application Area was visited during the summer months of 2010 in an attempt to further review and define the soils and their limitations and constraints in regards to project conceptual layouts. Soils were examined only where accessible by existing roads. Soils were compared to BLM and NRCS soil survey data. In some cases the data was noted as correct, further refined, or noted as inconsistent and the differences recorded. Photos were taken to display areas of concern or other notable features. The mapbook, with records on soil map units that were further refined or inconsistent, can be found in **Appendix F**. Photos referred to in the subsequent text are located in **Appendix F**. In general, the soils in the Application Area are highly influenced by parent materials, wind, and water. Soils in the Application Area are primarily derived from mixed sedimentary rock formations. Marine shales are prevalent in the Application Area and weather to form highly clayey, saline-sodic, occasionally seleniferous soils, as shown in **Photos 091**, **159**, **249**, and **259**. In general, these soils were noted along drainageways, flats, and valley bottoms. These soils are difficult to reclaim and are prone to gully erosion and piping, as displayed in **Photos 098**, **217**, **250,** and **321**. These soils are also prone to puddling (**Photo 112**) due to their fine texture and low permeability.

Shale outcrops and soils shallow to shale are common within the Chokecherry area and the lower Sierra Madre area below the rim. Soils with steep slopes that are shallow to shale are prone to slumping and mass wasting, as shown in **Photos 58**, **160**, **189**, and **204**. Many of the mass wasting events are fairly recent, notably due to the lack of vegetative cover. These soils are difficult to reclaim and stabilize.

Spotty areas of vegetated sand dunes were noted within soil map units along the rims of both Severson Flats in the Chokecherry area and Miller Hill in the Sierra Madre area. These eolian sands are highly erodible by wind if the protective vegetative cover is disturbed or denuded (**Photos 067** and **070**).

Aquolls or wet soils were commonly observed but not well documented in the current soil survey in the Sierra Madre area. These soils were commonly found at the base of Miller Hill (**Photos 180** and **183**) and in swales and valleys (**Photos 164**, **242**, and **260**) on Miller Hill, as shown in the mapbook in **Appendix F**. These soils were generally fine-textured and would be especially prone to rutting, displacement, and mixing due to their moisture content and clay content. Pachic (thick organic) soils vegetated with aspen, were observed in association with areas of wet soils fingering down from Miller Hill (**Photos 261** and **338**).

Gullied and eroded soils (**Photos 253** and **332**) were common in both Application Areas primarily on steep slopes or associated with fine-textured soils. Rilling and gully erosion was commonly observed on

native surface roads in the Application Area, such as in **Photos 055** and **163**. Wind scour (**Photos 081** and **126**) was noted on medium to coarse textured soils throughout the Application Area specifically on windswept ridges where grass or sedge cover was not prevalent.

Desert pavement was noted throughout the Application Area (**Photos 214** and **297**). In these areas the fine soil particles have been removed by wind. Often all that is left behind are pebbles or gravels on the soil surface or unvegetated scoured areas between existing vegetation displaying pedestaling.

3.10 Transportation

This section describes the local and regional transportation network that provides access to and within the Application Area.

3.10.1 Air Access

Rawlins Municipal Airport/Harvey Field offers general aviation capability for Rawlins and Carbon County. Located approximately 2 miles northeast of downtown Rawlins, the airport can support commercial air service, although no such service is presently offered. The airport is operated by the Carbon County Airport Joint Powers Board, which is currently updating its Airport Master Plan. When completed that plan is expected to identify improvements to meet existing and future needs for the airport. There are 16 aircraft based at Harvey Field (FAA 2009). Public general aviation airports also are located in Saratoga (18 based aircraft) and Dixon (6 based aircraft) (WYDOT 2008a).

3.10.2 Rail Access

One of the UPRR transcontinental mainline routes traverses Carbon County, generally along an east-west alignment, and a crew change terminal, switching yard, RDF, and related facilities are located in Rawlins. A major freight siding is located in Sinclair, serving the Sinclair Refinery. The northern boundary of the Chokecherry portion of the project lies just south of the UPRR mainline corridor.

3.10.3 Vehicular Access

According to PCW's February 2012 Preliminary Transportation Management Plan (PTMP) (PCW 2012b), access to the Application Area for all externally-originating heavy truck deliveries, would be via the WY 76/I-80 interchange at Exit 221, just east of Sinclair, connecting to CR 407 (CIG Road), which will connect to an internal haul road at the Application Area boundary. The PTMP identifies two scenarios for workforce commuting to and from the Application Area; the first would require all workforce traffic to use the same internal haul road and access routes as the heavy truck deliveries, the second assumes that a portion of the workforce would use WY 71/CR 401 (Sage Creek Road), to access the Application Area (PCW 2012b). Access points from these highways and roads to the CCSM sites are shown in **Figure 3.10-1** and discussed in Section 2.3.3.3.

It is possible to reach the Application Area from WY 789 on the west side, WY 70 on the south side, and WY 130 on the east (**Figure 1-1**). The access routes from these highways are gravel and native material, Carbon County, BLM, and undesignated roads and two tracks; conditions that necessitate slower travel speeds, particularly during inclement weather.

Access within the Application Area is currently provided by a variety of Carbon County, BLM, and private roads. There also are a number of unimproved and non-maintained undesignated roads and two-tracks within the Application Area.

3.10.4 Highway Access to the Application Area

The three highways that currently provide highway access to the Application Area include I-80, WY 76, and WY 71.

Over the past decade traffic volumes at points along this segment of I-80 increased between 16 and 37 percent with somewhat lower increases in truck traffic. Traffic volumes on this segment of I-80 showed both increases and decreases between 2007 and 2008; decreases reflecting a combination of a slowdown in natural gas drilling activity and completion of several major construction projects, the increases attributed to the initiation of other construction projects.

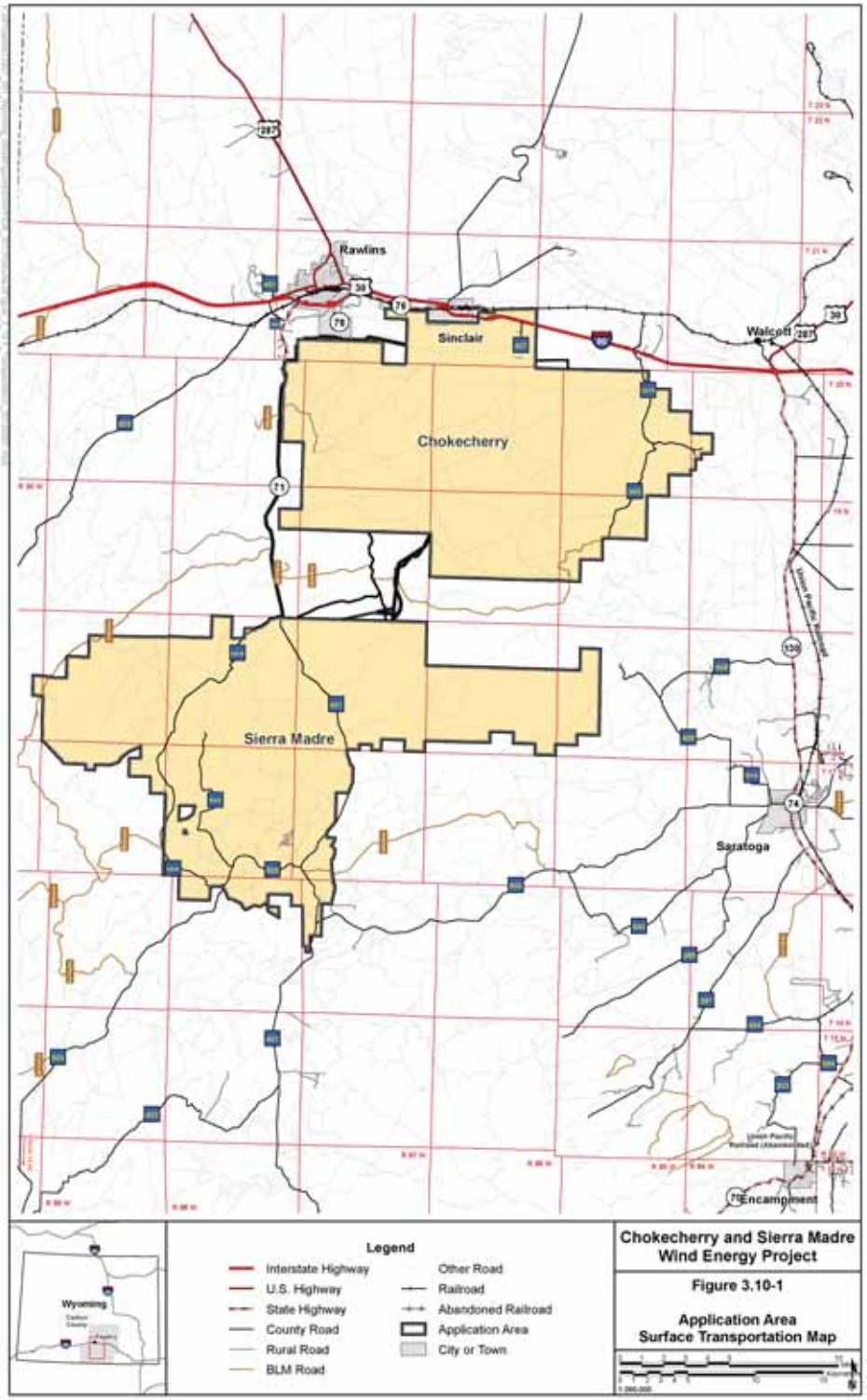
3.10.4.1 Interstate 80

I-80 is a transcontinental highway linking New Jersey and New York on the east to California on the west, passing through 10 other states along its route. It is one of the nation's major interstate commercial truck-haul routes. Recent traffic volumes on the Rawlins to Fort Steele segment of I-80 and comparison of those volumes to the corresponding 1998 traffic volumes are shown in **Table 3.10-1**. During 2008, traffic on this segment of I-80 averaged approximately 12,000 to 15,000 vehicles daily, on an annual average daily traffic (AADT) basis. Trucks accounted for over half of the total traffic.

Table 3.10-1 Recent and Historic Traffic Volumes on I-80

Route/ Direction of Travel	Section Description	2008 AADT		Change from 2007		Change from 1998	
		All Vehicles	Trucks	All Vehicles	Trucks	All Vehicles	Trucks
I-80 Eastbound	Johnson Road	6,450	3,440	0%	-4%	19%	13%
	Rawlins - W. Urban Limits	6,450	3,440	0%	-4%	19%	13%
	Junction Route 54 (Spruce Street)	6,190	3,430	-1%	2%	28%	22%
	Junction Route 4573 (Thayer)	6,580	3,380	3%	-2%	32%	20%
	Junction Route 54 (Cedar Street)	7,390	3,110	7%	-16%	30%	-9%
	Rawlins – E. Urban Limits	7,390	3,110	7%	-16%	30%	6%
	Junction Route 411 (W. Sinclair)	6,230	3,010	-4%	-16%	26%	7%
	Junction Route 411 (E. Sinclair)	5,930	3,000	-1%	-7%	17%	5%
	Fort Steele	5,880	3,000	-1%	-7%	16%	8%
I-80 Westbound	Johnson Road	6,570	3,520	-1%	-4%	21%	16%
	Rawlins – W. Urban Limits	6,570	3,520	-1%	-4%	21%	16%
	Junction Route 54 (Spruce Street)	6,300	3,480	-3%	-1%	30%	24%
	Junction Route 4573 (Thayer)	6,820	3,550	2%	-2%	37%	27%
	Junction Route 54 (Cedar Street)	7,530	3,270	-1%	-20%	33%	-5%
	Rawlins – E. Urban Limits	7,530	3,270	-1%	-20%	33%	12%
	Junction Route 411 (W. Sinclair)	6,130	3,170	-9%	-14%	24%	13%
	Junction Route 411 (E. Sinclair)	6,050	3,170	-2%	-5%	20%	10%
	Fort Steele	6,010	3,170	-1%	-4%	19%	14%

Source: WYDOT 2010.


Rawlins
Sinclair
Walcott
Chokecherry
Sierra Madre
Saratoga
Encampment
Wyoming
Legend
Interstate Highway
U.S. Highway
State Highway
County Road
Rural Road
BLM Road
Other Road
Railroad
Abandoned Railroad
Application Area
City or Town
Chokecherry and Sierra Madre Wind Energy Project
Figure 3.10-1
Application Area Surface Transportation Map

3.10.4.2 Wyoming State Highway 76

WY 76 travels approximately 6 miles from the east Rawlins I-80 interchange at Exit 215 through the Town of Sinclair and across the I-80 overpass at Exit 221 east of Sinclair. The highway is two-lane, undivided, with paved 12 foot travel lanes in each direction (PCW 2009d).

Table 3.10-2 displays recent and historic traffic volumes on WY 76.

Table 3.10-2 Recent and Historic Traffic Volumes on Wyoming SH 76

Route	Section Description	2008 AADT		Change from 2007		Change from 1997	
		All Vehicles	Trucks	All Vehicles	Trucks	All Vehicles	Trucks
WY 76 Both Directions	Junction I 80 (W Sinclair Into)	2,790	240	0%	0%	40%	-4%
	Sinclair E Corp Limits	670	80	0%	0%	43%	-58%

Source: WYDOT 2010.

During 2007 and 2008, construction related to the Sinclair Refinery expansion elevated traffic levels in the community. Traffic increased approximately 40 percent on WY 76 over the last decade, but truck traffic decreased, perhaps because of the increasing use of rail transport for refinery products.

3.10.4.3 Wyoming State Highway 71

WY 71 begins at a junction with WY 78 in southwest Rawlins. Within Rawlins, WY 71 has “T” intersections at Washington Street and Jackson Street, but with the exception of the intersection at WY 78/Higley Boulevard at its beginning, has no cross-traffic intersections. WY 71 through Rawlins is essentially separated from most traffic within the city. From the junction, the highway, the northern portion of which was recently upgraded, runs south for about 10.5 miles providing access to private and public lands south of Rawlins. Further to the south, state maintenance ends and the highway becomes CR 401 (Sage Creek Road), which provides access to the Medicine Bow National Forest and eventually intersects with WY 70 between the communities of Encampment to the east and Savery to the west. CR 401 (Sage Creek Road) is designated as National Forest Road 801 within the MBNF. **Table 3.10-3** displays recent and historic traffic volumes on WY 71.

Table 3.10-3 Recent and Historic Volumes on Wyoming SH 71

Route	Section Description	2008 AADT		Change from 2007		Change from 1997	
		All Vehicles	Trucks	All Vehicles	Trucks	All Vehicles	Trucks
WY 71 Both Directions	Junction Route 78 (WY 78)	1,680	60	-2%	0%	-5%	-57%
	Junction Washington St.	1,000	60	-2%	0%	-43%	-57%
	Rawlins - S. Corp. Limits	380	40	0%	0%	27%	-43%
	Rawlins - S. Urban Limits	250	20	0%	0%	39%	-33%

Source: WYDOT 2010.

Overall, traffic on WY 71 decreased by 2 percent in Rawlins between 2007 and 2008 and 5 to 43 percent over the last decade. South of Rawlins, overall traffic has increased by 27 to 39 percent over the last decade but truck traffic has decreased by 33 to 43 percent. Truck AADT south of Rawlins is fairly light - less than 40 trucks per day on average – therefore a small decrease can result in fairly large percentage decreases.

A traffic study commissioned by PCW in 2010 included traffic counts on WY 71 during August, the peak summer month for traffic. Those counts, taken near the corporate limits just south of the I-80 overpass, reported estimated average daily traffic (ADT) of 450 vehicles. That total is approximately 19 percent higher than the 2008 AADT reported by WYDOT for the same location, suggesting little change in traffic volume on this segment of WY 71 over the past 2 years. Additional traffic count data collected for CR 401 in 2010 and 2011, near the proposed haul road crossing, indicated a substantial decline in traffic volume as one moves south along WY 71/CR 401, but also recorded peak daily volumes considerably above the average volumes during two weekends in October (Adkins 2012).

WY 71 is designated by the WYDOT as a Minor Arterial and Collector route within Rawlins and a Rural Major Collector route outside the city limits. Widening, reconstruction, and paving of the 10.5-mile segment of the highway immediately south of Rawlins was completed in the fall of 2008. This was the first phase of the eventual reconstruction and repaving of the entire length of WY 71/CR 401 (Sage Creek Road) over the next 10 to 20 years; the pace of project completion will depend on the availability of state and federal funding.

Carbon County also funded the chip seal resurfacing (pavement surface treatment combining asphalt and aggregate) of an 8-mile segment of CR 401 (Sage Creek Road) beginning at Miller Hill and extending north toward Rawlins during the fall of 2008 (Nation 2009).

Between 1999 and August 2010, 35 vehicle accidents occurred on WY 71, 11 of which involved injuries. There were two fatalities. The majority of the injury accidents occurred at night on rural segments of the highway. Of the total accidents, 26 percent involved wildlife or livestock and 40 percent involved rollovers. Only four accidents involved collisions between two or more vehicles (Carpenter 2010).

3.10.4.4 Vertical Clearance and Other Roadway Constraints

There are eight underpasses on highways near the Application Area. Six of these underpasses involve travel lanes of I-80 passing underneath other roads passing over the interstate. All of these underpasses have minimum vertical clearances of 17 feet. The other two underpasses involve I-80 passing over local roads. Clearance for the WY 71 underpass under I-80 along the access route to the Application Area is 15 feet, 2 inches. Clearance for the Fort Steele access at the I-80 underpass, which provides access to the east side of the Application Area, is 14-foot 1-inch (**Table 3.10-4**).

There are intersections with turning radius constraints on all primary and secondary access routes to the Application Area. The existing configuration of WY 71 includes features that would create travel issues for long, low-clearance, over-sized and/or over-weight vehicles such as WTG component and heavy equipment transport vehicles (PCW 2009d).

3.10.5 Carbon County Roads

Existing access to, and in some cases within, the CCSM Application Area is provided by a number of Carbon County Roads including CR 401 (Sage Creek Road), CR 505W (Miller Hill W. Road), CR 407 (CIG Road), CR 347S/345 (Savage Ranch Road), CR 505E (Miller Hill E. Road), CR 503 (McCarty Canyon Road), and CR 340 (Hadsell Road/Ferris Crossing) (Nation and Fritz 2009). Current conditions of these roads are summarized below.

Table 3.10-4 Underpass Clearance on Application Area Access Routes

Highway	Underpass Name	Posted Clearance
I-80 Eastbound	Spruce Street Interchange	17 feet
I-80 Westbound	Spruce Street Interchange	17 feet
I-80 Eastbound	Higley Interchange	17 feet 5 inches
I-80 Westbound	Higley Interchange	18 feet 2 inches
I-80 Eastbound	East Sinclair Interchange	17 feet 3 inches
I-80 Westbound	East Sinclair Interchange	17 feet 4 inches
WY 71 (both directions)	Sage Creek Road Separation	15 feet 2 inches
CR 347 (Savage Ranch Road)	Fort Steele Interchange	14 feet 1 inch

Source: WYDOT 2008b.

CR 401 (Sage Creek Road) is a continuation of WY 71. The road is a two-lane, 24 foot-wide paved road with a recent chip seal overlay from the southern terminus of WY 71 to Sage Creek, a distance of about 8 miles. From there, the road has a 28 foot-wide gravel surface for the remainder of its roughly 37-mile length to its intersection with WY 70 northeast of Savery. Sage Creek Road/WY 71 provides primary access to the recreation resources on the west side of the Medicine Bow National Forest and is used seasonally by ranchers, grazing operators, and oil and gas operators. A major road reconstruction project is planned for CR 401 (Sage Creek Road) during 2011 and 2012 (Nation 2009).

CR (407 CIG Road) is a paved two-lane road that travels about 2 miles from I-80 at Sinclair to the CIG gas plant. The road parallels I-80 for approximately 1 mile and then makes a sharp 90-degree turn to the south. It primarily provides access to a natural gas processing plant and also accesses the BLM, state and private lands to the south.

CR 347S/345 (Savage Ranch Road) is a 24-foot-wide, two-lane road, which provides access from the I-80 exit at Fort Steele to the west side of the North Platte River and also to the eastern boundary of the Application Area. The initial segment of the road has a reclaimed asphalt surface; later sections are gravel and dirt. Owing to its proximity to the river, the road can be muddy and soft in the spring. The road currently provides fishing access to the North Platte River and access for grazing operators.

CR 505W (Miller Hill W. Road) is a 20- to-24-foot-wide gravel and dirt surfaced road that provides access to the Sierra Madre Application Area from CR 401 on the north and CR 503 on the south. Portions of the road are steep and impassable for much of the winter and during summer storm events. The road currently provides hunting and grazing access.

CR 505E (Miller Hill E. Road) is a dirt, two-track road that provides access to CR 503 north into the Sierra Madre Application Area. The road is used primarily for recreation and grazing access.

CR 503 (McCarty Canyon Road) is 24- to-26-foot-wide road that intersects with CR 401 near the southeastern boundary of the Application Area and travels about 27 miles to WY 70 at Dixon. CR 503 has a RAP surface in segments and gravel/dirt surface in segments. The road provides primary access to the BLM, state, and private lands north of the LSRV.

CR 340 (Hadsell Road/Ferris Crossing) is a 24-foot-wide gravel surface road that provides access from western Rawlins and I-80 via the West Spruce Street interchange and Wagon Circle Road. CR 340 intersects with WY 71 about 2 miles south of Rawlins and allows access to the Application Area for loads that cannot use the WY 71 underpass beneath I-80.

3.10.6 BLM Roads

Several BLM roads may be used to access portions of the Sierra Madre site. Current conditions of these roads are summarized below.

BLM 3301 (Bridger Pass Road) extends approximately 17 miles southwest from its terminus with WY 71 about 12 miles south of Rawlins. The road is approximately 18 feet wide and presently has a road base of native material. The road provides access for recreation, grazing and energy development. Consequently, road use has been increasing in recent years. A 6 inch gravel overlay was completed on over 17 miles of this road during the summer of 2009 (Estvold 2009).

BLM 3306 is approximately 14 miles in length, extending from CR 605 (Twenty Mile/J.O. Road) and BLM 3305 west of the Sierra Madre Application Area to the southeast where it connects with BLM 3308 and eventually to CR 505W (Miller Hill W. Road) in the southern portion of the Sierra Madre site. The road varies in width, up to a maximum of about 16 feet wide, has a native road base, and traverses through steep terrain. The road provides access for recreation, grazing and energy exploration and development.

3.10.7 Undesignated Roads on BLM, State, and Private Lands

There are a many undesignated roads and two-tracks on BLM, state, and private lands within both the CCSM sites. In most cases, these roads are unimproved and have been developed over time by users of the area for recreational and grazing purposes and oil and gas development. Some roads on private lands have been developed to support ranching operations.

3.11 Vegetation

Vegetation for the Application Area was determined using three methods:

- Review of the ecoregion map and summary table for the State of Wyoming (Chapman et al. 2004);
- Initial polygons for vegetation cover types were recorded on aerial photographs then digitized for the Application Area (PCW 2008b); and
- Two field reconnaissance efforts were undertaken to ground-truth the vegetation cover types in October and November 2008. This was followed by an update of the original cover type mapping in July (AECOM 2009).

The Wyoming Ecoregion Map indicates that the Application Area lies within three Level IV ecoregions. Plant community descriptions were developed based on a combination of the ecoregion descriptions (Chapman et al. 2004), the Final 2008 Rawlins RMP (BLM 2008a), and field reconnaissance surveys (AECOM 2009).

A majority of the Chokecherry portion of the Application Area is mapped as rolling sagebrush steppe. The rolling sagebrush steppe is a semiarid region of unglaciated plains and hills, featuring primarily ephemeral drainages. The potential natural vegetation in this ecoregion is listed as western wheatgrass (*Elymus smithii*), needle-and-thread (*Stipa comata*), blue grama (*Bouteloua gracilis*), Sandberg bluegrass (*Poa secunda*), prairie junegrass (*Koeleria macrantha*), various species of rabbitbrush (*Chrysothamnus* sp. and *Ericameria nauseosa*), fringed sage (*Artemisia frigida*), Wyoming big sagebrush (*Artemisia tridentata* var. *wyomingensis*), silver sagebrush (*Artemisia cana*) and black sagebrush (*Artemisia nova*) in lowlands, and mountain big sagebrush (*Artemisia tridentata* var. *vaseyana*) in higher elevation uplands (Chapman et al. 2004).

The Salt Desert Shrub Basin occurs on the northeast margin of the Application Area. The Salt Desert Shrub Basin ecoregion is a semiarid, unglaciated set of plains, nearly level floodplains, terraces, and rolling alluvial fans. Most stream courses in this ecoregion are ephemeral and the channels are typically incised. The potential natural vegetation for this ecoregion is greasewood (*Sarcobatus vermiculatus*), Gardner's saltbush (*Atriplex gardneri*), shadscale (*Atriplex confertifolia*), bud sage (*Picrothamnus desertorum*), big sagebrush (*Artemisia tridentata* spp.), alkali cordgrass (*Spartina gracilis*), Indian ricegrass (*Oryzopsis hymenoides*), blowout grass (*Redfieldia flexuosa*), alkali wildrye (*Leymus simplex*), and needle-and-thread (Chapman et al. 2004).

The Sierra Madre portion of the Application Area is mapped primarily as foothills shrublands. Foothills shrublands are unglaciated hills, ridges, and footslopes. Drainages in this ecoregion include perennial, intermittent, and ephemeral streams. Precipitation is greater here than in the two preceding ecoregions, averaging 12 to 18 inches annually. The potential natural vegetation for this ecoregion includes mountain mahogany (*Cercocarpus montanus*), mountain big sagebrush, blue grama, prairie junegrass, and western wheatgrass. There are pockets of aspen (*Populus tremuloides*), limber pine (*Pinus flexilis*), and Douglas fir (*Pseudotsuga menziesii*), on north-facing slopes. Riparian vegetation in this ecoregion may include various willow species (*Salix* sp.), narrowleaf cottonwood (*Populus angustifolia*), box elder (*Acer negundo*), and wild plum (*Prunus* sp.) (Chapman et al. 2004).

The haul road and transmission line is proposed within corridors bisecting the Chokecherry and Sierra Madre portions of the Application Area. The vegetation cover types described above for each portion of the Application Area would generally reflect those present within the haul road and transmission line corridors, specifically mountain big sagebrush, saltbush, and big sagebrush (Chapman et al. 2004).

In general terms, species composition and distribution were observed to vary across the Application Area based on soil type, available soil moisture, elevational gradient, slope aspect, and grazing pressure/disturbance.

3.11.1 Primary Vegetation Cover Types

Vegetation cover types for the Application Area are discussed in the following subsections, based on dominant cover types. These cover types correspond to the vegetation cover type map, **Figure 3.11-1**. A summary of vegetation cover types by Application Area is shown in **Table 3.11-1**. Aerial photo (PCW 2008b) interpretation and ground-truthing (AECOM 2009) produced six dominant vegetation cover types. These six cover types included mountain big sagebrush, saltbush, greasewood, Wyoming big sagebrush, aspen, and riparian/wetlands. Their estimated acreages and constituent species are listed in the following subsections. Botanical nomenclature used in this text follows Dorn (2001).

3.11.1.1 Mountain Big Sagebrush

Mountain big sagebrush was mapped as the major component of vegetative cover in the Application Area. A total of approximately 119,221 acres of this cover type was estimated based on aerial photo interpretation and field reconnaissance (**Table 3.11-1**). Of these 119,221 acres, six cover subtypes were mapped that contain dominant mountain big sagebrush vegetation. These subtypes included grassland/mountain big sagebrush (7,744 acres); mountain big sagebrush (106,881 acres); mountain big sagebrush/black sagebrush (2,920 acres); mountain big sagebrush/bird's foot sagebrush (259 acres); mixed shrub/mountain big sagebrush (693 acres); and steep/rocky/mountain big sagebrush (724 acres).

Mountain big sagebrush is a variety of big sagebrush that is currently recognized as a subspecies of *Artemisia tridentata*. The vegetative stems of mountain big sagebrush form an even-topped crown. The inflorescences rise evenly above the crown. Inflorescences are narrow and spicate bearing flower heads containing four to eight flowers per head. Leaves are characteristically wider than those of basin or Wyoming big sagebrush. In extracts, ultraviolet visible coumarins are abundant. This shrub is generally smaller in stature than basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) with an average height of 3 feet. Mountain big sagebrush inhabits an elevational range from 2,600 to approximately 10,000 feet. This shrub grows in moderately deep to deep, well drained soils which provide summer moisture. Mountain big sagebrush normally is found in loamy to gravelly soils, but can contain high amounts of clay (NRCS 2008). For the purposes of this mapping, mountain big sagebrush was mapped above 7,000 feet as directed by the BLM.

Some of the mountain big sagebrush and Wyoming big sagebrush communities were determined to be thick, old, and decadent and were treated to improve rangeland conditions. Two areas received granular Spike herbicide treatments to thin the sagebrush and allow for the development of new growth. Spike treatments occurred at Miller Hill in the Sierra Madre (5,304 acres) and at Double Draw Canyon in Chokecherry (10,318 acres). Treatment locations are shown in **Figure 3.11-2**.

A wide variety of grasses and other shrubs are typical in the mountain big sagebrush cover type. Common grass species include:

- Thickspike wheatgrass (*Elymus macrourus*);
- Bluebunch wheatgrass (*Elymus spicatus*);
- Sandberg bluegrass;
- Needle-and-thread;
- Bottlebrush squirreltail (*Elymus elymoides*);
- Prairie junegrass;
- Mutton grass (*Poa fenleriana*);

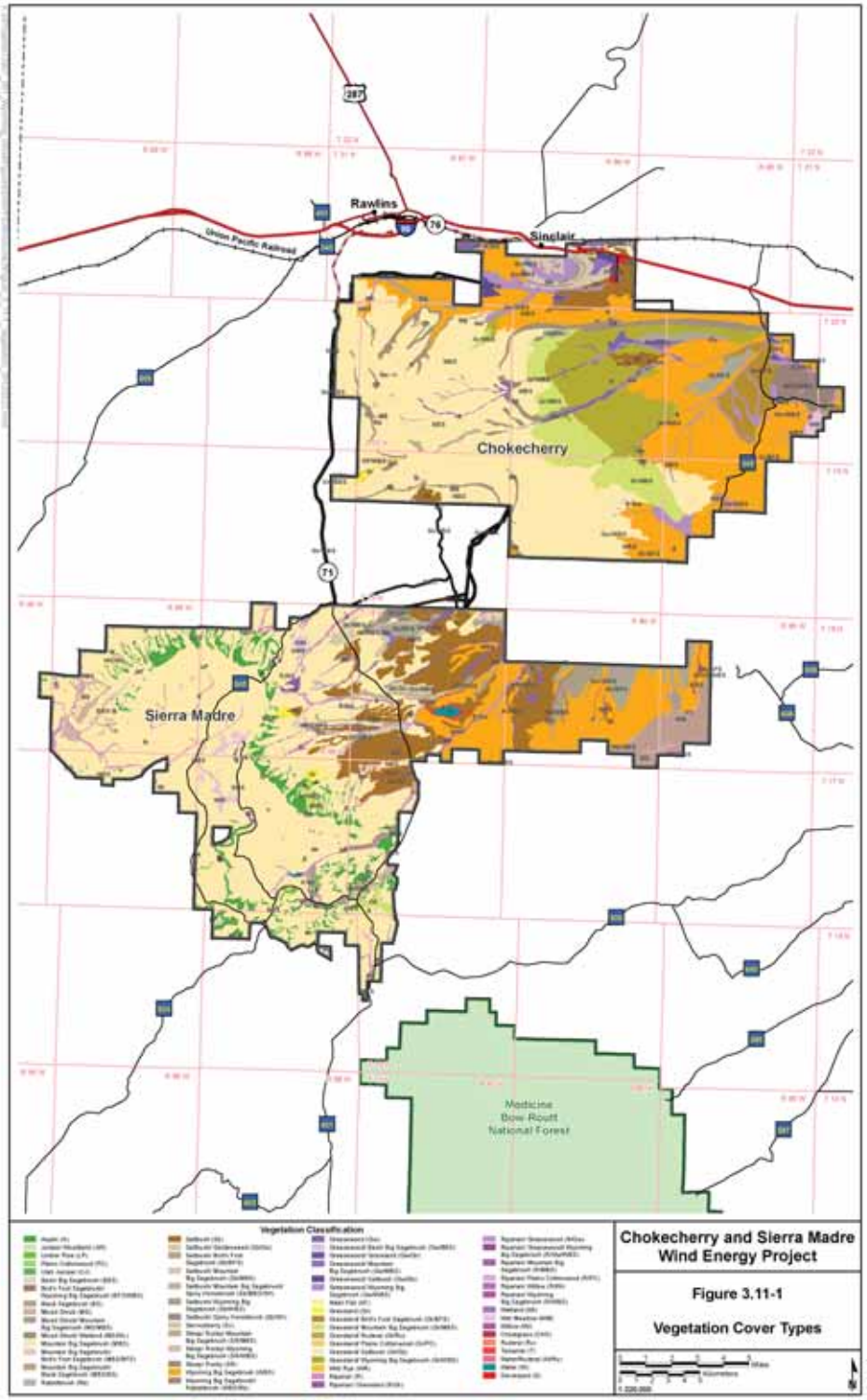

Rawlins
Sinclair
Union Pacific Railroad
Chokecherry
Sierra Madre
Medicine
Bow-Routt
National Forest
Vegetation Classification
Chokecherry and Sierra Madre
Wind Energy Project
Figure 3.11-1
Vegetation Cover Types

Table 3.11-1 Vegetation Cover Types in the Application Area

Vegetation Community	Chokecherry Site	Sierra Madre Site	Off-site	Application Area Total[1]
Alkali Flat	15	–	1	16
Aspen	–	7,166	–	7,166
Basin Big Sagebrush	75	388	–	464
Bird's Foot Sagebrush/Wyoming Big Sagebrush	1,759	–	–	1,759
Black Sagebrush	370	–	–	370
Cheatgrass	2	–	–	2
Developed	303	6	–	310
Grassland	188	407	–	594
Grassland/Bird's Foot Sagebrush	2,834	–	–	2,834
Grassland/Mountain Big Sagebrush	7,052	692	–	7,744
Grassland/Multiple Non-native Weed Species	93	–	–	93
Grassland/Plains Cottonwood	38	–	–	38
Grassland/Saltbush	329	–	–	329
Grassland/Wyoming Big Sagebrush	10,079	–	–	10,079
Greasewood	1,947	2,083	35	4,065
Greasewood/Basin Big Sagebrush	27	–	7	34
Greasewood/Grassland	36	49	–	85
Greasewood/Mountain Big Sagebrush	780	163	–	943
Greasewood/Saltbush	475	–	6	481
Greasewood/Wyoming Big Sagebrush	4,204	308	–	4,512
Juniper	–	3	–	3
Limber Pine	–	300	–	300
Mixed Shrub	368	2,007	–	2,375
Mixed Shrub/Mountain Big Sagebrush	–	693	–	693

Table 3.11-1 Vegetation Cover Types in the Application Area

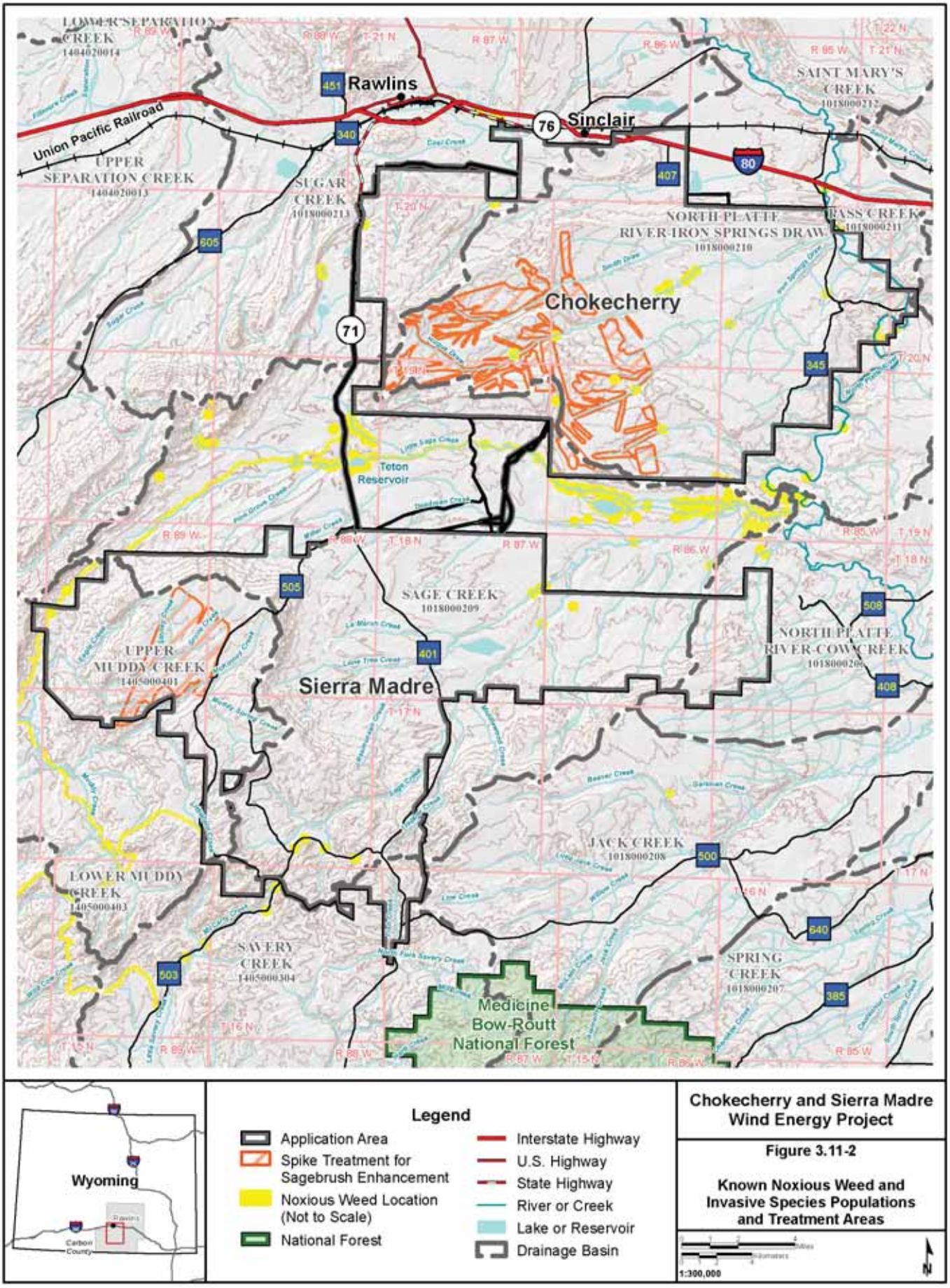
Vegetation Community	Chokecherry Site	Sierra Madre Site	Off-site	Application Area Total[1]
Mixed Shrub/Wetland	–	80	–	80
Mountain Big Sagebrush	42,254	64,360	268	106,881
Mountain Big Sagebrush/Bird's Foot Sagebrush	–	259	–	259
Mountain Big Sagebrush/Black Sagebrush	–	2,920	–	2,920
Plains Cottonwood	–	3	–	3
Rabbitbrush	9	–	–	9
Riparian	450	2,597	8	3,056
Riparian/Grassland	–	61	–	61
Riparian/Greasewood	415	514	–	929
Riparian/Greasewood/Wyoming Big Sagebrush	–	118	–	118
Riparian/Mountain Big Sagebrush	–	27	–	27
Riparian/Plains Cottonwood	49	–	–	49
Riparian/Willow	–	142	–	142
Riparian/Wyoming Big Sagebrush	36	–	–	36
Ruderal/Disturbed	86	–	–	86
Saltbush	2,605	12,786	355	15,747
Saltbush/Bird's Foot Sagebrush	1,444	2,502	–	3,947
Saltbush/Goldenweed	–	847	–	847
Saltbush/Mountain Big Sagebrush	1,452	361	13	1,826
Saltbush/Mountain Big Sagebrush/Spiny Horsebrush	–	92	–	92
Saltbush/Spiny Horsebrush	–	488	4	492
Saltbush/Wyoming Big Sagebrush	29	1,311	364	1,705
Serviceberry	–	34	–	34

Table 3.11-1 Vegetation Cover Types in the Application Area

Vegetation Community	Chokecherry Site	Sierra Madre Site	Off-site	Application Area Total[1]
Steep/Rocky	3,963	182	–	4,145
Steep/Rocky/Mountain Big Sagebrush	253	471	–	724
Steep/Rocky/Wyoming Big Sagebrush	–	49	–	49
Tamarisk	–	174	–	174
Utah Juniper	43	–	–	43
Water	1	237	–	239
Wet Meadow	281	688	–	969
Wetland	–	92	–	92
Wild Rye	65	–	—	65
Willow	–	108	—	108
Wyoming Big Sagebrush	24,674	12,450	378	37,503
Wyoming Big Sagebrush/Rabbitbrush	–	345	–	345

[1]Total discrepancies due to rounding.

Sources: AECOM 2009; PCW 2008b.



Chokecherry and Sierra Madre Wind Energy Project

Figure 3.11-2

Known Noxious Weed and Invasive Species Populations and Treatment Areas

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- Green needlegrass (*Stipa viridula*);
- Oniongrass (*Melica bulbosa*);
- Idaho fescue (*Festuca idahoensis*); and
- Spike fescue (*Leucopoa kingii*).

Common shrubs in this cover type include:

- Rubber rabbitbrush (*Ericameria nauseosa*);
- Bitterbrush (*Purshia tridentata*);
- Snowberry (*Symphoricarpos oreophilus*); and
- Serviceberry (*Amelanchier alnifolia*).

Field reconnaissance was conducted in October and November 2008 after herbaceous flowering plants had senesced for the year, making identification very difficult. An additional visit was conducted in July 2009, but the purpose was only to supplement the data to cover the expanded Application Area. The common herbaceous species that may be found in this cover type include:

- Bluebells (*Mertensia* spp.);
- Indian paintbrush (*Castilleja* spp.);
- Sego lily (*Calochortus nuttallianum*);
- False dandelion (*Agoseris glauca*);
- Locoweed (*Astragalus* spp.);
- Buttercup (*Ranunculus* spp.);
- Wild onion (*Allium* spp.);
- Beardtongue (*Penstemon* spp.);
- Grounsel (*Senecio* spp.);
- Phlox (*Phlox hoodii*);
- Sulfur flower (*Eriogonum umbellatum*);
- Geranium (*Geranium richardsonii*);
- Silky lupine (*Lupinus sericeus*); and
- Arrowleaf balsamroot (*Balsamorhiza sagittata*).

3.11.1.2 Saltbush

Saltbush (*Atriplex* spp.) was the second most prevalent vegetative cover type in the Application Area with a total of approximately 24,985 acres (**Table 3.11-1**). This cover type was dominated by Gardner's saltbush and shadscale. Gardner's saltbush is a subshrub, which is woody at its base and seldom grows higher than 4 decimeters (15.75 inches). It grows on alkaline soils of barren plains and hills. Gardner's saltbush in the Application Area was very diminutive at most sites. Shadscale is a relatively compact spiny shrub, also tending to grow in alkaline soils on plains and hills. Shadscale normally grows in dense clumps and ranges from 1 to 3 feet in height (USFS 1988). It is an important forage species for livestock. The total estimated acreage of saltbush-dominated land cover type was 24,985 acres. The saltbush cover type was divided among eight cover subtypes. These subtypes included saltbush (15,747 acres); saltbush/bird's foot sagebrush (3,947 acres); saltbush/mountain big sagebrush (1,826 acres); saltbush/goldenweed (847 acres); saltbush/mountain big sagebrush/spiny horsebrush (92 acres);

saltbush/spiny horsebrush (492 acres); grassland/saltbush (329 acres); and saltbush/Wyoming big sagebrush (1,705 acres).

Species common to saltbush communities include:

- Sandberg bluegrass;
- Indian ricegrass;
- Bottlebrush squirreltail;
- Western wheatgrass;
- Phlox;
- Biscuitroot (*Lomatium* spp.);
- Wild onion;
- Winterfat (*Krascheninnikovia lanata*); and
- Birdsfoot sagebrush (*Artemisia pedatifida*).

3.11.1.3 Greasewood

Greasewood was the third most prevalent cover type in the Application Area, with a total of approximately 10,120 acres of cover (**Table 3.11-1**). Of these 10,120 acres, six cover subtypes were mapped. These subtypes included greasewood (4,065 acres), greasewood/mountain big sagebrush (943 acres), greasewood/Wyoming big sagebrush (4,512 acres), greasewood/saltbush (481 acres), greasewood/grassland (85 acres), and greasewood/basin big sagebrush (34 acres). Greasewood is a spine-tipped shrub growing up to 10 feet in height. Reconnaissance of the Application Area revealed most greasewood to exhibit a shorter stature (3 to 5 feet). This shrub was found along many of the ephemeral and intermittent drainages and clay flats in the Application Area. It is capable of growing on alkaline soils.

Shrub species common in greasewood communities include:

- Basin big sagebrush;
- Mountain big sagebrush;
- Shadscale; and
- Gardner's saltbush.

Grasses and forbs commonly found in the greasewood cover type:

- Basin wildrye (*Elymus cinereus*);
- Western wheatgrass;
- Sandberg bluegrass;
- Bottlebrush squirreltail;
- Inland saltgrass (*Distichlis sticta*);
- Biscuitroot; and
- Wild onion.

3.11.1.4 Wyoming Big Sagebrush

Wyoming big sagebrush was the fourth most dominant cover type within the Application Area. The 49,735 acres of Wyoming big sagebrush is comprised of five subtypes, including Wyoming big sagebrush (37,503 acres); Wyoming big sagebrush/rabbitbrush (345 acres); bird's foot sagebrush/Wyoming big sagebrush (1,759 acres); grassland/Wyoming big sagebrush (10,079 acres); and steep/rocky/Wyoming big sagebrush (49 acres). Wyoming big sagebrush is a variety of big sagebrush and is closely related to mountain big sagebrush. Wyoming big sagebrush overlaps in range and elevation with basin big sagebrush. Plants are considerably smaller than those of basin big sagebrush, usually less than 0.9 m tall, and have main stems branching from the ground. Flowering stems are not as widely branching as those of the basin variety, but otherwise closely resemble that subspecies. Leaves are typically shorter, from 1 to 1.5 cm long, and flabelliform (NRCS undated). The range of mountain big sagebrush and Wyoming big sagebrush overlap and are known to hybridize with each other. For the purposes of mapping the vegetation communities, Wyoming big sagebrush was mapped below 7,000 feet in elevation.

Common understory species may include:

- Douglas rabbitbrush (*Chrysothamnus viscidiflorus*);
- Rubber rabbitbrush;
- Winterfat;
- Cotton horsebrush (*Tetradymia canescens*);
- Prickly pear cactus (*Opuntia polyacantha*); and
- Broom snakeweed (*Gutierrezia sarothrae*).

Common grasses and sedge species include:

- Western wheatgrass;
- Thickspike wheatgrass;
- Sandberg bluegrass;
- Bottlebrush squirreltail;
- Needle-and-thread;
- Indian ricegrass; and
- Threadleaf sedge (Carex *filifolia*).

Forbs common to this cover type include:

- Hood’s phlox (*Phlox hoodii*);
- Hooker sandwort (*Arenaria hookeri*);
- Low buckwheat (*Eriognum ovalifolium*);
- Spring parsley (*Cymopterus acaulis*);
- Locoweed;
- Goldenweed (*Stenotus* spp.);
- Hollyleaf clover (*Trifolium gymnocarpum*);

- Wild onion; and
- Beardtongue.

3.11.1.5 Aspen

Aspen is a widely distributed pioneer tree species. It forms dense, pure stands with trees averaging 20 to 50 feet in height. It tends to grow at elevations ranging between 6,000 and 11,000 feet. Aspens grow on rich, moist, loamy soil, but may occupy sites that are substantially wetter or even dry and gravelly (USFS 1988). Aspen reproduces vegetatively by way of horizontal rhizomes. Aspen is limited to the Sierra Madre Application Area for a total estimated acreage of approximately 7,166 acres (**Table 3.11-1**). It was documented to occur in relatively small stands, distributed on north and east facing slopes below escarpments in the Sierra Madre area.

Aspen stands have a typical understory with several shrub species including:

- Snowberry;
- Serviceberry;
- Common juniper (*Juniperus communis*); and
- Scouler's willow (*Salix scoulerianna*).

The common grasses and forbs in aspen cover type are:

- Mountain brome (*Bromus marginatus*);
- Blue wildrye (*Elymus glaucus*);
- Kentucky bluegrass (*Poa pratensis*);
- Columbine (*Aquilegia* spp.);
- Waterleaf (*Hydrophyllum* spp.);
- Bluebells;
- Wild licorice (*Glycyrrhiza lepidota*);
- Bedstraw (*Gallium* spp.);
- Heartleaf arnica (*Arnica* spp.);
- Fairybells (*Disporum* spp.);
- Solomon's seal (*Polygonatum biflorum*);
- Yampa (*Perideria* spp.); and
- Sweet cicely (*Osmorhiza* spp.).

3.11.1.6 Riparian/Wetlands

The riparian/wetland cover type includes riparian vegetation, wetlands, and wet meadows in the Application Area. The wetlands and wet meadows are restricted to the Sierra Madre area and the haul road/transmission line corridors. The Chokecherry area does have some riparian development, but there is more riparian cover in the Sierra Madre area. The Application Area includes 5,708 acres of riparian and wetland cover types. These riparian and wetland cover types include the following cover sub-types: 3,056 acres of riparian cover; 929 acres of riparian/greasewood; 61 acres of riparian grassland; 969 acres of wet meadow; 118 acres of riparian/greasewood/Wyoming big sagebrush;142 acres of riparian/willow; 92 acres of wetland; 49 acres of riparian/plains cottonwood; 108 acres of willow; 38 acres of grassland/plains cottonwood; 36 acres of riparian/Wyoming big sagebrush; 3 acres of plains

cottonwood; 80 acres of mixed shrub/wetland; and 27 acres of riparian/mountain big sagebrush (**Table 3.11-1**).

Shrub species common to this cover type include:

- Shrubby cinquefoil (*Pentaphylloides floribunda*);
- Coyote willow (*Salix exigua*);
- Yellow willow (*Salix lutea*);
- Bebb's willow (*Salix bebbiana*) (limited to the Sage Creek area);
- Geier's willow (*Salix geyeriana*) (limited to the Sierra Madre area);
- River birch (*Betula occidentalis*);
- Wild rose (*Rosa woodsii*); and
- Golden currant (*Ribes aureum*).

The grass and grass-like species that may be found in the riparian/wetland cover type include the following species:

- Kentucky bluegrass;
- Inland saltgrass;
- Bentgrass (*Agrostis alba* and *Agrostis stolonifera*);
- Slender wheatgrass (E*lymus trachycaulus*);
- Meadow barley (*Hordeum brachyantherum*);
- Baltic rush (*Juncus balticus*);
- Spikerush (*Eleocharis palustris*);
- Tufted hairgrass (*Deschampsia cespitosa*);
- Northern reedgrass (*Calamagrostis inexpansa*);
- Common reed (*Phragmites communis*);
- Nebraska sedge (*Carex nebrascensis*);
- Beaked sedge (*Carex utriculata*);
- American bulrush (*Scirpus americanus*); and
- Pondweed (*Potamogeton* sp.).

The common forbs in this cover type may include:

- Aster species;
- Locoweed;
- Goldenrod (*Solidago canadensis*);
- Wild licorice;
- Prickly lettuce (*Lactuca seriola*);
- Field mint (*Mentha arvensis*);
- Willowherb (*Epilobium glandulosum*);

- Plantain (*Plantago eriopoda*); and
- Strawberry potentilla (*Potentilla anserina*).

3.11.1.7 Minor Vegetation Cover Types

Minor cover types were found scattered throughout the Application Area. These cover types included basin big sagebrush (464 acres); black sagebrush (370 acres); grassland (various species) (594 acres); limber pine (300 acres); mixed shrub (various species) (2,375 acres); rabbitbrush (9 acres); Utah juniper (*Juniperus osteosperma*) (43 acres); tamarisk (174 acres); wildrye (65 acres); and ruderal/disturbed (88 acres). The estimated acreages of these vegetation cover types for the Application Area are listed in **Table 3.11-1**.

In addition to the minor cover types, the vegetation mapping efforts also documented approximately 310 acres of developed lands, 239 acres of water, and 4,145 acres of steep/rocky terrain with no dominant vegetation designated (**Table 3.11-1**), and 16 acres of alkali flats.

3.11.1.8 Cushion Plant Communities

The term cushion plant is described in Jones (2005) as “short, often sparse vegetation on rims and outcrops formed in resistant bedrock, where cushion plants contribute a major proportion of the plant canopy cover.” The studies performed by Jones did not occur directly in the Application Area, but both Chokecherry and Sierra Madre areas have extensive landforms favorable for cushion plant community development similar to the Jones’ (2005) study area. The Chokecherry area features very steep escarpments, many rolling hill landforms, and near-surface bedrock. The Sierra Madre area has fewer exposed bedrock features than Chokecherry, but there is extensive rim features on the north and east portion of the Sierra Madre area. These windswept locations are naturally inhabited by plants with a growth form that prevents desiccation from water loss. Jones (2005) found that only a handful of individual plant taxa are found exclusively on rims and rocky outcrops. Cushion plants contributed over twice the proportion of cover on rims and outcrops as they did on sample plots in nearby shrub steppe vegetation cover. Grasses and shrubs tend to provide more cover further away from rims and outcrops features.

The most common species found in cushion plant communities of south-central Wyoming by Jones (2005) include:

- Goldenweed (*Stenotus acaulis*);
- Goldenweed (*Stenotus armerioides*);
- Bluebunch wheatgrass (*Elymus spicatus*);
- Hooker sandwort (*Arenaria hookeri*);
- Phlox (*Phlox muscoides*);
- *Tetraneuris acaulis*;
- Milkvetch (*Astragalus spatulatus*); and
- Milkvetch (*Astragalus simplicifolius*).

Jones (2005) also that vehicle tire tracks and mammal burrows were commonly found at study sites on rims; however, weed invasion was not an observed outcome of this disturbance.

Cushion plant communities are important communities because they are specifically adapted to the extremely harsh environments of these rim features with shallow soils and are exposed to harsh winds and low moisture. These communities are considered to be difficult to restore and no examples of

successful restoration of these communities in the area are known. Commercial seed sources for the cushion communities are not readily available.

3.11.2 Wildlife Habitat Management Areas

The Application Area contains portions of two separately designated WHMAs: the Red Rim-Grizzly WHMA and the Upper Muddy Creek Watershed/Grizzly WHMA. The two areas are managed with specific goals and objectives for vegetation communities and wildlife species habitat that are different than the remainder of the Application Area. The overlapping areas of these WHMAs with the Applications primarily contain mountain big sagebrush and basin big sagebrush vegetation cover types. In addition, a minor vegetation cover type, wet meadow (2.4 acres or <1% of the area of interest) is associated with Muddy Spring Creek within both WHMAs. Within the Application Area, the Red Rim-Grizzly WHMA consists of 7,366 acres; the Upper Muddy Creek Watershed/Grizzly WHMA consists of 15,443 acres, totaling 22,809 acres.

3.11.3 Noxious Weeds and Invasive Species

EO 13112, signed by President Clinton in 1999, established a mechanism to prevent the introduction of invasive species; provide for their control; and minimizes the economic, ecological, and human health impacts that invasive species cause. These weeds are primarily spread through roads, waterways, animals, and soil disturbing activities. Weeds are difficult to control unless there is regional land management cooperation such as federal, state, county, and private groups. The Carlson-Foley Act (P.L. 90-583) as well as state law holds the federal government responsible for controlling invasive and designated noxious weeds on public land and provide direction on their control.

Noxious and invasive weeds are a continuing threat to the biological diversity and integrity of native ecosystems. Noxious and invasive weed presence can result in the loss of productive rangeland, loss of wildlife habitat, increased soil erosion, decreased biological diversity, and an increased risk of fire. Noxious weed individuals and populations, as compiled from known populations and vegetation mapping efforts by the BLM and AECOM, are illustrated in **Figure 3.11-2**. Most of the weed populations are associated with drainages, water features, and disturbed areas, with highest concentrations occurring along Little Sage Creek and Sage Creek, and extending from west of CCR 401 (Sage Creek Road) to the North Platte River and downriver to Fort Steele. Detailed noxious weed mapping would be performed immediately prior to construction within project disturbance areas. The BLM and the TOTCO (as well as the previous ranch owners) have cooperatively participated in weed control since 1999, and conducted an experimental weed burn in June 2003 (Newberry 2010a). The weed burn occurred on Little Sage Creek to remove thick overstory vegetation to better find and treat perennial pepperweed and Russian knapweed.

Weeds in the Chokecherry area were primarily observed in disturbed areas, within drainages, and water impoundments. The Sierra Madre area is relatively free of noxious and invasive weeds. In addition to the weeds within the Application Area, it is important to note populations of weeds in other adjacent areas since these populations provide the most likely sources for potential infestation. The most common weeds occur within the Sage Creek Basin and Bolten sub-regions and include halogeton, whitetop, perennial pepperweed, Russian knapweed, cheatgrass, leafy spurge, and Canada thistle. Cheatgrass is found locally throughout the TOTCO, but does have a tendency to be found in the sandier soils. Less common weeds include sowthistle, black henbane, Russian thistle, poverty weed, and saltcedar. A description of recorded weed occurrences found in and adjacent to the Application Area is provided below and are listed from north to south.

<u>Chokecherry Portion of the Application Area and Vicinity</u>

- Numerous Russian knapweed sightings near the UPRR just east of Rawlins.
- Perennial pepperweed is prevalent throughout Sugar Creek.

- The pipeline easement and associated access roads south of the Greenville Dome contain a number of pipeline disturbances with annual weeds including halogeton, cheatgrass, and Russian thistle.
- Cheatgrass, alyssum, and tumble mustard are recorded throughout Chokecherry, mostly on the sandier soils.
- Along the North Platte River, there are several large patches of sow thistle, Russian knapweed, Canada thistle, whitetop, and leafy spurge.
- There is Russian olive and saltcedar scattered along the North Platte River upstream (south) of the I-80 bridge.
- Along Pass Creek, near the gravel pit, there is Russian olive and Russian knapweed.
- Hugus Draw has whitetop scattered throughout, but its heaviest occurrence is the middle section.
- Iron Spring Draw contains Russian knapweed and common whitetop.

Sierra Madre Portion of the Application Area and Vicinity

- Common whitetop occurs along Rasmussen Creek.
- Russian knapweed, whitetop, and Canada thistle occur along Sage Creek east of Sage Creek Road.
- Canada thistle occurs along perennial drainages and roadsides throughout the area.
- Cheatgrass occurs sporadically along the main roads and soil disturbances throughout the area.
- Rasmussen Reservoir, near the confluence of Lone Tree Creek and Rasmussen Creek, has a large stand of saltcedar surrounding its banks.

Other Adjacent Areas

- There is halogeton along the main ranch road and roads in the south central portion of Chokecherry and the natural gas development.
- Starting at Beckman Canyon at the base of Atlantic Rim, Little Sage Creek has numerous occurrences of musk thistle, common whitetop, and Russian thistle. Near Little Sage Reservoir, perennial pepperweed and sowthistle occur to WY 71 (Sage Creek Road). The area surrounding Teton Reservoir contains large patches of saltcedar and perennial pepperweed.
- Perennial pepperweed extends along Little Sage Creek from Teton Reservoir to the confluence with Sage Creek. Numerous occurrences of Russian knapweed also occur along this area.
- Kindt Reservoir is surrounded by large populations of perennial pepperweed, Russian knapweed, saltcedar, and Canada thistle.
- Around the ranch buildings and hay meadows, there are several large patches of Russian knapweed, whitetop, and perennial pepperweed.
- Russian knapweed also extends from these large patches along the ranch roads in all directions.
- Numerous occurrences of leafy spurge, whitetop, Russian knapweed, sowthistle, and Canada thistle have been documented along the North Platte River.
- There also is Russian olive and saltcedar scattered along the North Platte River.

Some of these weed species require soil disturbance to become established, while other species do not. The weeds appear to be mostly spread through soil moving activities such as pipeline and road construction, surface flows, grazing, and road corridors in the Chokecherry site and other adjacent areas.

However, the county road and ranch roads in Sierra Madre do not appear to have the same amount of weed influence as Chokecherry.

The 2008 Rawlins RMP (BLM 2008a) states that the BLM's primary focus is treatment of noxious weeds. The secondary priority is controlling invasive species such as halogeton, henbane, and cheatgrass through management of grazing, wildlife, and human activities. In areas infested with invasive and noxious weeds, surface disturbing activities such as roads and pipeline construction are increasing their opportunity to spread at a higher rate. Species such as halogeton can accumulate selenium from the soil that when ingested by livestock and sheep can create a cumulative poisoning at certain thresholds. Selenium poisoning also is known as "alkali disease" and "blind staggering." Halogeton has been observed along the pipeline construction ROWs at the north side of the Chokecherry area.

3.11.4 Wetlands and Riparian Zones

Wetlands and associated riparian zones are a rare and unique habitat type in Wyoming's semi-arid environment and the general project vicinity. In general, they provide a multitude of ecological, economic, and social benefits including habitat for fish, wildlife, and a variety of plants. They also can serve as nurseries for many fish of commercial and recreational importance. Wetlands are important landscape features because they hold and slowly release flood water and snow melt, recharge groundwater, act as filters to cleanse water of impurities, recycle nutrients, and provide recreation and wildlife viewing opportunities.

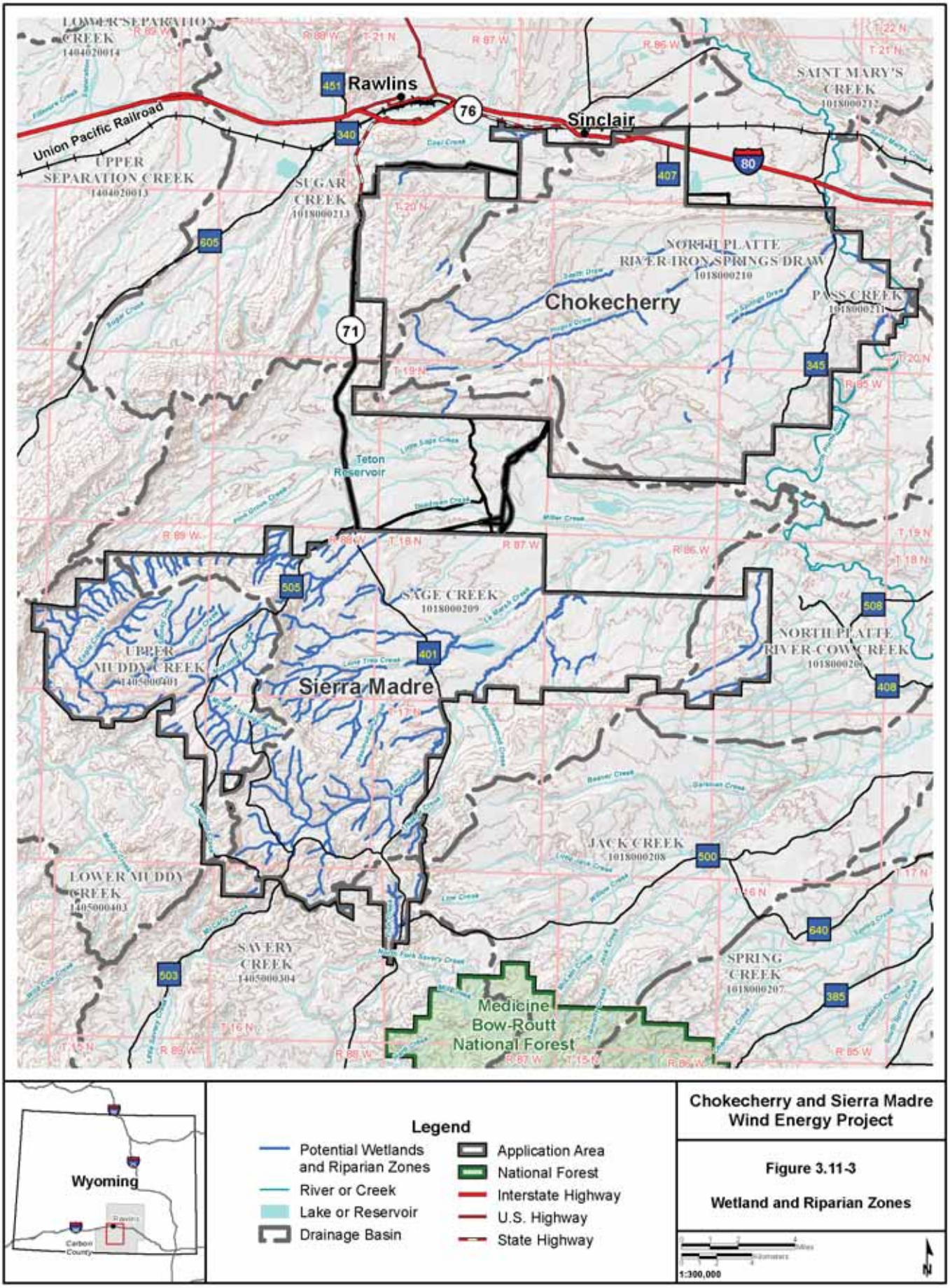
The importance of wetlands has long been recognized and is protected by national and BLM legal and regulatory guidelines, including:

- Section 404 of the CWA requires the USACE issue permits for placement of dredged or fill material in, or excavation of, waters of the U.S. and their adjacent wetlands;
- EO 11990, Protection of Wetlands, requires federal agencies to take action to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands;
- EO 11988, Floodplain Management, provides for the restoration and preservation of natural and beneficial floodplain values, and enhancement of the natural and beneficial values of wetlands in carrying out programs affecting land use (most 100-year floodplains within the Application Area likely would occur within 500 feet of perennial waters and within 100 feet of ephemeral drainages); and
- The 2008 Rawlins RMP stipulates that no surface disturbance may occur within 500 feet of surface water or riparian areas (BLM 2008a, 2008 Rawlins RMP, pg. 2-99).

The analysis area for the assessment of impacts to wetlands and associated riparian zones is the Application Area. Wetlands and associated riparian zones were determined by mapping those drainages that likely contain wetlands and riparian zones. These drainages were based on National Hydrography Dataset (NHD) and classified by AECOM, in consultation with the BLM, using a combination of existing field knowledge and aerial photographs (PCW 2008b). Since many of these wetlands and associated riparian zones are linear and narrow in nature, they were too small to be mapped by the vegetation community mapping. This data only identifies the length of the drainages these features are associated with and does not account for the spatial extent of the wetlands and riparian zones. The National Wetland Inventory (USFWS 2008d) identifies six wetland types that occur in the analysis area: freshwater emergent wetland, freshwater forested/shrub wetland, freshwater pond, lake, riverine, and other; however, the National Wetlands Inventory (NWI) mapping was determined to be incomplete for the Application Area.

A total of 316 miles of perennial, ephemeral, and ephemeral/riparian drainages have been identified within the Application Area, of which 52 miles are within the Chokecherry portion of the Application Area;

263 miles are within the Sierra Madre portion of the Application Area; and 1 mile is associated with the haul road/transmission line corridors (**Figure 3.11-3**). Of those mapped drainages in the Application Area, 130 miles of these wetland and riparian drainages are on BLM land, of which 17 miles are in Chokecherry; 113 miles are in Sierra Madre; and less than 1 mile is associated with the haul road/transmission line corridors. Drainages in the Chokecherry Application Area include Hugus Draw, Iron Spring Draw, Little Sage Creek, North Platte River, Smith Draw, Pass Creek, Sugar Creek, and a number of unnamed drainages. The Sierra Madre Application Area includes Deadman Creek, Eagle Creek, Fish Creek, Grove Creek, La Marsh Creek, McKinney Creek, Middlewood Creek, Miller Spring, Muddy Spring Creek, North Fork Savory Creek, Pine Grove Creek, Rasmussen Creek, Sage Creek, Stone Creek, Trapper Creek, and many unnamed drainages.



Chokecherry and Sierra Madre Wind Energy Project

Figure 3.11-3

Wetland and Riparian Zones

3.12 Visual Resources

This section describes the visual resource setting, including user sensitivity, scenic quality, and the visibility of the Application Area that may be affected.

3.12.1 Analysis Area

The BLM VRM system divides landscapes into three distance zones based on relative visibility from travel routes or observation points:

- Foreground-middle ground: Areas seen from viewing locations that are up to 5 miles away;
- Background: Areas seen beyond the 5-mile foreground-middle ground zone to 15 miles away; and
- Seldom seen: Areas visible beyond 15 miles or not visible in the foreground-middleground or background zones.

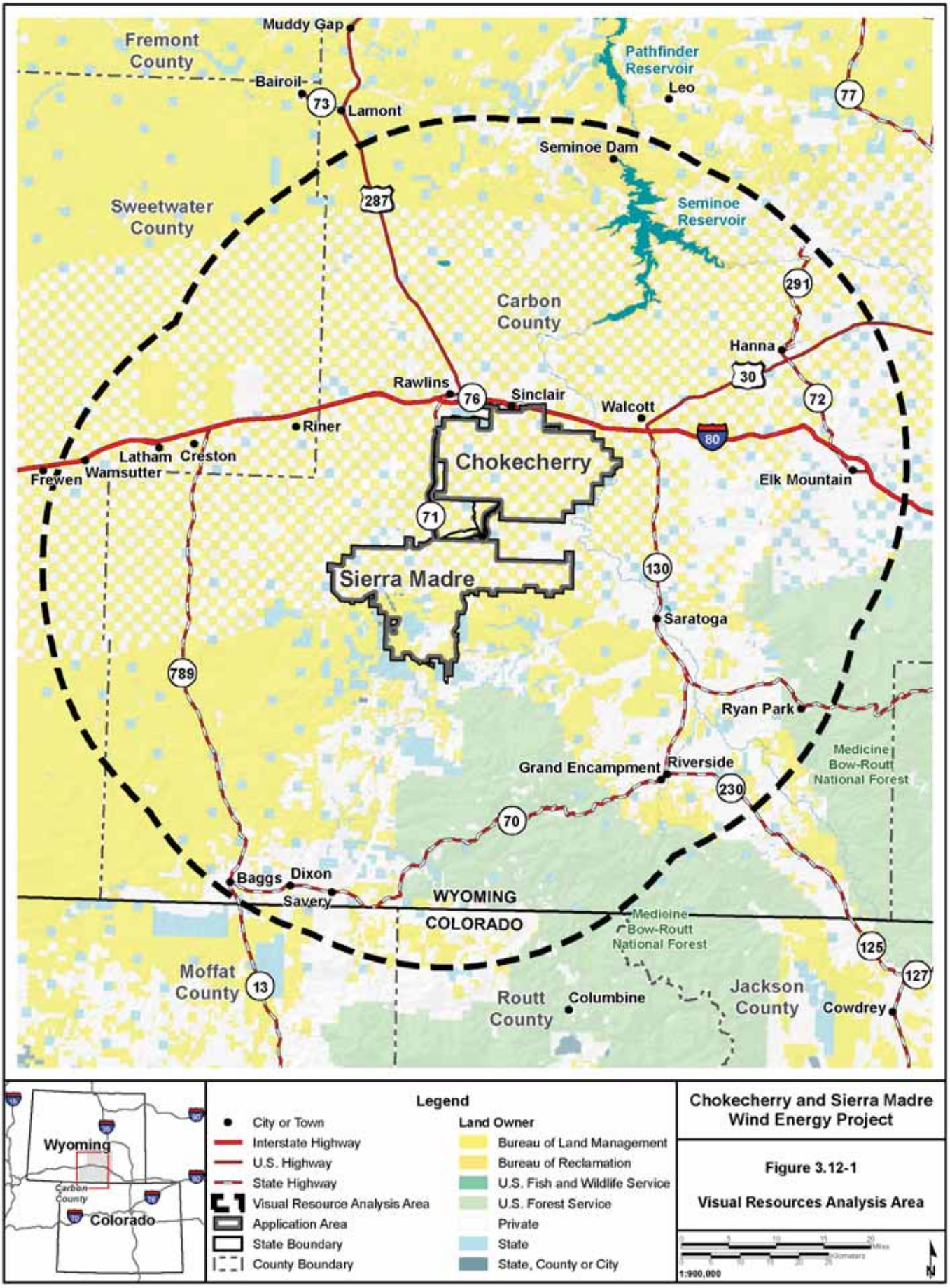
As WTGs are visible at great distances, the visual resources analysis area consists of the visible areas (or viewsheds) of all proposed project facilities, from the Application Area to beyond the background distance zone (approximately 30 miles), as shown in **Figure 3.12-1**. At 30 miles, the motion of a WTG is generally not discernible although project facilities and night lighting are generally still identifiable (AECOM 2011).

3.12.2 BLM Visual Resources Management

The BLM's VRM system provides a way to inventory and evaluate the scenic value of an area's visual resources in order to determine appropriate levels of management (BLM 1986a,b). The visual resources of the Application Area and the surrounding regions within the background distance zone of 30 miles were inventoried using the BLM VRI process in 2010 (Otak, Inc. 2011). The VRI consists of a sensitivity level analysis, scenic quality evaluation, and a delineation of distance zones. Based on these three factors, public lands are placed into one of four VRI classes that represent the relative value of the visual resources. Classes I and II are the most valued, Class III represents a moderate value, and Class IV is of the least value. Inventory classes are informational in nature and provide the basis for considering visual values in the development of management alternatives, or VRM classes. The inventoried sensitivity levels, scenic quality, and visibility and distance zones are described in Section 3.12.3.

VRM classes determine the degree of acceptable visual change within a characteristic landscape. The system also provides a way to analyze potential visual impacts and apply visual design techniques to ensure that surface-disturbing activities are harmonized with their surroundings or are appropriate with the surrounding landscape (BLM 1986b). VRM classes are only applicable to BLM managed lands, not to other public, state, or private lands.

VRM classes in the Application Area are established through Volume 1, which describes the 2008 Rawlins RMP amendment process to development VRM Alternatives and a Preferred VRM Alternative developed from the VRI, among other management considerations. The VRM classes under Alternative 1R apply in the event the Preferred Alternative under the Draft 2008 Rawlins RMP Amendment is adopted. As shown in **Figure 3.12-2**, the majority of the Chokecherry site is managed for VRM Class IV and the Sierra Madre site is managed for VRM Classes III and IV. Small portions of the Application Area, namely the North Platte River Corridor and lands near the Medicine Bow-Routt National Forest, are managed for VRM Class II. **Table 3.12-1** lists the management objectives of the applicable VRM classes.



Chokecherry and Sierra Madre Wind Energy Project

Figure 3.12-1

Visual Resources Analysis Area

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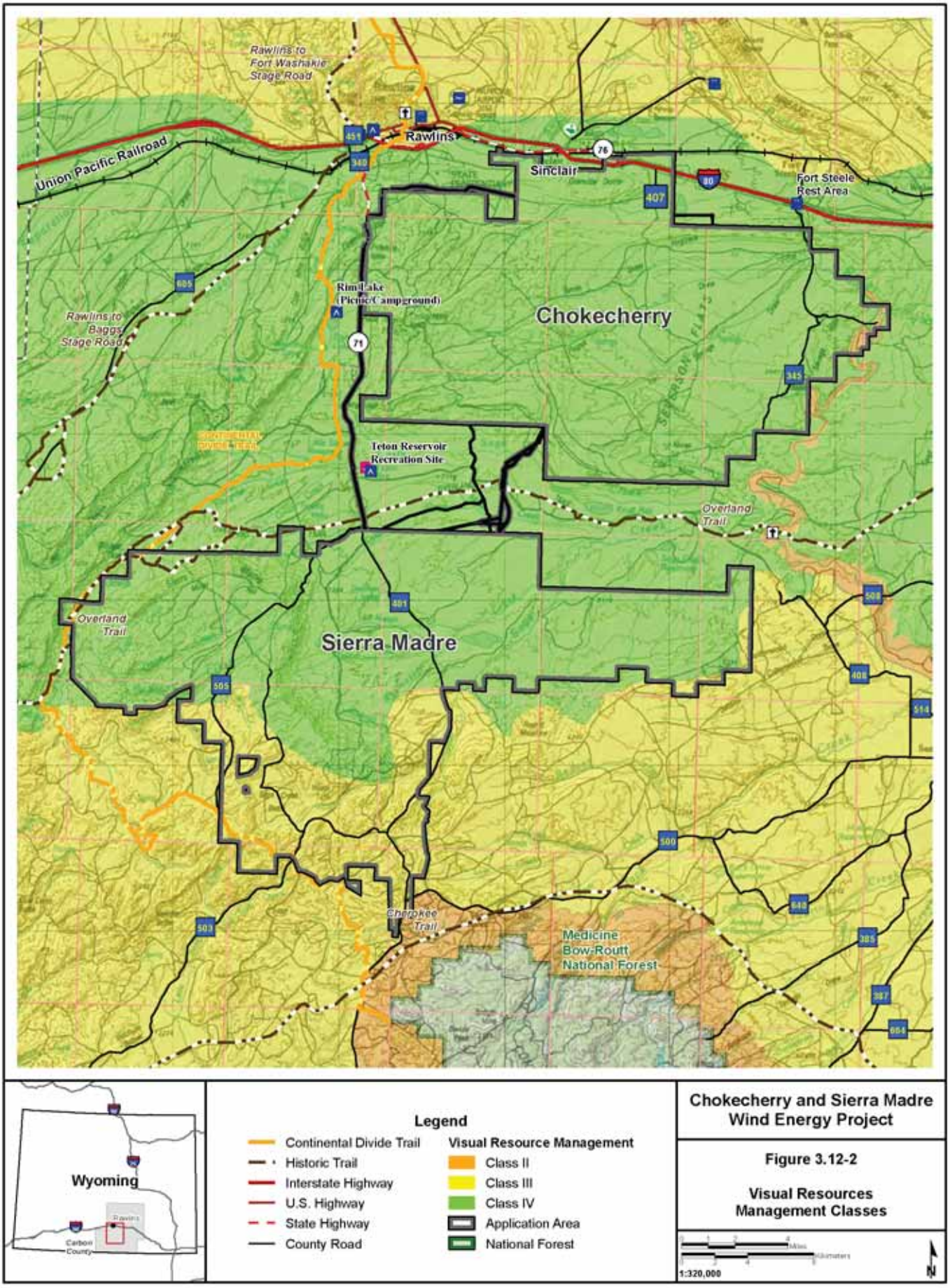

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Table 3.12-1 VRM Classes and Management Objectives

VRM Class	Management Objective
I	Preserves the existing character of the landscape. Provides for natural ecological changes. Does not preclude very limited management activity. Level of change to the characteristic landscape should be very low and must not attract attention.
II	Retains the existing character of the landscape. Management activities may be seen, but should not attract the attention of the casual observer. Level of change to the characteristic landscape should be low. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.
III	Partially retains the existing character of the landscape. Management activities may attract attention, but should not dominate the view of the casual observer. Level of change to the characteristic landscape should be moderate. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.
IV	Provides for management activities that require major modification of the existing character of the landscape. Management activities may dominate the view and be the major focus of viewer attention. Level of change to the characteristic landscape can be high. Every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.

Source: BLM Manual 8431, Visual Resource Contract Rating.

The CDNST is managed in an SRMA. A management objective for the CDNST SRMA stated in the 2008 Rawlins RMP is to comply with the CDNST Management Plan. The 2009 CDNST Plan (USFS 2009) management direction for visual resources states that the visual resource as seen from the trail must be considered in Land and Resource Management Planning, and in specific project planning and design. The 2009 Plan does not specify the level of protection for CDNST visual resources in the Visual Resource guidance section; however, guidance for recreation resources states that the CDNST is to be managed to provide high-quality scenic, primitive hiking and pack and saddle stock opportunities.

3.12.3 Visual Resources Inventory (VRI)

Visual resources within the Application Area are influenced by a wide variety of characteristics including topography, geology, vegetation, and hydrology. Much of the visual experience in the analysis area is dominated by the arid Wyoming western ranch landscape. This is evidenced in many views by the presence of cattle, barbed-wire fences, and dirt roads. There also is often the presence of wildlife in the analysis area including deer, pronghorn, and elk, among others.

3.12.3.1 Sensitivity Levels Analysis

Although landscapes do have common elements that can be measured, there is a subjective dimension to landscape aesthetics. Each viewer brings perceptions formed by individual influences: culture, visual expectations, familiarity with local geography, and personal values. To measure regional and individual attitudes in the evaluation of a landscape, visual sensitivity is determined by considering use volume and user attitude across BLM lands (BLM 1986a,b).

Use volume refers to the frequency of travel through an area (by road, trail, or river). Areas seen and used by large numbers of people are potentially more sensitive. Protection of visual values generally becomes more important as the number of viewers increases.

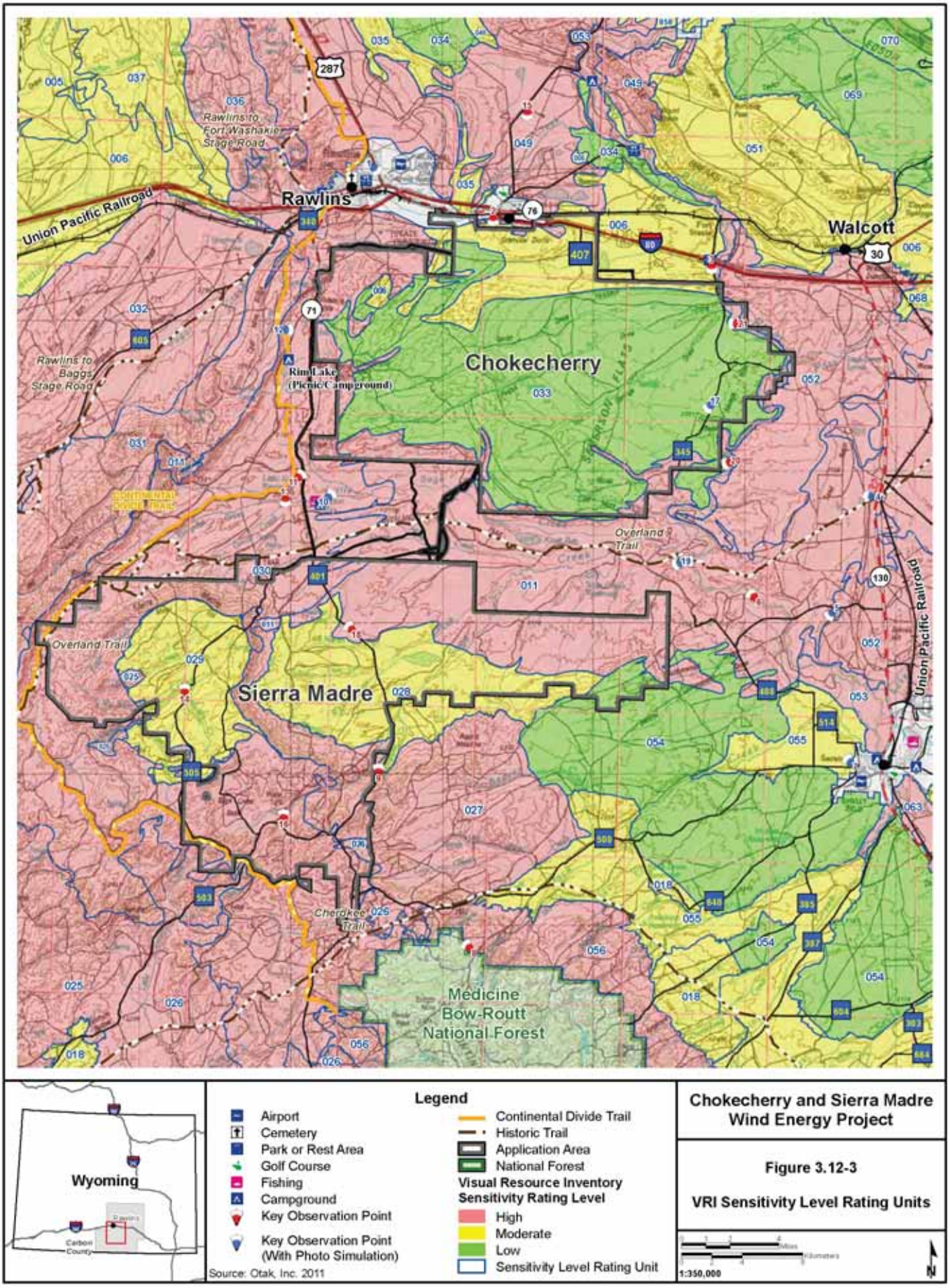
User attitude is a measure of public concern for scenic quality. User attitude is dependent on factors such as the type of users, public interest, and adjacent land uses. For example, recreational users, especially those who are attracted to an area by its scenic quality and intact landscape character, tend to be highly sensitive to changes in visual quality. Conversely, those who pass through an area on their way to work may not be as sensitive to change. User attitude also is dependent on the level of public interest associated with the Application Area. The visual quality of an area may be of concern to local, state, or national groups. Public controversy created in response to proposed activities that would change the landscape character should be considered. Lastly, user attitude can be dependent on adjacent land uses. The interrelationship with land uses in adjacent lands can affect the visual sensitivity of an area. For example, an area within the viewshed of a developed recreation area may be very sensitive, whereas an area surrounded by commercially developed lands may not be as visually sensitive.

Visual resources in the Application Area are often associated with recreational opportunities, as discussed in Section 3.7. Lands acknowledged in the 2008 Rawlins RMP for their visual sensitivity include the CDNST SRMA, the North Platte SRMA, cultural sites, historic trails, eligible wild and scenic river segments, and the Seminoe-to-Alcova Back Country Byway. Many recreational activities, such as backpacking, hunting, fishing, geologic and nature study, photography, and hiking, either depend on natural settings and scenic views or are the primary attraction for recreationists in these areas. The Sierra Madre, North Platte River, and Saratoga areas are recreational destinations and are easily accessible for tourists and other recreationists.

The VRI sensitivity level analysis assigns public lands high, medium, or low ratings by analyzing the various factors that include: 1) type of users; 2) amount of use; 3) public interest; 4) adjacent land uses; 5) management objectives of special areas; and 6) other indicators of sensitivity that may be specific to the region under analysis. Areas inventoried with high sensitivity levels occur in the vicinity of communities, highways, and other public roads that cross through the Application Area, and the viewsheds of special management areas, including the areas described above. The VRI rated the CDNST and the associated 5-mile trail viewshed with a high sensitivity level rating based on the type of users (hikers and equestrians), public interest, and the National Scenic Trail designation (Otak 2011). The majority of the Chokecherry site was found to have low sensitivity; conversely the majority of the Sierra Madre site has high sensitivity, as shown in **Figure 3.12-3** and **Table 3.12-2**.

3.12.3.2 Scenic Quality

Scenic quality is best described as the overall impression retained after traveling through an area. The VRI scenic quality evaluation divides the inventory area into Scenic Quality Rating Units (SQRUs) for rating purposes. Rating areas are delineated on a basis of similar physiographic characteristics that include similar visual patterns, texture, color, variety, and level of development. The key factors in a landscape that affect existing scenic quality are landform, vegetation, water, color, influence of adjacent scenery, scarcity, and cultural modification (BLM 1986a). The VRI assigns a relative scenic quality rating (A [High], B [Moderate], or C [Low]) to each SQRU on BLM lands, scenic quality A being the highest rating as identified in **Table 3.12-3**.



Chokecherry and Sierra Madre Wind Energy Project

Figure 3.12-3

VRI Sensitivity Level Rating Units

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Table 3.12-2 Sensitivity Level Rating Units in the Application Area

Application Area	SLRU Identifier	SLRU Rating Score	Acres in Application Area	Percent of Application Area	SQRU Rating Description
Chokecherry	006	Moderate	13,221	6	Moderate due to high traffic volume. A corridor for transportation, communications, utilities.
	011	High	6,793	3	Overland Trail, most important historic trail in southern Wyoming; high public interest.
	028	Moderate	4	0	Low expectations for visual management due to location in checkerboard land ownership area; contains Overland Trail and portion of Continental Divide National Scenic Trail.
	030	High	8,605	4	Nationally designated scenic trail, high public interest.
	033	Low	77,498	34	Low; public access and knowledge of the area has been limited for the past 35 years.
	049	High	392	0	High concern for scenic quality and visual variety influenced byway designation; high traffic volume, recreational access corridor.
	052	High	576	0	Corridor for tourism; adjacent scenery improves perceived scenic value.
	053	High	1,286	1	Recreational and scenic core of the Saratoga Valley.
	NA	NA	710	0	NA
Sierra Madre	011	High	25,275	11	Most important historic trail in southern Wyoming; high public interest.
	025	High	1,001	0	Major complex of recreational, scenic, and wildlife values. Important recreation area for Rawlins and southern Wyoming.
	026	High	485	0	A complex of values that suggest high visual sensitivity: scenic, recreational, and historic.
	027	High	10,220	4	An area of very high interest to Rawlins area and Wyoming residents.

Table 3.12-2 Sensitivity Level Rating Units in the Application Area

Application Area	SLRU Identifier	SLRU Rating Score	Acres in Application Area	Percent of Application Area	SQRU Rating Description
	028	Moderate	23,900	10	Low expectations for visual management due to location in checkerboard landownership area; contains a portion of the Overland Trail viewshed.
	029	Moderate	16,619	7	Checkerboard ownership inhibits recreational use and access in northern portion. Of high interest to Rawlins area recreationists.
	030	High	38,673	17	Nationally designated scenic trail, high public interest.
	31	High	0	0	High scenic and associated values; public opinion supports maintaining scenic and environmental quality.
	054	Low	2,379	1	Lands lack distinguishing features, visual variety.
Offsite	006	Moderate	81	0	Medium due to high traffic volume. A corridor for transportation, communications, utilities.
	011	High	754	0	Most important historic trail in southern Wyoming; high public interest.
	030	High	595	0	Nationally designated scenic trail, high public interest.
	033	Low	11	0	Low; public access and knowledge of the area has been limited for the past 35 years.

Source: AECOM; Otak, Inc. 2011.

Table 3.12-3 Scenic Quality Rating Units in the Application Area

Application Area	SQRU Number	SQRU Name	SQRU Score	SQRU Rating	Acres in Application Area	Percent of Application Area	SQRU Rating Description
Chokecherry	015	Atlantic Rim	17	B	115	0.05	A dramatic rim with substantial vertical relief. Interesting landforms. An imposing visual presence.
	039	Sage Creek	9	C	526	0.23	A large landscape that lies between Bolton Rim on the north and the foothills of the Sierra Madre Mountains in the south. Low vegetative cover gives the area a light color.
	040	Bolton Ranch	13	B	103,148	45.03	A complex system of rims, ridges, and diagonal slopes. Dramatic banded rock outcrops. High vertical relief.
	044	Separation Flats	10	C	2,725	1.19	A broad, flat area lacking in visual variety. Features are subtle. A strongly horizontal landscape. Structures jut up out of the landscape, have smooth surfaces but are considered coarse in texture.
	070	Walcott	9	C	576	0.25	A vast open landscape with minimal vertical relief and visual variety.
	071	Platte North	16	B	1,286	0.56	Very pleasant and scenic river corridor. Dominant water feature, cottonwood-riparian vegetation and pleasant pastoral setting with adjacent cultivated fields.
	(blank)	(blank)	0	N	710	0.31	(blank)
Sierra Madre	015	Atlantic Rim	17	B	474	0.21	A dramatic rim with substantial vertical relief. Interesting landforms. An imposing visual presence.
	016	Miller Hill	12	B	18,221	7.95	A gentle, rolling landscape with some modest visual variety in terms of landforms and vegetation.
	017	Grizzly Management Area	17	B	8,436	3.68	A landscape with distinct hills and buttes, deep drainages, lush vegetation. Steep slopes, contrast in color, and a distinctly coarser texture than some surrounding lands.
	037	Upper Savery Drainage	14	B	3,309	1.44	A mostly open area with gentle, rolling hills and distinctive drainages. Lush sagebrush/grass vegetation with pockets of aspen, willows, and meadows.
	038	Middlewood Hill	13	B	34,583	15.10	Complex topography: rims and associated steep slopes, drainages, and small perennial and intermittent streams intermingled with sagebrush, grass, patches of aspen, and mixed aspen/conifers. Narrow riparian areas with willows, meadows.
	039	Sage Creek	9	C	53,529	23.37	A large landscape that lies between Bolton Rim on the north and the foothills of the Sierra Madre Mountains in the south. Low vegetative cover gives the area a light color.

Table 3.12-3 Scenic Quality Rating Units in the Application Area

Application Area	SQRU Number	SQRU Name	SQRU Score	SQRU Rating	Acres in Application Area	Percent of Application Area	SQRU Rating Description
Off-site	015	Atlantic Rim	17	B	6	0.00	A dramatic rim with substantial vertical relief. Interesting landforms. An imposing visual presence.
	039	Sage Creek	9	C	1,089	0.48	A large landscape that lies between Bolton Rim on the north and the foothills of the Sierra Madre Mountains in the south. Low vegetative cover gives the area a light color.
	040	Bolton Ranch	13	B	290	0.13	A complex system of rims, ridges, and diagonal slopes. Dramatic banded rock outcrops. High vertical relief.
	044	Separation Flats	10	C	55	0.02	A broad, flat area lacking in visual variety. Features are subtle. A strongly horizontal landscape. Structures jut up out of the landscape, have smooth surfaces but are considered coarse in texture.

Source: AECOM; Otak, Inc. 2011.

Diversity of topography, soils, and climate creates a range of vegetation communities in the analysis area. These communities include aspen, sagebrush, juniper, mountain shrub, saline desert shrub, and riparian/wetlands among others. Some of the vegetation communities within the analysis area are large, homogeneous, continuous, and relatively undisturbed tracts. These include large blocks of continuous grass, sagebrush, and some areas of tree cover, depending on elevation, soils, and water (Section 3.11).

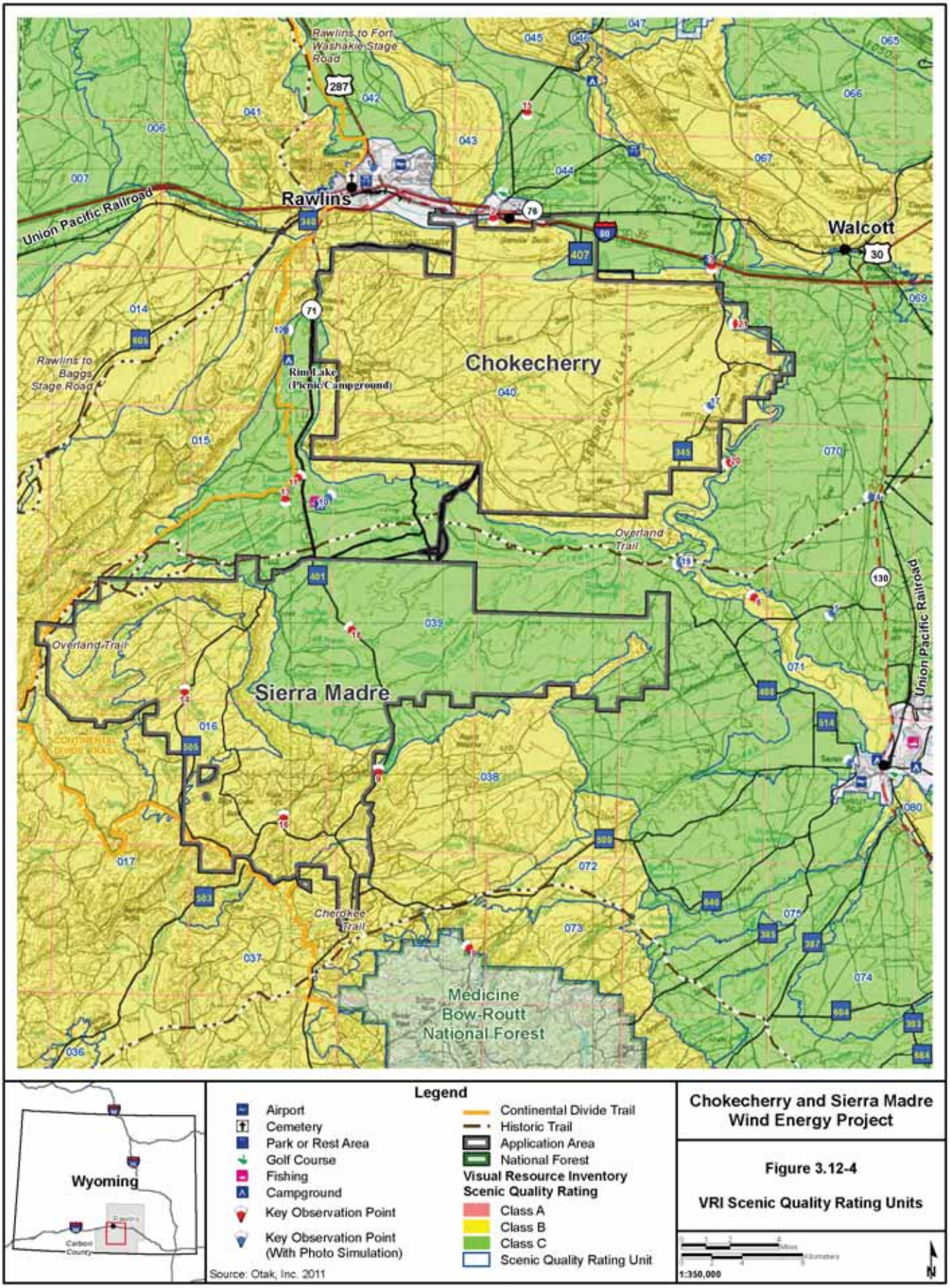
Landforms in the Chokecherry site are characteristic of the Wyoming Basin Physiographic Province, with flat lands, flat topped mesas, tall buttes, and rocky outcrops (Fenneman 1931). This portion of the analysis area is primarily open grasslands and scrub vegetation with limited development, providing wide open spaces with panoramic vistas to the south, east, and west. Industrial development in and around Sinclair and Rawlins, where visible, attracts attention. Development in the Chokecherry site consists primarily of communication structures such as cellular telephone towers and meteorological data gathering towers. Most of these structures are located on Chokecherry Knob at an elevation of approximately 8,131 feet. There also are several private dirt roads in use by TOTCO.

The forms, lines, colors, and textures of the North Platte River and numerous small drainages also dissect the landscape and add diversity and visual appeal to the Chokecherry site. The eastern portion of the Chokecherry site slopes toward the North Platte River, and views of its river bluffs and serpentine riparian canopy attract attention. The eastern valley associated with the North Platte River has a wide flat floor with broad floodplains bordered in some areas by wide belts of flat-topped, steep-sided buttes that rise sharply above the surrounding plains. Views in the warmer months are dominated by scrubby, low-growing gray-green vegetation, distant mountains, and deep blue skies. Views in the colder, winter months are dominated by a gray to brown apparently lifeless foreground with snow packed peaks in the background and clear blue skies. Industrial development in the Sinclair and Rawlins vicinity are the only major sources of night lighting. Often in the winter months, the fore and middle grounds are snow covered, providing a bright, white color dominating the landscape (BLM 1995). The VRI rated the majority of the Chokecherry site as Class B, or moderate scenic quality, as shown in **Figure 3.12-4**.

The Sierra Madre site transitions from the Wyoming Basin Physiographic Province to the Southern Rocky Mountains Physiographic Province. Landforms in the southern Sierra Madre site are more varied and striking in appearance with undulating hills, flat topped mesas, low valleys, and canyon-like slopes in the foreground and middlegrounds, with higher elevation mountain peaks to the south and east in the background. Miller Hill, a semi-circular plateau, is the dominant landform and aspen and conifer stands accentuate its visual interest. The Sierra Madre site is natural and primarily undeveloped, providing wide open spaces with panoramic vistas and scenic views in each direction. Development in this area consists primarily of ranching infrastructure (dirt roads, fences). A limited number of communication and meteorological towers, and a few private structures may be visible at times but do not attract attention. The Rawlins Reservoir and water storage reservoirs are present in the low lying Sage Creek Basin and attract attention against the arid saltbrush vegetation. Views in the warmer months are dominated by, low-growing gray-green vegetation, isolated aspen and conifer stands, distant mountains, and deep blue skies. Views in the colder, winter months are dominated by a green and yellow foreground with snow packed peaks in the background and clear blue skies. There are no major night light sources in the Sierra Madre site. Often in the winter months, the foreground-middleground is snow covered, providing a bright, white color that dominates the landscape (BLM 1995). Greater diversity in landform and vegetation occurs with increasing elevation and on the more rugged terrain of Miller Hill and Sage Creek Flat in the Sierra Madre site, which were rated as Class B, or moderate scenic quality, in the VRI. The remainder of the site was rated as Class C, or low scenic quality, as shown in **Figure 3.12-4**.

3.12.3.3 Visibility and Distance Zones

Field reconnaissance, public and agency scoping, and literature review identified 21 KOPs. KOPs are points on a travel route or at a use area or potential use area where the view of a management activity would be most revealing, and include special landscape features, populated areas, historic points, and



Chokecherry and Sierra Madre Wind Energy Project

Figure 3.12-4

VRI Scenic Quality Rating Units

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recreational trails as shown in **Table 3.12-4** and **Figure 3.12-3**. Existing conditions photography was collected for each KOP using a digital single-lens reflex camera at a 50 millimeter equivalent.

Table 3.12-4 Key Observation Points

KOP #	Location	Heading
1	Rawlins Recreation Center	SE
2	Sinclair I-80 Overpass	S
3	I-80 Fort Steele Rest Stop	S
4	SH 130 at Overland Trail Historical Marker	W
5	Access Road to Pick Bridge Public Access Area	SW
6	Sanger Public Access Area	NW
7	West of Saratoga – CR 500	W
8	Forest Service Road 542 at USFS Boundary	NW
9	CR 71 – Kendt Reservoir Overlook	N
10	Teton Reservoir Campground	NE
11	CDNST towards Chokecherry	NE
12	CDNST above Rim Lake	E
13	CR 3301 – Bridger Pass Road along CDNST	S
14	CR 505 – Edge of VRM II Boundary on Miller Hill	N
15	Seminoe to Alcove Scenic Byway BLM Kiosk	S
16	Access Road – Homes in Sage Creek Basin	N
17	CR 345 SW Savage Hills	SW
18	SH 71 Near La Marsh Creek	NW
19	Overland Trail Crossing North Platte River	SW
20	Cherokee Historic Trail Crossing	SW
21	Rochelle Recreation Area, 3.5 Miles South of Fort Steele	W

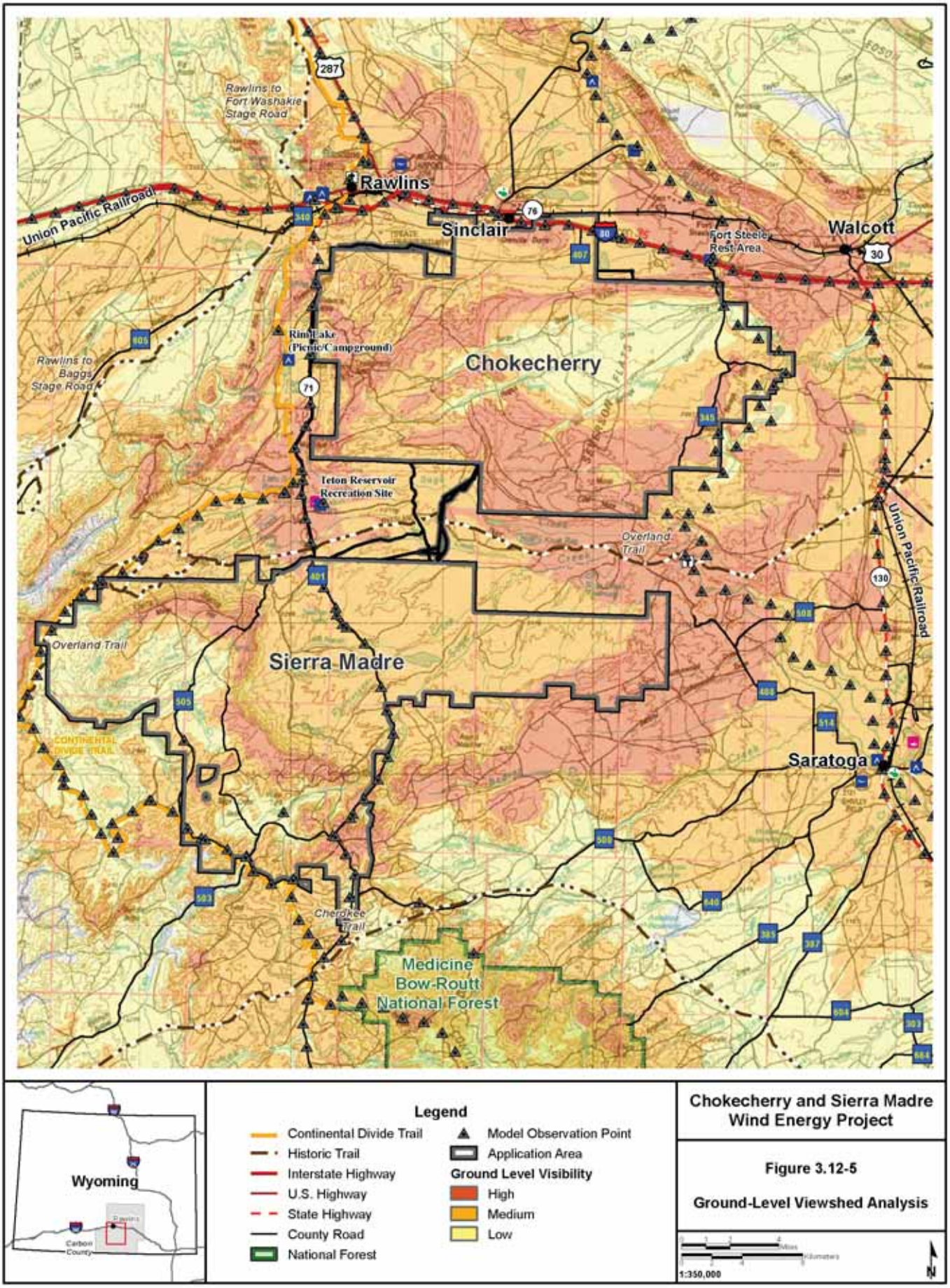
In varying degrees, parts of the Application Area are visible from WY 71/ CCR 401, WY 130, and I-80. WY 71/CCR 401 is an important access road for recreationists utilizing developed BLM recreation facilities, for hunting on BLM lands, and to the Medicine Bow National Forest. WY 71/CCR 401 also is a primary travel corridor for auto touring and scenic driving. WY 130 is the primary access road to the Town of Saratoga and for recreationists accessing the North Platte River and other BLM lands and the Medicine Bow National Forest for hunting and other recreational activities.

High to very high visibility is a defining characteristic of the region. Generally, the vast, open nature of the analysis area provides for wide and distant vistas. To the west of the analysis area lies the Atlantic Rim, one of the more distinctive landforms in the area. Panoramic views are seen from the crest of the Atlantic Rim, one of the highest points in the analysis area. Bridger Pass and the Continental Divide, as the highest ridgelines along the southwest, west, and north portions of the Sierra Madre site, screen the majority of westward views. The Grenville Dome, a linear geologic ridgeline, is situated adjacent to I-80 on the north side of Chokecherry. The Grenville Dome and Hogback Ridge that run parallel to I-80 for 13 miles from the WY 130 interchange to Sinclair screen background views from I-80, Fort Steele, and

the Town of Sinclair when looking south into the Application Area. From Sinclair and Rawlins, the northern half of the Chokecherry site is visible, especially north-facing slopes.

Field reconnaissance and ground-level viewshed analysis indicate that the majority of the ground surface has low to moderate visibility from major roads and KOPs, with many areas that are seldom seen (**Figure 3.12-5**). A turbine-level viewshed analysis, however, identifies large areas where a wind turbine generator (assumed height to nacelle of 100 m) would be moderately to highly visible from major roads and KOPs (**Figure 3.12-6**).

Because of the hogback terrain and low vegetation in the Chokecherry site and the prominent ridgeline and flat top of Miller Hill in the Sierra Madre site, vertical structures above the horizon line can be visible at great distances. The horizon is a significant aspect of all distant views and observers can generally discern individual skylined features such as communication towers and transmission poles that extend above the horizon beyond 5 miles, depending on atmospheric conditions. Communication towers and transmission poles below the horizon line typically are not readily discernible beyond 3 miles, as they blend with the forms, lines, colors, or textures of the background.



Chokecherry and Sierra Madre Wind Energy Project

Figure 3.12-5

Ground-Level Viewshed Analysis

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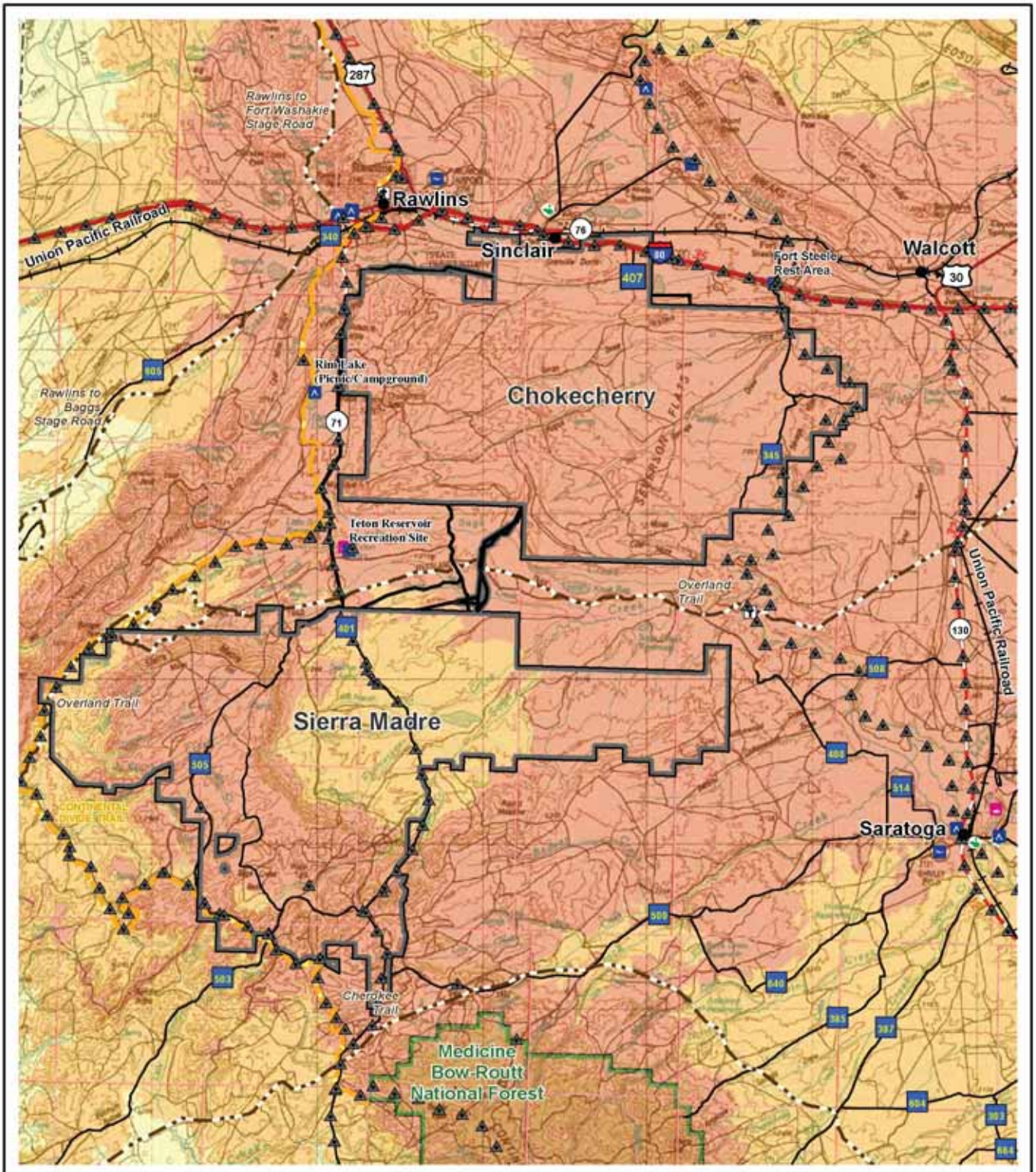

Legend

- Continental Divide Trail
- Historic Trail
- Interstate Highway
- U.S. Highway
- State Highway
- County Road
- National Forest
- Model Observation Point
- Application Area

Turbine Visibility Based on 100 m Turbine

- High
- Medium
- Low

Chokecherry and Sierra Madre Wind Energy Project

Figure 3.12-6

Turbine-Level Viewshed Analysis (100m or 328ft)

1:350,000

N